Temporal Implicatures

by

Guillaume Thomas

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Abstract

This dissertation proposes a theory of temporal implicatures, and applies it to the study of tense in Mbyá Guaraní. It is composed of two parts. In the first one, I discuss the analyses of temporal implicatures developed by Musan (1995, 1997) and Magri (2009). Although I argue in favor of Magri's (2009) analysis, I reject two aspects of his proposal: that tense is universally or generically quantified in individual level sentences, and that the present tense is vacuous (following Sauerland 2002). Building on the semantics of tense presented in chapter 2, I propose a revision of Magri's analysis in chapter 3, which integrates Katzir's (2008) theory of structurally defined alternatives, and relies on a more conservative non-vacuous analysis of the present. Sauerland's (2002) arguments that the present tense is vacuous are criticized in chapter 5. In the second part of the dissertation, I study the expression and interpretation of tense in Mbyá. Like its close relative Paraguayan Guaraní, Mbyá has two temporal morphemes *-kue* and *-rã* that can be used either in clauses or inside noun phrases. However, the nominal uses of *-kue* and *-rã* license inferences that are not attested in their clausal uses. This lead Tonhauser (2006, 2007, 2011b) to argue that the nominal uses of *-kue* and *-rã* are not tenses, and that Paraguayan Guaraní is a tenseless language. I challenge both of these claims in Mbyá. After presenting a descriptive overview of the expression of tense in Mbyá in chapter 6, I argue in chapter 7 that *-kue* in its clausal uses is best analyzed as a relative past tense, and *-rã* as a future oriented modal. I conclude that Mbyá is not a tenseless language. In chapter 8, I propose a unified analysis of nominal and clausal uses of *-kue* and *-rã*. I argue that the special properties of their nominal uses are due to the interaction between temporal implicatures and independently attested presuppositions of noun phrases. I show that these temporal implicatures are also attested in clausal uses of *-kue* and *-rã*, although they are obligatory in their nominal uses, while they can be blocked in their clausal uses. I propose an explanation of this contrast.

Thesis Supervisor: Irene Heim
Title: Professor of Linguistics

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I am very fortunate to have had Irene Heim, Martin Hackl, Sabine Iatridou and Lisa Matthewson as my dissertation committee. I benefited greatly from their comments and their advice, and I must admit that I could have benefited a lot more from them, had I had the time to absorb all of this information in time to integrate it in this dissertation. I truly lack words to express my gratitude and my admiration towards my dissertation supervisor, Irene Heim. Aside from being an outstanding scholar, advisor and professor, Irene has been and will remain a model of maturity and ethical responsibility for me. I have of course learned a great deal of linguistics during the classes that she taught and during our meetings. More importantly, I was given the opportunity to learn from the great intellectual honesty and humility with which she approaches every problem that is presented to her. I am also immensely grateful for the patience that Irene showed me on so many occasions, and for her amazing ability to be respectful and critical at the same time. I thank Martin Hackl for many insightful comments, and for making time to meet with me and to show interest in my research project on Mbyá, even when he had a lab to run and scores of graduate students to supervise. I greatly enjoyed meeting with Sabine Iatridou, even before I started my dissertation research. Most of Sabine's work lies at the interface between syntax, morphology and semantics, and pays close attention to cross-linguistic variation, which made me feel intellectually at home during our meetings. Last but certainly not least, I am very lucky that Lisa Matthewson agreed to join my dissertation committee. Although we didn't have the chance to meet face to face to discuss my research, Lisa made extensive written comments on the draft of this dissertation and we had many stimulating email exchanges. Her knowledge of tense and modal semantics and of their cross-linguistic variation was extremely helpful, as well as her methodological rigor and integrity. I hope I will have other opportunities to learn from her in the future. Finally Benjamin Spector was not on my dissertation committee but provided very insightful comments on my work, especially on the first part of the dissertation.

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Contents

Chapter 1

Introduction

1.1 Overview of the dissertation

This dissertation is composed of two parts, which are unified by the theme of temporal implicatures, i.e. quantity implicatures triggered by the use of temporal operators such as tenses or future oriented modals. In the first part, I propose a theory of the computation and the cancellation of temporal implicatures. The language that is used to develop the theory is English. In the second part, I use this theory to solve issues in the interpretation of tense in Mbyá Guaraní, a Tupí-Guaraní language spoken in Argentina, Brazil and Paraguay. This introduction outlines the issues that will be addressed in each part.

1.1.1 Temporal Implicatures

Temporal implicatures are inferences of the sort illustrated in (1) and (2). In both cases, the utterance of a past or future sentence licenses the inference that its present alternative is false:

(1) John was a linguist. ⤳ John is not a linguist.

(2) John will be a linguist. ⤳ John is not a linguist.

That these inferences are implicatures rather than other forms of inferences (such as entailments or presuppositions) is a theoretical claim that can only be justified or attacked in the light of a particular theory of implicatures. The goal of the first part of the dissertation is to build such a theory. My proposal is actually a modification of Magri's (2009) theory, integrating Katzir's (2008) theory of structurally defined alternatives and a more precise analysis of tense.

Temporal implicatures and lifetime effects

There are two major contributions to the study of temporal implicatures: Musan (1995, 1997) and Magri (2009). Both are mostly concerned with the analysis of lifetime effects of past sentences with individual level predicates, like (3):

(3) Gregory was from America.

Individual level predicates denote permanent properties, as opposed to stage level predicates (Carlson 1977). Musan (1995, 1997) and Magri (2009) observe that sentences like (3) are infelicitous in contexts where it is known that the subject (Gregory) is alive at the time of utterance, while they are felicitous in contexts where it is known that the subject is dead at the time of utterance. In contexts where it is not known whether the subject is dead or alive, such sentences trigger the inference that the subject is dead at the time of utterance. Both Musan and Magri propose that this interpretative pattern is due to an implicature triggered by the use of the past tense, namely that Gregory is not from America at the time of utterance. Musan and Magri also share the intuition that, in contexts where the sentence is infelicitous, the issue with this implicature is that in conjunction with the literal meaning of (3), it conflicts with the common knowledge that being from America is a permanent property.

Nevertheless, there are significant differences in the ways Musan and Magri pursue this intuition. Musan argues that when it is known that Gregory is alive at the time of utterance, (3) fails to implicate that Gregory is not from America. She proposes that the sentence is infelicitous because it is felt to be under-informative, due to the absence of the temporal implicature. On the contrary, Magri argues that (3) does implicate that Gregory is from America when it is known that Gregory is alive at the time of utterance, and he proposes that the infelicity of (3) in this context is due to the fact that this implicature contradicts common knowledge. Conversely, in contexts where it is known that Gregory is dead at the time of utterance, Musan argues that the temporal implicature is computed, while Magri argues that it is blocked. In contexts where it is not known whether Gregory is dead or alive at the time of utterance, Musan argues that the temporal implicature is computed and is the source of the inference that Gregory is dead. Magri is not explicit about this case. In chapter 4, I argue that Musan's analysis faces serious conceptual issues, and that one must adopt some version of Magri's proposal instead.

A theory of temporal implicatures

In the Gricean and Neo-Gricean tradition (Grice 1975, Horn 1972), conversational implicatures are inferences that are triggered by the utterance of a sentence S, under the assumption that the speaker of S is cooperative and rational. Quantity implicatures are a species of conversational implicatures that follow from the assumption that speakers try to be optimally informative, given the limits provided by their knowledge and considerations of relevance. An example of such an implicature is given in (4). More precisely, (4) is an instance of scalar implicature. According to (Neo)-Gricean analyses, one infers from an utterance of (4) that John did not read all of the books, because one reasons that if the speaker believed that John had read all of the books, it would have been more informative to say so. Assuming that the speaker is both cooperative and opinionated about the issue under discussion, one may infer that the speaker believes that John did not read all the books.

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(4) John read some of the books.
    ⤳ John did not read all of the books.

By contrast, Magri's work is rooted in the grammatical analysis of scalar implicatures (see Chierchia 2004, Fox 2007, Chierchia et al. 2009, among others). Scalar implicatures are triggered by silent exhaustivity operators that are inserted in the syntactic structure of sentences. More precisely, Magri argues that an exhaustivity operator EXH is obligatorily adjoined to every sentence. Given a sentence φ, [EXH φ] is interpreted as the conjunction of φ and the negation of every excludable alternative to φ. To keep the matter simple, one might say for now that an alternative ψ to a sentence φ is excludable if and only if φ does not entail ψ.

Since EXH is obligatorily adjoined to every sentence, Magri predicts that scalar implicatures are obligatory. This explains why the temporal implicature of (3) sticks to the sentence even in contexts where it contradicts common knowledge. However, the claim that EXH is obligatorily adjoined to every sentence appears to be inconsistent with the common observation that scalar implicatures can generally be canceled. For instance, one might follow an utterance of *John read some of the books* by *and as a matter of fact, he read all of them*. To account for this fact, Magri argues that exhaustivity operators only negate alternatives that are relevant. Therefore, the scalar implicature $\neg\psi$ of a sentence φ is blocked whenever the alternative ψ to φ is not relevant in the context of utterance.

Consequently, in order to derive the infelicity of (3) in contexts where it is known that Gregory is alive at the time of utterance, Magri must convince us that the present alternative to this sentence is obligatorily relevant in such contexts. His strategy is based on the observation that if a sentence ψ is contextually equivalent to a sentence ϕ and ϕ is relevant, then ψ is relevant too. From there, Magri argues that the present alternative to (3) is contextually equivalent to (3) in contexts where it is known that Gregory is alive at the time of utterance. Since (3) is relevant by assumption, so is its present alternative, which predicts that the temporal implicature will be computed and the sentence will be infelicitous. On the contrary, the felicity of (3) in contexts where it is known that Gregory is dead at the time of utterance indicates that the temporal implicature is not computed, and therefore that the present alternative to the sentence is not relevant. What must be shown then is that the present alternative is not contextually equivalent to (3) in such contexts. Finally, Magri does not explain the inference that is observed in contexts where it is not known whether Gregory is dead or alive at the time of utterance. I propose an analysis of this inference in chapter 3.

While I adopt the logic of Magri's analysis of lifetime effects, I depart from his proposal in the details of the computation of temporal implicatures. As we will see in chapter 4, Magri's (2009) analysis relies on the assumptions that (i) tense in sentences with individual level predicates is universally quantified and (ii) the present tense is vacuous. I disagree on both counts. The theory of tense that I adopt

is presented in chapter 2. In chapter 3, I combine it with Katzir's (2008) theory of structurally defined alternatives to propose a simpler analysis of the computation of temporal implicatures, which does not rely on the assumption that the present tense is vacuous. That this assumption is incorrect is argued for in chapter 5.

1.1.2   Nominal tense and modality in Mbyá

The second part of the dissertation applies the theory of temporal implicatures to the analysis of the interpretation of tense in Mbyá, a Tupí-Guaraní language spoken in Argentina, Brazil and Paraguay. The starting point of this study is the use of temporal morphemes *-kue* and *-rã* in Mbyá. *-Kue* and *-rã* can be used inside noun phrases, much like *ex-* and *future* in English, as illustrated in the following examples[1]:

(5)   A-echa   mburuvicha-kue.
      A1.SG-see leader-KUE

      'I saw the ex-leader'

(6)   Kuee,   a-jogua   che-ro-rã.
      Yesterday, A1.SG-buy B1.SG-house-RA

      'Yesterday, I bought my (future) house'

Tonhauser (2006, 2007) has described this use of *-kue* and *-rã* in Paraguayan Guaraní, a language closely related to Mbyá. Tonhauser argues that *-kue* and *-rã* are not tenses, and that Paraguayan Guaraní is a tenseless language. I take issue with this conclusion and argue that *-kue* is a relative past tense and *-rã* a future oriented modal. This claim is supported by the analysis of these morphemes outside of noun phrases, namely in matrix clauses, relative clauses and complement clauses, as illustrated in (7) to (9):

(7)   Juan o-mba'apo va'e-kue vaipa.
      Juan A3-work   VAE-KUE a.lot

      'Juan was working/worked a lot.'

(8)   Juan o-icha'ã Maria o-mba'apo-a-gue vaipa.
      Juan A3-think Maria A3-work-NLZ-KUE a.lot

      'Juan thinks that Maria worked/was working a lot.'

(9)   Juan i-jayvu va'e-rã ava Maria o-jurupyte va'e-kue reve.
      Juan B3-talk VAE-RA man Maria A3-kiss   VAE-KUE with

      'Juan will talk to the man that Maria kissed/was kissing'

However, there is an obstacle to a unified analysis of nominal and clausal uses of *-kue* and *-rã*, as nominal uses licenses inferences that are unattested in clausal uses. First, (10) triggers an obligatory inference that Juan is not a priest at the time of utterance, a phenomenon that Tonhauser (2006) called the *change of state*

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[1]The glosses used for Mbyá are in appendix A.

property. Secondly, (10) entails that Juan was alive when he stopped being a priest, a phenomenon that Tonhauser (2006) called the *existence property*. The clausal use of *-kue* in (11) does not trigger these inferences. Similar observations can be made with *-rã*.

(10)   Juan opygua-kue.
       Juan priest-kue
       'Juan is an ex-priest'

(11)   Juan oiko va'e-kue opygua.
       Juan be   VAE-KUE priest
       'Juan was a priest'

I argue that these additional inferences are due to the interaction of the meaning of *-kue* and *-rã* with general constraints on the temporal interpretation of noun phrases. At the heart of the analysis is the proposal that *-kue* and *-rã* trigger temporal implicatures both in their nominal and their clausal uses, but that these implicatures can be blocked only in their clausal uses. To illustrate, I propose that (10) and (11) have the same literal meaning, namely that there is a time before the time of utterance at which Juan is a priest. Both sentences also implicate that Juan is not a priest at the time of utterance, but this implicature is obligatory in (10). This derives the change of state property. The existence property follows from the interaction of this obligatory implicature with independently attested presuppositions of noun phrases.

1.1.3   Tenseless languages

Using a revision of Magri's analysis of temporal implicatures, I propose a unified analysis of the nominal and clausal uses of *-kue* and *-rã*. According to this analysis, *-kue* is a relative past tense, and *-rã* is a future oriented modal. To the extent that this proposal can be generalized to other Guaraní languages – which will remain an open question – it contradicts Tonhauser's claim that Paraguayan Guaraní is a tenseless language.

Tonhauser (2006, 2007) argues that *-kue* in its nominal uses is not a tense, mostly on the grounds that the change of state and existence properties do not follow from its analysis as a past tense. However, if I am correct, these properties are just pragmatic epiphenomena which arise from the interaction of a relative past tense (or future oriented modal, in the case of *-rã*) with independent properties of noun phrases.

Tonhauser (2011b) also argues that Paraguayan Guaraní has no tenses on verbs. This argument has two parts. Firstly, she argues that *-kue* and *-rã* in their clausal uses are not tense. *-Kue* is described as a terminative aspect (a species of perfect aspect) and *-rã* as a modal operator. I agree with the modal analysis of *-rã*. However,

a closer look at the use of -*kue* outside of noun phrases in Mbyá reveals that it cannot be analyzed as a terminative aspect, but that it must be analyzed as a relative past tense. The second part Tonhauser's argument focuses on the analysis of bare verbs in Paraguayan Guaraní. Bare verbs are verbs without temporal morphology. In matrix clauses, they are interpreted as non-futures, as illustrated in (12).

(12)   Juan o-mba'apo.
       Juan A3-work.

       'Juan is working' or 'Juan was working' or 'Juan worked.'

Tonhauser (2011b) considers and discards a number of tensed analysis of bare verbs in Paraguayan Guaraní. On the contrary, I argue that bare verbs in matrix clauses combine with an underspecified tense, a null temporal pronoun whose reference is determined contextually, following Matthewson's (2006) analysis of non-future verbs in St'át'imcets.

I conclude that Mbyá is resolutely a tensed language: its inventory of tenses includes at least a relative past tense, -*kue*, and an underspecified null tense.

1.2   The Mbyá language

Mbyá is a Guaraní language of the Tupí-Guaraní family in the Tupí stock (see Rodrigues 1984). The Tupí-Guaraní family includes more than 50 languages and is one of the most numerous linguistic families in South America, according to Rodrigues (1984, 1987). Rodrigues divided the Tupí-Guaraní family in 8 sub-groups. In this classification, Mbyá belongs to the sub-group of Guaraní languages, along with Paraguayan Guaraní, Aché, Ava, Eastern Bolivian Guaraní, Western Bolivian Guaraní, Kaiwá and Xetá.

Mbyá is spoken by 14,000 to 15,000 speakers in Argentina, Brazil and Paraguay (Ladeira 2003). Most Mbyá communities are found in rural areas. The economy is based on subsistence farming and commerce in craft work. In Argentina and Brazil, children are raised exclusively in Mbyá before they attend public school, which is when they start learning the official language of the state, either Spanish (Argentina) or Brazilian Portuguese (Brazil). Women and elders are mostly monolingual, while adult men and teenagers are bilingual. However, the use of Spanish and Portuguese is gaining in importance as the economic and political relations between Mbyá communities and Argentinian/Brazilian/Paraguayan cities are tightening.

Bilingual schooling has been introduced in Brazil and Argentina but is still in its development phase and is very much dependent on the ebb and flow of local politics. In the province of Misiones in Argentina, where the fieldwork that this dissertation is partly based on was conducted, a special program of the ministry of education has been created to this effect: Programa de Educación Intercultural

Bilingüe (PEIB). The PEIB is currently training auxiliary teachers and teachers from Mbyá communities to teach in Mbyá schools along with non indigenous teachers.

Although the Mbyá population is numerous when compared to other Tupí languages, and although Mbyá is still the primary language of education and social interaction for children inside Mbyá communities, the integrity of the language is threatened by the increasing use of Spanish and Brazilian Portuguese inside communities. Code switching between Spanish and Mbyá is common among young adults in Mbyá communities in Misiones. In the northern part of the province of Misiones, frequent contacts with Paraguayan Guaraní speakers result in the introduction of Paraguayan Guaraní lexicon in Mbyá. In addition to this, due to recent migrations of speakers of other Guaraní languages to traditional Mbyá areas, some Mbyá communities are actually composed of speakers of various Guaraní languages. In Misiones, this is especially true in the northeastern part of the province, which borders Brazil and Paraguay and which has seen migration from speakers of Nhandeva from Brazil.

This situation is a source of worries for older speakers of Mbyá, who fear for the integrity of their language. During meetings of trainees of the PEIB with elders of the communities in Misiones, elders have expressed concerns that significant parts of the vocabulary were being lost or substituted by cognates from Paraguayan Guaraní.

Previous work   There is a substantial body of work on the typology and comparative grammar of Tupí Guaraní languages in general and Guaraní languages in particular (see Rodrigues 1984, 1987, Jensen 1998, and references therein). These works are based almost exclusively on morpho-phonological and lexicographic studies.

There is also a good number of theoretical and descriptive studies on Paraguayan Guaraní. On the descriptive end, several grammars and dictionaries have been written by South American linguists, such as Gregores & Suárez (1967) and Guash (1981). Most of the theoretically oriented studies of the phonology of Paraguayan Guaraní have been focused on the analysis of regressive nasal harmony (see among others Lunt 1973, Rivas 1974, Walker 1999). In morpho-syntax, the stative-active morphological system of Paraguayan Guaraní has also been a popular subject of study, as it has been in other Guaraní languages (see Velázquez-Castillo 2002, and references therein). Other aspects of the morpho-syntax of Paraguayan Guaraní that Maura Velázquez Castillo studied include the nature of grammatical relations, serial verbs constructions (Velázquez-Castillo 2004), and incorporation (Velázquez-Castillo 1996). In semantics, it is the tense/aspect/modality of Paraguayan Guaraní that has received the most attention, notably in the work of Judith Tonhauser (see e.g. Tonhauser 2006, 2007, 2010, 2011a,b).

Mbyá enjoyed much less attention. Guedes (1983) offers a description of the

morpho-phonology of Mbyá. Of central importance is the work of Robert Dooley, who described various aspects of Mbyá morpho-syntax and information structure, and produced a dictionary and grammar of the language (see Dooley 2006, and references therein). More recently, Martins (2003) offered a general overview of the grammar of Mbyá, mostly of a descriptive nature.

Orthography   See appendix B.

1.3   Theoretical assumptions

1.3.1   Syntax

This work is loosely located within the group of theories consisting of Government and Binding (Chomsky 1981) and its more recent evolutions in the minimalist program (Chomsky 1995, 2001). However, this being mostly a study in semantics and pragmatics, I am not committed to any specific theory of syntax. I assume that the syntactic structure of sentences is adequately represented by binary branching trees. Syntactic phrases are projected by lexical or functional heads following X-bar theory. Therefore, I recognize different levels of phrase structure: heads, intermediate projections and maximal projections. I assume that heads may be syntactically complex. Although I assume X-bar theory, I will sometimes ignore the labeling of trees, and will adopt simplifying conventions when indicating labels: for instance, I will always represent (13) as (14) and (15) as (16):

(13)
$$
\begin{array}{c}
\text{XP} \\
\diagup\diagdown \\
\text{YP} \quad \text{X}' \\
| \\
\text{X} \\
| \\
\text{head}
\end{array}
$$

(14)
$$
\begin{array}{c}
\text{XP} \\
\diagup\diagdown \\
\text{YP} \quad \text{X} \\
| \\
\text{head}
\end{array}
$$

(15)
$$
\begin{array}{c}
\text{XP} \\
| \\
\text{X}' \\
| \\
\text{X} \\
| \\
\text{head}
\end{array}
$$

(16)
$$
\begin{array}{c}
\text{XP} \\
| \\
\text{head}
\end{array}
$$
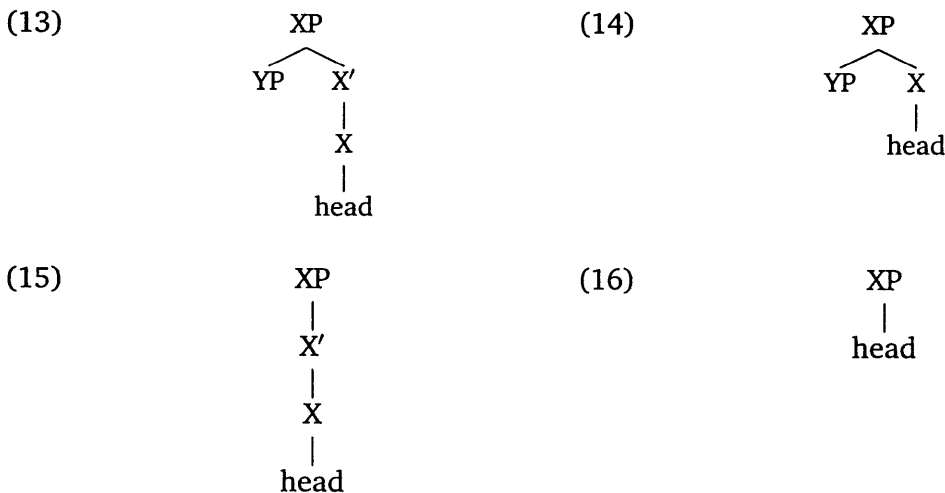
I assume the existence of movement, and I make use of empty categories, in particular silent pronouns of various types. Finally, I will often use the notion of extended projection, in the sense of Grimshaw (2005), i.e. as the constituent formed of a lexical phrase together with its functional superstructure.

1.3.2 Semantics

I work within the tradition of Montague Grammar Montague (1970a,c, 1973) and more precisely its adaptation to the Government and Binding Theory/minimalist framework in Heim & Kratzer (1998). Syntactic structures are directly interpreted rather than translated in an intermediate logical language. Interpretation is type driven and uses the rules of Terminal Nodes, Non-Branching Nodes, Functional Application, Predicate Modification and Intentional Functional Application, see Heim & Kratzer (1998).

I assume that lambda abstraction is created by movement. When an expression Δ undergoes certain forms of movement, it may leave an indexed trace in its base position and insert a lambda operator immediately below its landing site, as illustrated in the following schema:

(17) $[\Delta [1 [... t_i]]]$

Following Heim & Kratzer (1998) and von Stechow (2009), I assume that not only overt expressions but also silent pronominal expressions may create lambda abstraction by movement. PRO-movement will be essential in the interpretation of tense and aspect.

1.4 Fieldwork methodology and data collection

1.4.1 Fieldwork methodology

Since the dissertation research was carried out in the paradigm of generative syntax and semantics, it required the elicitation of the linguistic intuitions of native speakers on sentences of Mbyá (see Matthewson 2004).

Judgments of grammaticality are crucial to obtain information about the structure of sentences. For instance, one reason to think that there is a structural asymmetry between subjects and objects in transitive sentences in Mbyá is (as in English) the fact that reflexive objects are licensed by a subject antecedent while reflexive subjects are not licensed by an object antecedent. In order to construct this argument, one needs to know not only that sentences such as *Pedro oecha guay pe* ('Peter saw his [reflexive] son') in (18) are grammatical, but also that sentences such that *Gua'y oecha Pedro pe* ('His [reflexive] son saw Pedro') in (19) are not. Since ungrammatical sentences are not attested in naturally occurring data, one needs to elicit judgments of grammaticality from native speakers to obtain negative evidence:

(18)   Pedro o-echa gu-a'y
       Pedro A3-see REFL-son

       'Pedro$_1$ saw his$_1$ son.'

(19) *Gu-a'y   o-echa Pedro
      REFL-son A3-see Pedro
      '*His$_1$ son saw Pedro$_1$.'

Judgments of truth-value are needed to study the meaning of sentences and parts of sentences, and how this meaning is determined by syntactic structures. Our basic assumption is that knowing what a sentence means is, to a great extent, knowing what the world must be like for the sentence to be true. A related assumption is that in order to characterize the meaning of a sentence of a language under investigation, it is not enough to translate it in a more familiar language. Indeed, even if the translation was truth-conditionally equivalent to the target sentence, there is absolutely no guarantee that the meaning of the parts of the translation and the way these parts are put together is identical to those of the target sentence. For instance, the quantificational and aspectual suffix -pa does not have an appropriate translation in English, as shown by the fact that it can be translated alternatively as 'all' or 'completely':

(20) Yy   i-piru-pa
      lake B3-dry-pa
      'The lake is completely dry.'

(21) Maria o-echa-pa ava-kue.
      Maria A3-see-pa man-plural
      'Maria saw all the men.'

It is however possible to give a precise specification of the meaning of -pa in terms of its contribution to the truth-conditions of the sentences in which it occurs (see Thomas 2007). A formal truth-conditional analysis has the additional advantage of making precise predictions about the distribution of pa (e.g. what kind of verbs or adjectives it can combine with), predictions that can be falsified by eliciting judgments of grammaticality from native speakers.

The research methodology can therefore be broken in two major steps: (1) how to obtain the sentences that are to be judged by the consultants and (2) how to obtain the consultants' judgments on these sentences. Sentences were obtained in one of three ways: (i) extracted from texts written by native speakers or from recordings of native speakers, (ii) translated from sentences in Spanish provided by the investigator, or (iii) modified from naturally occurring sentences or translations. These modifications are done by the investigator to study fine-grained syntactic and lexical variations. Only translations of unambiguous or disambiguated sentences were asked for. In particular, no translation of words or part of sentences were asked for. Matthewson (2004) argues that parts of sentences usually lack a well defined meaning and therefore do not lend themselves well to requests for translations. Occasionally, embedding a Spanish sentence in a discourse context (also in Spanish) was used to disambiguate the meaning of the sentence. It should be noted that translations constitute a relatively minor part of semantic fieldwork, the bulk

of the fieldwork being devoted to elicitation of judgments of grammaticality or of truth-value. The use of contexts becomes more crucial in order to obtain these judgments. In order to obtain judgments of grammaticality, one has to make sure that sentences are presented in a context that makes them pragmatically plausible. This is of course a hard task for a non-native speaker, which takes essentially a negative form: when a sentence is judged incorrect by a consultant, the linguist must further investigate why the sentence is judged incorrect, for instance by asking if the very same sentence could be correct with a different pronunciation or in a different context. Knowledge of the truth-conditions of sentences is obtained by asking for the truth-value of sentences in a variety of well-chosen contexts. This contexts where presented to native speakers verbally, using Spanish as an intermediate language.

1.4.2 Data collection

I worked with five consultants, including three regular consultants and two occasional ones. The consultants are all native speakers of Mbyá from the state of Misiones, Argentina. Four of them live in the community Kuña Piru, and the last one lives in Posadas, the capital of the sate. All the consultants are adult males. I have done seven field trips to Misiones to work with these consultants between 2007 and 2012. However, the data that were used in this dissertation were obtained mostly during two field trips, one in the summer of 2011 and another in the winter of 2012.

Data were elicited only with the informed consent of the consultants. Consultants were payed between 25 and 30 Argentinian Pesos per hour (depending on inflation). At the beginning of each elicitation session, forms of consent written in Spanish were provided to the consultants, who were asked for their authorization to use the data elicited in the session in linguistic research and to include excerpts of the elicitation session in academic publications, as well as to include their names in the acknowledgement section of publications. The forms of consent also informed the consultants of their right to stop the elicitation at any point without losing their financial compensation and to revoke the authorization to use the data recorded during the elicitation session. Since most of the the elicitation sessions were held in a Mbyá community, Kuña Piru, the authorization to hold elicitation sessions in the community was obtained from the political leader of the community.

1.5   Organization of the dissertation

The dissertation can be divided in two parts. The first one, which includes chapters 2 to 5, introduces the necessary theoretical background on tense and implicatures and proposes a modification of Magri's (2009) analysis of temporal implicatures. The second part includes chapter 6 to 8 and discusses tense in Mbyá.

In chapter 2, I give an overview of the semantics of tense and aspect. I locate the

dissertation in the tradition of extensional tense logic, following Ogihara (1996), Kusumoto (1999) and von Stechow (2009). In chapter 3, I propose an analysis of temporal implicature, based on the work of Magri (2009) and Katzir (2008). In chapter 4, I discuss Musan's (1995) and Magri's (2009) analyses of lifetime effects with past individual level sentences and I compare them with the analysis proposed in chapter 3. Chapter 5 criticizes Sauerland's (2002) argument that the present tense is vacuous.

Chapter 6 is an informal description of the clausal uses of *-kue* and *-rã* and of bare verbs in Mbyá. It is followed by a semantic analysis of these facts in chapter 7, where it is argued that Mbyá is not a tenseless language. Finally, chapter 8 examines nominal uses of *-kue* and *-rã*. Chapter 9 concludes the dissertation.

Chapter 2

Tense semantics

2.1 From Tense Logic to explicit quantification over times

Tense logic, the classical treatment of tense in formal semantics, is due to Arthur Prior (Prior 1957, 1967) and was adopted by Montague in PTQ (Montague 1973). It is based on several assumptions: times are instants, they are introduced as parameters of an evaluation function rather than referred to by expressions of the object language, and tenses are sentential operators that are interpreted as quantifiers over times. In this section, I describe a language of Tense Logic, and I discuss some of the limitations of the analysis of tense that it embodies.

2.1.1 A Priorian analysis of tense

In order to interpret sentences according to a Priorian analysis of tense, we need to add temporal structure to our models. In Priorean tense logic, times are duration-less instants. The set of times I is ordered by a relation of precedence $<$. It is assumed that time is dense, i.e. that for any $t, t' \in I$ such that $t < t'$, there is a $t'' \in I$ such that $t < t'' < t'$.

(1) A model M for a Priorian analysis of tense is a 5-tuple $\langle D, W, I, <, V \rangle$ such that:

1. D is a non-empty set of individuals and:
    (a) $\mathbf{D}_e = D$
    (b) $\mathbf{D}_t = \{0, 1\}$
    (c) $\mathbf{D}_{\langle \alpha, \beta \rangle} = \{f \mid f : D_\alpha \to D_\beta\}$
    (d) $\mathbf{D}_{\langle s, \alpha \rangle} = \{f \mid f : W \to D_\alpha\}$

2. W is a non-empty set of worlds.

3. I is a non-empty set of times (instants).

4. $<$ is a linear order on I

5. V is a function from contexts, times, worlds and constants of type α to members of D_α.

The interpretation function must be redefined relative to a time of evaluation. Sentences are true or false at the temporal index of the interpretation function. Tenses are sentential operators which shift the index at which a sentence is interpreted.

(2) For any sentence φ, $[\![PAST\ \varphi]\!]^{M,w,t,g} = 1$ iff there is a t' such that $t' < t$ and $[\![\varphi]\!]^{M,w,t',g} = 1$

(3) For any sentence φ, $[\![FUT\ \varphi]\!]^{M,w,t,g} = 1$ iff there is a t' such that $t' > t$ and $[\![\varphi]\!]^{M,w,t',g} = 1$

Note that in this system, the present tense is vacuous: a present sentence is just true or false at the temporal index of the interpretation function. In order to generate correct truth conditions, we can assume that the temporal index of the interpretation function that is applied to root sentences is always the time of utterance, TU. In the following examples, I assume that the past and future tenses are silent operators and that the temporal morphology on verbs is itself uninterpreted, although it has to agree with the silent tense operator:

(4) $[\![Bill\ is\ happy]\!]^{M,w,TU,g} = 1$ iff Bill is happy at TU in w

(5) $[\![[PAST\ [Bill\ was\ happy]]]\!]^{M,w,TU,g} = 1$ iff there is a t such that $t < TU$ and $[\![Bill\ is\ happy]\!]^{M,w,t,g} = 1$

(6) $[\![[FUT\ [Bill\ will\ be\ happy]]]\!]^{M,w,TU,g} = 1$ iff there is a t such that $t > TU$ and $[\![Bill\ is\ happy]\!]^{M,w,t,g} = 1$

2.1.2   Issues with embedded tense

Priorian analyses of tense in natural language like the one sketched above face several well known problems. First, it was shown by Kamp (1971) that Priorian tense semantics makes incorrect predictions with embedded tense. Sentences (7) and (8) receive the same analysis. The LF of both sentences is the same, modulo the use of *will* instead of *would*, as in (9). Both sentences are interpreted as in (10). But while this analysis is correct for (7), it is clearly wrong for (8). The only interpretation of this sentence is that some child who was born before the time of utterance will become ruler of the world after the time of utterance.

(7) A child was born who would become ruler of the world.

(8) A child was born who will become ruler of the world.

(9)

```
          PAST
         /    \
        /      _____
       /      /|   was born
      A      / |
       \ child |
        \    2 |
         \  / \|
          FUT  \
          / \   \
        d₂   \___\
             would/will become ...
```
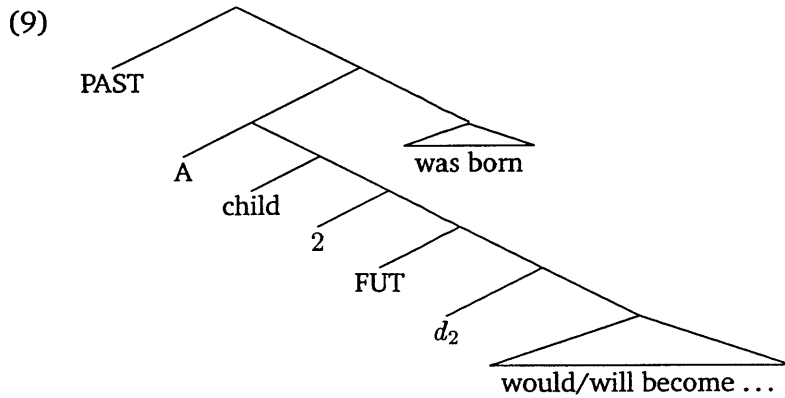
(10) $[\![(9)]\!]^{M,w,TU,g} = 1$ iff there is a time t before TU such that some child is born at t and there is a time t' after t at which this child becomes ruler of the world.

The issue is that the auxiliary *will* inside a relative clause embedded under a matrix past tense is still interpreted as a future tense relative to the time of utterance. However, Priorian tense logic is set up in a way that the sentential argument of a past tense is interpreted relative to a time that precedes the initial temporal index. A future operator embedded under a past tense is interpreted with respect to this shifted index. Kamp's (1971) solution to this problem was to use two temporal indices to interpret sentences, so that a tense operator only shifts the first of the two indices:

(11) For any φ,
$[\![\text{PAST } \varphi]\!]^{M,w,t,t',g} = 1$ iff there is a t'' s.t. $t'' < t$ and $[\![\varphi]\!]^{M,w,t'',t',g} = 1$

(12) For any φ,
$[\![\text{FUT } \varphi]\!]^{M,w,t,t',g} = 1$ iff there is a t'' s.t. $t'' > t$ and $[\![\varphi]\!]^{M,w,t'',t',g} = 1$

Using two indices allows Kamp to define an operator N (for 'now') that shifts the value of the first index to the value of the second index:

(13) $[\![N \varphi]\!]^{M,w,t,t',g} = [\![\varphi]\!]^{M,w,t',t',g}$

In this system, tense operators never change the value of the second index. Therefore, if this index is initially set at the time of utterance, the effect of N is to make the temporal interpretation of its sentential complement relative to the time of utterance. This allows Kamp to deal with indexical uses of embedded tenses as follows:

25

(14)

```
              PAST
             /    \
            A       \
             \       _____
            child      \     was born
                \       \
                 2       \
                  \       \
                   N       \
                    \       \
                    FUT      \
                       \      \
                        d₂     \
                         _____\
                       would/will become ...
```
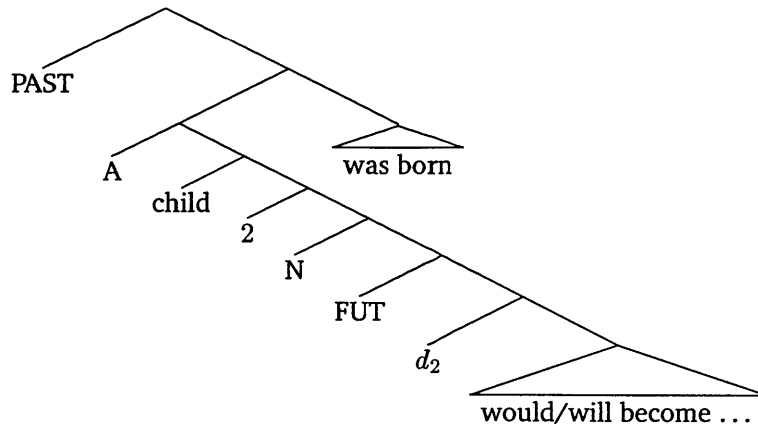
(15) $[\![(14)]\!]^{M,w,TU,TU,c,g} = 1$ iff there is a time t before TU such that some child is born at t and there is a time t' after TU at which this child becomes ruler of the world.

Unfortunately, it was shown by Vlach (1973) that we also need an operator that shifts the value of the second index to the value of the first one. Consider (16), under the reading where the temporal adverbial *one day* takes scope over the universal quantifier, and *then* refers to a salient past time, presumably provided by the linguistic context[1]. Since we are using the 'future in the past' auxiliary *would*, the future tense operator must be interpreted in the scope of a past tense operator. Moreover, since *one day* scopes over the universal quantifier, so does the future operator. However, the reduced relative clause *(who were) alive* has to be interpreted at a time that precedes the time of the subjects' death. This is not possible in a single index system, where an LF like (17) is interpreted as in (18):

(16) One day, all persons alive then would be dead.

(17)

```
          PAST
             \
            FUT
               _____
              /    \                 \
            All      \          would be dead
                \     \
              persons alive
```
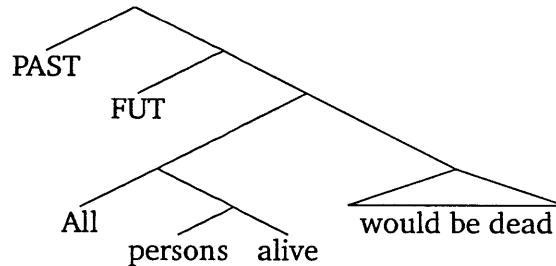
(18) $[\![(17)]\!]^{M,w,TU,g} = 1$ iff there is a time t before TU and there is a time t' after t such that for every person who is alive at t', that person is dead at t'.

Vlach solves this problem by introducing an operator K that mirrors Kamp's N operator. Sentence (16) is now parsed as the LF in (20), which is interpreted as in (21):

---

[1]One might wonder whether this sentence is grammatical at all, since *would* is not in the scope of an overt past tense. I suspect that it is only grammatical in free indirect discourse, c.f. *Paul came to a terrible realization. One day, every person alive then would be dead.*

(19) $[\![K\,\varphi]\!]^{M,w,t,t',g} = [\![\varphi]\!]^{M,w,t,t,g}$

(20)
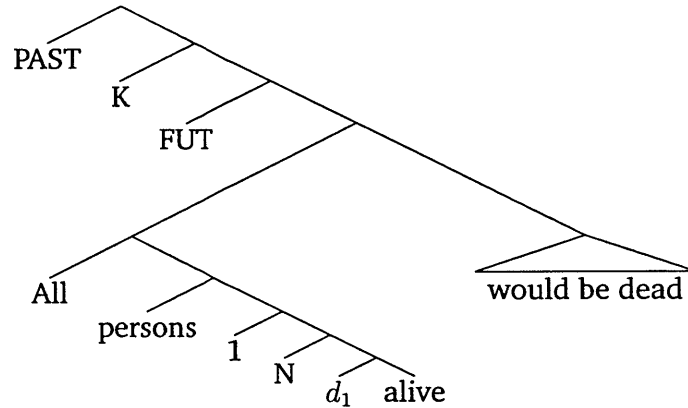
(21) $[\![(20)]\!]^{M,w,TU,TU,g} = 1$ iff there is a time t before TU and there is a time t' after t such that for every person who is alive at t, that person is dead at t'.

A consequence of the introduction of N and K in tense logic is that a double-index solution to the problem of embedded tense is no longer sufficient, since the initial second index will no longer be retrievable by the operator N embedded under the operator K itself embedded under a past or future tense. Gabbay (1974) showed that this makes it possible to build sentences that require n indices, for any positive integer n. As a consequence, English has the expressive power of a language with an infinite number of indices. But as Cresswell (1990) demonstrated, tense logic then becomes as expressive as an extensional first order logic with quantification of times in the object language.

2.1.3 Extensional treatment of tense

In view of this state of affair, we might want to switch to an extensional treatment of tense, which allows for a more elegant treatment of the examples above. The analysis of tense that is presented here is very much in the spirit of Kusumoto (1999). Times are now represented directly in the object language, rather than in the meta-language. To do so, we add a basic type i of times to the language. Some predicates gain a temporal argument, which will be saturated by a temporal variable. For now, I will assume that only verbs and adjectives have a temporal argument, as illustrated in the following examples:

(22) $[\![run]\!]^{M,w,g} = \lambda x.\lambda t.\mathbf{run}(w)(t)(x)$
$[\![read]\!]^{M,w,g} = \lambda y.\lambda x.\lambda t.\mathbf{read}(w)(t)(y)(x)$
$[\![happy]\!]^{M,w,g} = \lambda x.\lambda t.\mathbf{happy}(w)(t)(x)$

The syntactic representations of sentences of English contain abstract tense operators PAST and FUT, which have to agree with the uninterpreted tense morphology on verbs:

(23) $[\![PAST]\!]^{M,w,g} = \lambda t.\lambda t'.t' < t$

27

(24) $[\![\text{FUT}]\!]^{M,w,g} = \lambda t.\lambda t'.t' > t$

In matrix clauses, the internal argument of tense is saturated by a temporal pronoun N. N always refers to the time of utterance TU. The interpretation of N does not depend on an assignment function, but rather on the context of utterance. Therefore, we make the interpretation function relative to a context of utterance c:

(25) $[\![N]\!]^{M,w,c,g} = \text{TU}$

The external argument of tense is bound by an adverbial quantifier over times ONCE. For the sake of clarity, in the syntactic representations of sentences of English, I will represent silent pronouns and traces ranging over individuals with the letter d and those ranging over times with the letter t:

(26) $[\![\text{ONCE}]\!]^{M,w,c,g} = \lambda P_{\langle i,t\rangle}.\exists t[P(t)]$

As an illustration, consider the LF of the sentence *John ran* and its interpretation:

(27)
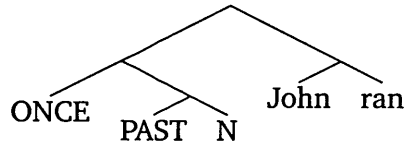
(28) $[\![(27)]\!]^{M,w,c,g} = 1$ iff $\exists t[t < TU \wedge \mathbf{run}(w)(t)(\mathbf{John})]$

This system allows us to deal with embedded tense in an elegant way, as Ogihara (1996) and Kusumoto (1999) pointed out. Let us assume that in relative clauses, the internal argument of tense may be either saturated by N or by a temporal pronoun coindexed with the external argument of the matrix tense. For instance, (29) may be parsed either as (30) or as (31):

(29) Jane will Marry a man who graduated from Harvard.

(30)

[A [man [1 [ONCE [[PAST N]] [d_1 graduated from Harvard]]]]]

(31)

[A [man [3 [ONCE [[PAST t_1]] [d_3 graduated from Harvard]]]]
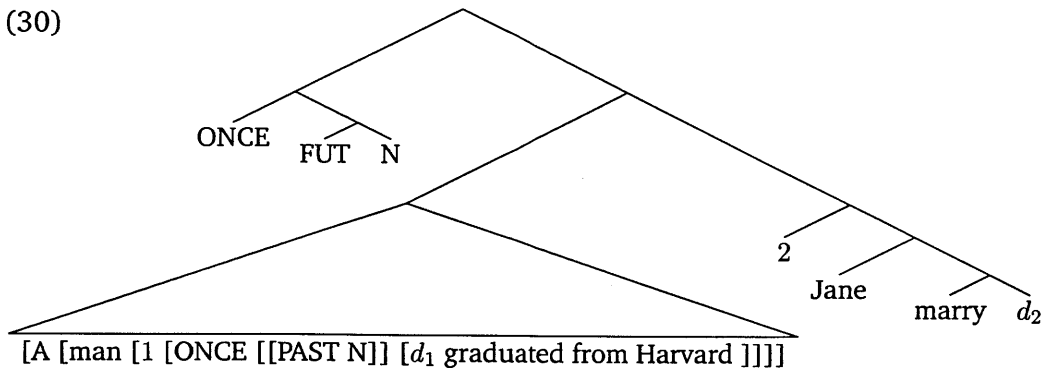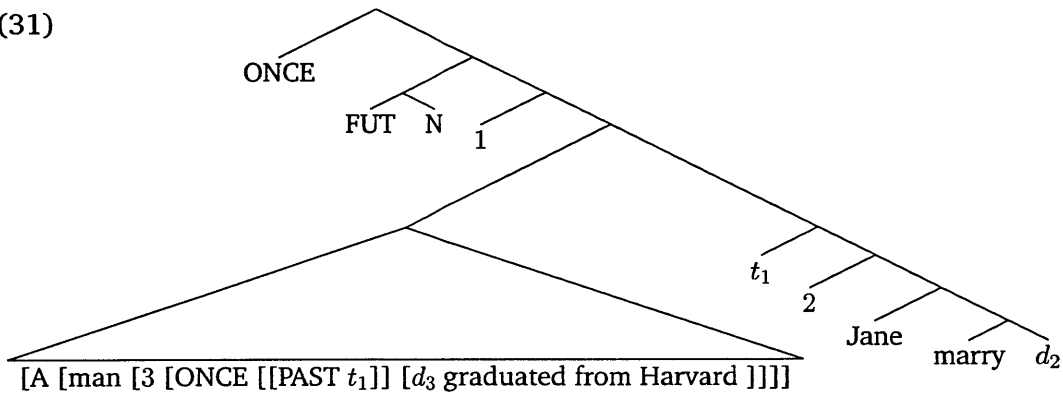
In (30), the internal argument of the embedded tense is saturated by N. As a consequence, this tense is interpreted as a past relative to the time of utterance. In (31), the internal argument of the embedded tense is saturated by the silent pronoun t_1, which is coindexed with the external argument of the matrix future tense. Therefore, the embedded tense is interpreted as a past relative to some time that is located in the future by the matrix tense:

(32) $[\![(30)]\!]^{M,w,c,g} = \exists t[t > TU \land \exists x[\mathbf{man}(w)(x) \land \mathbf{marry}(w)(t)(x)(\mathbf{Jane})$
$\land \exists t'[t' < TU \land \mathbf{graduated\text{-}from\text{-}Harvard}(w)(t')(x)]]]$

(33) $[\![(31)]\!]^{M,w,c,g} = \exists t[t > TU \land \exists x[\mathbf{man}(w)(x) \land \mathbf{marry}(w)(t)(x)(\mathbf{Jane})$
$\land \exists t'[t' < t \land \mathbf{graduated\text{-}from\text{-}Harvard}(w)(t')(x)]]]$

It is also straightforward to express the meaning of Kamp's problematic example in this theory. Since the embedded future in (34) is interpreted independently of the matrix past tense, its internal argument must be N, as shown in (35), which is interpreted as in (36):

(34)   A child was born who will become ruler of the world.

(35)
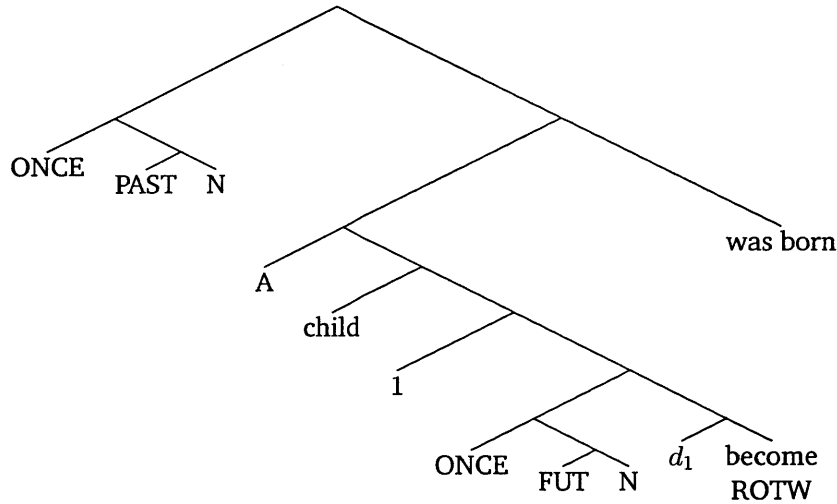
(36) $[\![(36)]\!]^{M,w,c,g} = \exists t[t < TU \land \exists x[\mathbf{child}(w)(x) \land \mathbf{born}(w)(t)(x) \land$
$\exists t'[t' > TU \land \mathbf{become\text{-}ROTW}(w)(t')(x)]]]$

One might also try to solve the problems of single-index tense logic with tense in relative clauses by scoping said relative clauses over the matrix tense. Nevertheless, Kusumoto demonstrated that this analysis leads to scope paradoxes. The reader is referred to Kusumoto (1999, in particular chapter 2) for a discussion of this matter. In the rest of this dissertation, I will adopt an extensional analysis of tense.

2.2 Aspect and interval semantics

2.2.1 From instants to intervals

Priorian tense logic is based on the assumption that sentences are evaluated at instants. However, Bennett & Partee (1978) observed that this is insufficient and that sentences are better evaluated at intervals. For convenience, I will discuss their arguments using an extensional analysis of tense, although their original work is laid out in an intensional tense logic.

Intervals are defined as convex sets of instants, i.e. an interval t is a subset of the set I of times such that for any instants $t', t'', t''' \in I$, if t', t''' are members of t and $t' < t'' < t'''$, then t'' is a member of t. The domain of the precedence relation $<$ is extended to pairs of intervals or instants by positing that (i) an interval t precedes an instant t' iff all instants in t precedes t' and (ii) an interval t precedes an interval t' iff all instants in t precedes all instants in t'. To any instant t there corresponds an interval which is the singleton set $\{t\}$. We posit $t = \{t\}$, whenever t is an instant.[2] The domain $\mathbf{D}_i$ is redefined as the set of all intervals on I, including instants.

Bennett and Partee's criticisms are directed at Montague's treatment of tense (Montague 1970b, 1973), but target instant tense semantics more generally. Their first argument concerns Montague's analysis of the present perfect. For Montague, the present perfect is a simple Priorian past tense: *John has visited Rome* is true at *TU* iff there is an instant t that precedes *TU* such that *John visits Rome* is true at t. Bennett and Partee argue on the other hand that present perfect sentences describe events that fall inside an interval that starts at some past time and extends up to the time of utterance. Evidence for this analysis is that sentences in the present perfect can combine with adverbials that denote such intervals:

(37)   John hasn't been in Paris since 2005.

Note that this is only an argument that the present perfect involves reference to or quantification over intervals, and not that sentences must be evaluated at intervals rather than at instants.

Bennett and Partee's second criticism is directed at Montague's analysis of the progressive, according to which *John is walking* is true at an instant t iff there is an

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[2]Identifying individuals and their singleton set in set theory has already been proposed by von Orman Quine (1980) and adopted by Schwarzschild (1996) in his analysis of the semantics of plurality.

open interval l such that t is in l, and for every instant t' in l, *John walks* is true at t'. Using an open interval is necessary in order to account for the inference from (38) to (39). Indeed, if (38) is true at TU, then assuming that time is dense, if TU is a member of an interval l, there is another instant t that precedes TU and that is a member of l; otherwise, TU would be a lower bound for l and therefore l would not be an open interval. But this means that (38) entails (39), since Montague analyses the present perfect as a simple Priorian past operator.

(38) John is walking.

(39) John has walked.

Unfortunately, this analysis makes incorrect predictions with accomplishments and achievements. Bennett and Partee remarked that Montague's analysis predicts that (40) should entail (41), which is clearly false.

(40) John is leaving.

(41) John has left.

Interpreting sentences directly at intervals rather than at instants yields better results. For any VP, let $[\![\text{PROG VP}]\!]^{M,w,c,g}$ be true at an instant or interval t iff there is an interval t' such that t is a non-final subinterval of t', and $[\![\text{VP}]\!]^{M,w,c}$ is true at t':

(42) $[\![\text{PROG}]\!]^{M,w,c,g} = \lambda P_{\langle i,t \rangle}.\lambda t.\exists t', t'', t'''[t'' \subset t' \wedge t''' \subset t' \wedge t'' < t < t''' \wedge P(t')]$

In order to make sense of this definition, we must let predicates be true or false relative to intervals, where truth at an interval is primitive rather than reduced to truth at an instant. This means that the extension of predicates like *walk* is defined at a world and an interval, which might not be instantaneous:

(43) For any interval l and world w, $\lambda x.\textbf{walk}(w)(x)(l)$ is the characteristic function of the set of individuals who walk in w throughout l

This analysis so far does not predict the inference from (38) to (39). In order to do so, we must recognize that activity verbs like *walk* have what Bennett and Partee called the sub-interval property: if *John walks* is true at an interval l, then it is true at any sub-interval of l:

(44) A property of intervals P has the subinterval property iff for all intervals t, t', if $P(t) = 1$ and $t' \subset t$, then $P(t') = 1$.

The inference from (38) to (39) follows from the interpretation of the progressive aspect together with the fact that *walk* has the sub-interval property[3], and the density of time: if *John is walking* is true at TU, then there is an open interval l that includes TU such that *John walks* is true at l. Therefore, there is a sub-interval l' of l whose upper bound is TU at which *John walks* is true. But these are precisely the

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[3]Although maybe not down to instants, see the discussion of non-stative non-imperfective predicates in the present tense below.

31

conditions in which *John has walked* is true, according to Bennett and Partee. Note that *John is leaving* does not entail that *John has left* because *leave* does not have the sub-interval property.

Finally, Bennett and Partee show that instant tense semantics fails to account for common uses of the present tense. It is well known that non-progressive sentences that describe events (as opposed to states) are either unacceptable in the present, or receive a special interpretation (for instance, *John smokes* is interpreted as a habitual sentence). (45) for instance would be unacceptable in most contexts of utterance. In Priorian tense logic, present tense sentences are in a sense tenseless: they have no tense operator. These sentences are directly evaluated at a time which I take to be TU for matrix sentences, as illustrated in (46). Moreover, it is crucial that all such sentences be interpretable at an instant, since the interpretation of past and future sentences depends on the interpretation of tenseless sentences at a past or a future instant. For instance, the truth of sentence (47) at TU is dependent on the truth of sentence (45) at some interval t' that follows TU:

(45) John builds a house.

(46) $[\![(45)]\!]^{M,w,c,g}(TU) = 1$ iff John builds a house at TU

(47) John will build a house.

(48) $[\![(47)]\!]^{M,w,c,g}(TU) = 1$ iff there is a $t' > TU$ such that John builds a house at t'

An unfortunate consequence of this analysis of tense is that sentences like (45) should be perfectly interpretable and acceptable, contrary to facts. Bennett and Partee propose that such sentences are unacceptable because they describe eventualities that are not instantaneous: building a house takes time, and so cannot be true or false at an instant. This proposal was also advocated by Taylor (1977) and further developed by Dowty (1979). In essence, Dowty proposes that eventive predicates are only defined at intervals greater than an instants because they describe processes, and processes cannot take place instantaneously. Assuming then that matrix sentences are interpreted with respect to the time of utterance TU, and that TU is an instant, we predict that non-progressive event sentences are undefined in the present tense.[4]

2.2.2 Aspectual classes

There is an intuitive notion that different predicates describe different types of eventualities. For instance, the adjective *happy* describes a state that individuals might

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[4]This theory fails to predict that achievements are ungrammatical in the descriptive present, since achievements are generally agreed to be linguistically instantaneous. Irene Heim (p.c.) points out that this issue is addressed by Ogihara (2007). In short, Ogihara proposes that TU is the interval that it takes to utter a sentence, rather than an instant, and that a present sentence *PRES P* is true iff *P* is true at all subintervals of TU, down to instants. As a consequence, P cannot be a non-imperfective activity or accomplishment (since activities and accomplishments are undefined at instants), and it cannot be an achievement either, since achievements are quantized, see section (2.2.2).

be in, while the verb *explode* describes a process that individuals might undergo. The classification of eventualities in such types originates in the philosophical tradition (Ryle 1949, Vendler 1957, Kenny 1963). In linguistics, it is commonly referred to to as *Aktionsart*, and has been studied extensively (Bach 1986, Hinrichs 1985, Krifka 1989, 1998, Filip 1999, among others). The classification that I will discuss in this section is due to Vendler, and comprises four classes:

(49) Vendler's classification of Aktionsart:

1. States: *be happy, know*
2. Activities: *smoke, sleep, write letters*
3. Accomplishments: *walk to the station, read a book*
4. Achievements: *arrive, find a book*

In English, stative predicates are most easily distinguished from events (activities, accomplishments and achievements) by their compatibility with the descriptive present tense and their incompatibility with the progressive aspect. Only stative predicates can occur in the descriptive present without using the progressive aspect and without a shift in meaning. Of the following examples, only the stative sentence (50) is grammatical as an unmarked description of what is going on at the time of utterance. The eventive sentences in (51) to (53) are either unacceptable or undergo a shift of meaning: (50) for instance is readily interpreted as a habitual sentence, while (52) and (53) may be acceptable in some peculiar contexts, for instance in stage directions, where the author describes a scene from a 'temporally frozen' perspective. In any case, these three sentences would be unacceptable as answers to the question *What is John doing?*, which shows that they cannot be used as descriptions of the action in which John is engaged at the time of utterance.

(50) John is happy.

(51) #John smokes.

(52) #John walks to the station.

(53) #John arrives.

Furthermore, stative predicates are for the vast majority incompatible with the progressive aspect. Predicates that describe location in space are a notable exception. Note that some examples in (54) are acceptable in the particular sense that John is *acting* as if he were intelligent or stupid. This distinguishes states from activities and accomplishments, but not from achievements, which are generally incompatible with the progressive aspect as illustrated in (57):

(54) *John is being happy/intelligent/stupid.

(55) John is standing next to Mary.

(56) John's keychain is hanging from his belt.

(57) *John is finding his car keys.

Moving to eventive predicates, one can make a distinction between telic and atelic predicates. Telic predicates describe events that have a set termination point or culmination. *Eat an apple* for instance describes events that end once the relevant apple is consumed, and *walk to the station* describes events that end once the agent reaches the station. If an event of eating an apple ends before the apple is completely eaten, this event is in a sense incomplete. Atelic predicates have no culmination: *eat apples* or *walk in the park* describe events that may end at any point without being incomplete: indeed, the notion of completion is irrelevant in the description of atelic predicates. Activities are atelic, while accomplishments and achievements are telic. There are several linguistic manifestation of telicity. I will mention two of them. First, a progressive sentence entails its perfective counterpart with atelic predicates, but not with telic predicates

(58) John is walking in the park $\Rightarrow$ John walked in the park.

(59) John is walking to the station $\nRightarrow$ John walked to the station.

Secondly, atelic predicates are compatible with *for*-adverbials but not with *in*-adverbials, while the opposite is true of telic predicate (achievements are incompatible with both adverbials, since they have no duration):

(60) John walked in the park for an hour/*in an hour.

(61) John walked to the station in an hour/*for an hour.

Finally, achievements are distinguished from other predicates in our classification by being linguistically instantaneous. By that, I mean that although one might conceive of the events that are described by achievements as having a duration, these predicates behave as if they described instantaneous events.

(62) John found his car keys *in an hour/*four an hour.

There is an important temporal property that distinguishes states and activities on the one hand from accomplishments and achievements on the other hand. States and activities have what Bennett and Partee called the sub-interval property. A predicate of intervals P has the subinterval property iff for all t, t', if P is true at t and t' is a sub-interval of t, then P is true at t'. Let us first illustrate this point with a stative predicate. The claim is that if John is in the denotation of the tenseless verb phrase *be happy* at an interval t, say from 2:00 pm to 4:00 pm, then he is in the denotation of this predicate at all sub-intervals of t, for instance from 2:00 pm to 3:00 pm. Likewise with activities: if John is in the denotation of *walk in the park* from 2:00 pm to 4:00 pm, then he is in the denotation of this predicate from 2:00 pm to 3:00 pm. On the contrary, accomplishments and achievements are quantized (Bennett and Partee's anti-sub-interval property; the term 'quantized' is due to Krifka (1989)). A predicate of intervals P is quantized iff, for all t, t', if P is true at t and $t \subset t'$, then P is false at t'. For instance, if John is in the denotation of *walk to the station* from 2:00 pm to 3:00 pm, he is not in the denotation of this predicate from 2:00 pm to 4:00 pm. The intuition behind this claim is that if a predicate is

telic, it should be true only at intervals that contain a complete eventuality. State and activity predicates on the other hand are atelic: therefore, they should be true at any interval throughout which the state holds or the activity is going on.

Another temporal property that distinguishes telic from atelic predicates is cumulativity. A predicate of intervals P is cumulative iff for all t, t', if P is true at t and at t' and t, t' are adjacent[5], then P is true at the union of t and t'. So, if John is in the denotation of *be happy* or *walk in the park* from 2:00 pm to 3:00 pm and from 3:00 pm to 4:00 pm, he is in the denotation of these predicates from 2:00 pm to 4:00 pm. Of course, a quantized predicate cannot be cumulative.

The study of Aktionsart has been a lively domain of research in syntax and semantics alike, and I must acknowledge that the sketch that was proposed in this section is very shallow. In particular, nothing has been said about the composition of this form of aspect: it is well known that aktionsart is a property of verb phrases that depends not only on the lexical properties of the verb, but also on the lexical properties of its arguments (see Krifka 1998, Filip 1999). More recent theories also claim that the aktionsart of verb phrases is conditioned by structural factors like case, as much as by the lexical properties of the verb and its thematic arguments (see Kratzer 2004, Borer 2005). I will ignore these issues and assume that the aktionsart of verb phrases is given non-compositionally.

2.2.3 Viewpoint aspect

Finally, I would like to discuss so called viewpoint or grammatical aspect, such as perfective and progressive. A common view is that the perfective aspect presents an eventuality 'as a whole' or from the 'outside', while the progressive presents it 'from the inside' (Comrie 1976, Smith 1997). More concretely, I will follow Klein (1994) and Kratzer (1998) in assuming that the perfective and progressive aspects act as mediators between the Verb Phrase and tense. The perfective aspect locates some interval at which the VP is true inside the interval that is fed to tense, while the progressive aspect locates the interval that is fed to tense inside some interval at which the VP is true:

(63) $[\![\text{PFV}]\!]^{M,w,c,g} = \lambda P_{\langle i,t \rangle}.\lambda t. \exists t'[t' \subset t \wedge P(t')]$

(64) $[\![\text{PROG}]\!]^{M,w,c,g} = \lambda P_{\langle i,t \rangle}.\lambda t. \exists t'[t \subset t' \wedge P(t')]$

This analysis has the merit of capturing a number of interactions between tense, viewpoint aspect and aktionsart. First, note that perfective accomplishments in the past tense entail that the eventuality has reached its culmination, while past imperfective accomplishments do not have this entailment. For instance, (65) but not (66) entails that John reached the station at some point in the past. This is correctly predicted if the time that tense locates in the past of TU is the evaluation time viewpoint aspect, rather than the evaluation time of the verb phrase:

---

[5]i.e. there is no interval t'' such that $t < t'' < t'$ or $t' < t'' < t$

(65) φ = John walked to the station.

$\llbracket \varphi \rrbracket^{M,w,c,g} = \exists t[t < TU \wedge \exists t'[t' \subset t \wedge P(t')]]$

(66) ψ = John was walking to the station.

$\llbracket \psi \rrbracket^{M,w,c,g} = \exists t[t < TU \wedge \exists t'[t \subset t' \wedge P(t')]]$

Secondly, as we saw in section (2.2.1), a slightly more complex definition of the progressive aspect (which posits that PROG(VP) is true at non-final subintervals of some interval at which the VP is true) together with the sub-interval property and its converse, quantization, captures the entailment from past imperfective to past perfective with activities and its absence with accomplishments:

(67) John was walking $\Rightarrow$ John walked.

(68) John was walking to the station $\not\Rightarrow$ John walked to the station.

Of course, this analysis of viewpoint aspect has its limitations. In particular, it has been pointed out that the progressive must be given a modal semantics, since the truth of a progressive accomplishment at some past time does not entail that the event was or will be completed: *John was crossing the street* might be true at some past time even if John never got to the other side of the street and never will (Dowty 1979, Landman 1992, Portner 1998).

2.2.4   Introducting events

The previous subsections have motivated the move from an instant semantics to an interval semantics. But most studies of tense and aspect in natural language semantics nowadays use a form of event semantics, often in addition to interval semantics. In this subsection I review classic arguments in favor of event semantics and I reformulate the analysis of lexical and grammatical aspect proposed in the previous subsections using events.

Davidson (1967) argued that the ontology of English includes events, and that verbs denote properties of events or relations between events and individuals. Davidson's (1967) main argument in favor of the event argument is that it allows us to account for entailments generated by adverbial modification of sentences. Indeed, sentence (69a) entails all of (69b-d), which are obtained from (69a) by deleting (b and c) or reshuffling (d) adverbs. If the logical form of (69a) is (70) –abstracting away from tense and modality for a moment– the entailment can easily be explained by the tautologies $p \wedge q \rightarrow p$ and $p \wedge q \rightarrow q \wedge p$:

(69) a. Jones buttered the toast slowly, deliberately, in the bathroom, with a knife, at midnight.
b. Jones buttered the toast slowly, deliberately, in the bathroom, with a knife.
c. Jones buttered the toast.
d. Jones buttered the toast, at midnight, with a knife, in the bathroom, deliberately, slowly.

(70) $\exists e[\textbf{butter}(e)(\text{the-toast})(\text{John}) \wedge \textbf{slow}(e) \wedge \textbf{deliberate}(e)$
$\wedge \text{LOCATION}(e) = \textbf{the-bathroom} \wedge \exists x[\textbf{knife}(x) \wedge \text{INSTRUMENT}(e) = x]$
$\wedge \tau(e) = \textbf{midnight}]$

A second argument that is often invoked in favor of Davidson's claim is that it is possible to make anaphoric reference to events using the pronoun *it*, as in example (71) from Cappelen & Lepore (2002). As Cappelen and Lepore note, this test is relevant because not all objects that are made salient in discourse can be used as antecedent for pronominal anaphora. It is usually recognized that anaphoric reference (as opposed to demonstrative reference) is only licensed if the antecedent is syntactically represented in the linguistic context, as illustrated by the contrast between (72a) and (72b) (see Cooper 1979, Evans 1980, Heim 1990).

(71) Mary kissed John and it happened at midnight.

(72) a. John has a wife. She is sitting next to him.
b. John is married. ??She is sitting next to him.

To add events to our toolbox, we define a new type v and domain D_v of events. I will use the letter e both to refer to events in the meta-language that is used to describe truth-conditions, and to name silent pronouns ranging over events in syntactic representations. The denotations of verbs and adjectives can now be restated as follows. Eventive predicates denote properties of events or relations between individuals and events, e.g. (73) and (74). Stative predicates denote properties of times or relation between times and individuals, e.g. (75):

(73) $[\![\text{rain}]\!]^{M,w,c} = \lambda e.\textbf{rain}(w)(e)$

(74) $[\![\text{eat}]\!]^{M,w,c} = \lambda y.\lambda x.\lambda e.\textbf{eat}(w)(e)(y)(x)$

(75) $[\![\text{happy}]\!]^{M,w,c} = \lambda x.\lambda t.\textbf{happy}(w)(t)(x)$

This difference of types can be exploited to explain why the distinction between perfective and imperfective aspect is only relevant for eventive verbs: if grammatical aspects map properties of events to properties of times, they cannot combine with stative predicates for type theoretic reasons. I will adopt the formalization of Klein's (1994) theory of grammatical aspect using event semantics of Kratzer (1998). The perfective aspect maps a property of events P to a property of time t such that there is an event e that satisfies P and the running time of e ($\tau(e)$) is included in t. The progressive aspect on the other hand asserts that t is included in $\tau(e)$:

(76) $[\![\text{PFV}]\!]^{M,w,c} = \lambda P.\lambda t.\exists e[P(e) \wedge \tau(e) \subseteq t]$

(77) $[\![\text{PROG}]\!]^{M,w,c} = \lambda P.\lambda t.\exists e[P(e) \wedge t \subseteq \tau(e)]$

Since grammatical aspect outputs a property of times, we don't need to change our theory of tense.

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2.2.5 Notational hygiene

At this point it might be useful to make a quick summary of some notational conventions. The system of types is:

(78) Types:

- Individuals, type e, domain D_e
- Times (Intervals and instants), type i, domain D_i
- Events, type v, domain D_v
- Truth values, type t, domain $\{0, 1\}$

In the metalanguage used to describe truth-conditions, I use the following conventions:

(79) Metalanguage conventions:

- Individual variables: $x, x', \ldots, y, y', \ldots, z, z', \ldots$
- Time variables: $t, t', \ldots$
- Event variables: $e, e', \ldots$

In Logical Forms, I represent silent pronouns and traces as follows:

(80) LF conventions:

- Individuals: $d_1, d_2, \ldots$
- Times: $t_1, t_2, \ldots$
- Events: $e_1, e_2, \ldots$

2.3 Tenses and pronouns

Priorian tense logic offers an existential treatment of tense. However, Partee (1973, 1984) pointed out a number of shortcomings with this approach, and proposed that in some cases tenses behave more like pronouns than like existential quantifiers. It is well known that pronouns can be used either as referring expressions or as bound variables. As referring expressions, their reference is determined contextually: they must 'pick up' an antecedent in the linguistic or extra-linguistic context. In the latter case, pronouns are often called deictic: the referent is an entity that is not mentioned in the discourse but is otherwise contextually salient. When (81a) is uttered by a witness in a mug show, who is pointing at one of the suspect, he is used as a deictic pronoun. In (81b) on the other hand, the antecedent of he is a referring expression in the previous sentence. In this case, the relation between the two expressions is one of co-reference. In (81c), he is used as a bound-variable pronoun: the reference of 'he' co-varies with the individuals that are quantified over by every. While the use of pronouns in (81a-c) are easy enough to account for, there are more complex uses of pronouns. In (81d), he is anaphoric to an indefinite expression. If

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indefinites are interpreted as existential quantifiers, the relation between the pronoun and its antecedent cannot be one of co-reference, since quantifiers are not referring expressions. A related problem is illustrated in (81e): here, we would like the indefinite in the antecedent of the conditional to be interpreted as a quantifier that binds the pronoun *it* in the consequent. Unfortunately, *it* is not in the scope of the indefinite.

(81)   a. He is the culprit!
        b. Bobby went to the roadhouse. He got drunk.
        c. Every boy thinks that he will win the contest.
        d. A man entered the room. He was drunk.
        e. If Pedro owns a donkey, he beats it.

Partee (1973, 1984) suggested that all these uses of pronouns have equivalents in the domain of tense. First, let us look at an example of deictic past tense. (82) is supposed to be uttered on the highway, a couple of minutes after the speaker left home. A simple existential analysis of the sort illustrated in (83) fails to capture the correct interpretation of the sentence. (83a) is true iff there is no time before TU at which the speaker turned-off the stove, while (83b) is true iff there is a time before TU at which the speaker didn't turn off the stove. The first reading is too strong, and the second is too weak. Indeed, the correct interpretation of (82) in the indicated context is that the speaker didn't turn-off the stove at a specific interval that covers, say the last few minutes that she spent at home just before she left. Therefore, it appears that the past tense in this example is not existential but referential. Furthermore, its referent is not mentioned in the preceding discourse but is an interval that is salient in the extra-linguistic context.

(82)   I didn't turn off the stove!

(83)   a. $\neg \exists t[t < TU \land \textbf{turn-off}(t)(\textbf{the stove})(\textbf{the speaker})]$
        b. $\exists t[t < TU \land \neg\textbf{turn-off}(t)(\textbf{the stove})(\textbf{the speaker})]$

The next example illustrates an anaphoric use of tense. This example is not from Partee, but I think it is a clear case of anaphora to a definite time. The question establishes Wednesday 22 April 1500 as a topic time, and the past tense in the answer is clearly anaphoric to this date:

(84)   Q: What happened on Wednesday 22 April 1500?
        A: Cabral landed at Monte Pascoal.

Bound variable interpretations of tense can be built using adverbial clauses: (85) asserts that for every interval t during which Mary telephoned, Sam was asleep through t:

(85)   Whenever Mary telephoned, Sam was asleep.

Partee (1984) proposes sentence (86) as an example of temporal anaphora with an indefinite antecedent: here the past tense in the second sentence is supposed to

be anaphoric to the time at which Mary woke up during the night. (87) may be a clearer example though. Here, the first sentence does not convey any information about the interval at which I am asserted to have visited Germany, beyond the fact that it precedes the time of utterance (and is extended enough to include a complete trip to Germany). Furthermore, the event of going to Berlin that is related in the second sentence is clearly located inside the interval that is described in the first sentence (while in (86), the event of turning the light on actually follows the event of waking up – more on this below). The parallel to (81d) is more striking.

(86)   Mary woke up sometime during the night. She turned on the light.

(87)   I once visited Germany. I went to Berlin.

Finally, one might expect analogues of Donkey anaphora in the temporal domain. I propose (88) as an example, which is not from Partee (1973, 1984):

(88)   Everyone who once visited Germany went to Berlin.

I will analyze these facts in the spirit of Partee (1973), assuming that at least some uses of tense are pronominal. In a static semantic theory, pronouns can be treated as variables. Deictic and anaphoric pronouns are free variables. As we know, the interpretation of free variables depends on an assignment function, which assigns a value to them. However, the interpretation of pronouns is also context-sensitive. This is clear with deictic interpretations of pronouns: (89) uttered out of the blue in a context in which there is no salient male individual is uninterpretable, because the reference of the pronoun *him* cannot be determined.

(89)   I like him.

In order to capture the context-sensitivity of pronoun interpretation, we can interpret sentences with respect to a partial assignment function, which assigns values only to some variables – including indexed pronouns. The nature of the assignment reflects the contextual information that is used to interpret pronouns. Let c be the name of the context of utterance, and g_c the partial assignment function that it determines. We adopt the following principles of interpretation from Heim & Kratzer (1998):

(90)   Appropriateness condition:
       A context c is appropriate for an LF φ only if c determines a variable assignment g_c whose domain includes every index which has a free occurrence in φ.

(91)   Truth and Falsity conditions for utterances:
       If φ is uttered in c and c is appropriate for φ, then the utterance of φ in c is true in w if $[\![\varphi]\!]^{M,w,c} = 1$ and false in w if $[\![\varphi]\!]^{M,w,c} = 0$.

The next step is to decide how to make tense pronominal. In the extensional analysis of tense that I have adopted, a simple solution is to assume that the external

argument of tense operators is saturated by a silent pronoun rather than bound by an existential quantifier[6]:

(92)
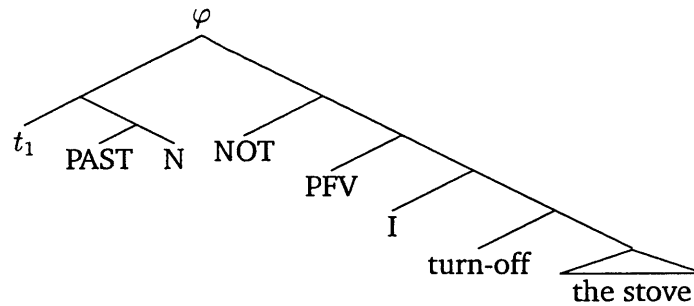
(93) $\quad [\![\varphi]\!]^{M,w,c} = g_c(t_1) < TU \land \neg \exists e[\tau(e) \subset g_c(t_1)$
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad \land \text{turn-off}(w)(e)(\text{the stove})(\text{the speaker})]$

Alternatively, one might assume with Ogihara (1996) that tense is existentially quantified, but that the domain of its quantifier is contextually restricted. In the following LF, the contextual restriction is represented as an indexed predicate C_i, for some numerical index i:

(94)
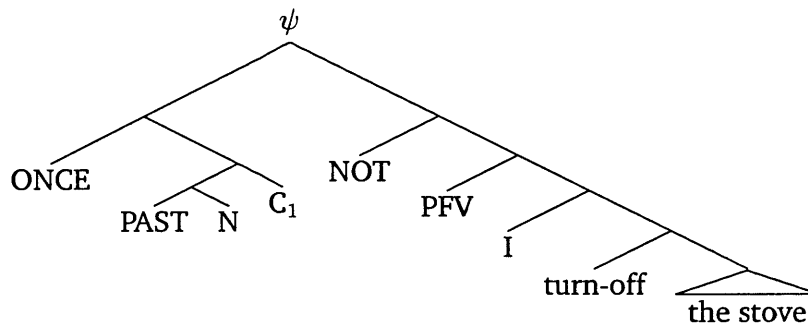
The index on C_i is meant to represent the context sensitivity of the domain restriction. C_i denotes function from intervals to truth-values. More precisely, it maps an interval t to the truth value 1 iff t is identical to some salient time $g_c(t_i)$:

(95) $\quad [\![C_1]\!]^{M,w,c} = \lambda t.t = g_c(t_1)$

(96) $\quad [\![\psi]\!]^{M,w,c} = \exists t[t = g_c(t_1) \land t < TU \land \neg \exists e[\tau(e) \subset t$
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad \land \text{turn-off}(w)(e)(\text{the stove})(\text{the speaker})]$

We see that the two strategies are equivalent then. In the rest of this chapter, I will adopt the former, and assume that the external argument of tense may be saturated by a temporal pronoun.

At this point, one may wonder whether all instances of tense are pronominal. Given our assumptions on the interpretation of free variables, this would mean that

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[6]In (92), the negation operator NOT is interpreted as polymorphic negation as in Winter (2001), p. 23.

all uses of tense are context dependent. This does not seem to be correct. We have seen that there are truly existential uses of the past tense, i.e. sentences which assert that some eventuality took place at some time in the past, and that are not context dependent (beyond the determination of the time of utterance, that is). A clear example was the first sentence of (87), repeated here for convenience:

(87)   I once visited Germany. I went to Berlin.

Note that the distinction between pronominal tense and existential tense does not mean that existential tense is always unrestricted. Indeed, the first sentence of Partee's example in (86) is best described as a restricted existential past tense. The past tense is not pronominal, since the time at which Mary woke up is not determined by anaphora to a contextually salient interval. Nevertheless, the existential quantification is restricted, since the adverbial *during the night* conveys that this time is a sub-interval of the night that precedes the time of utterance:

(86)   Mary woke up sometime during the night. She turned on the light.

We can now deal with the remaining types of temporal anaphora. I will follow the account of anaphora presented in Heim & Kratzer (1998). Anaphora to a definite time is handled just as deictic uses of tense. In (84), the past tense in the answer is saturated by a pronominal tense, which is interpreted as a free variable. The explicit mention of the date in the question makes it salient enough to serve as an antecedent. Furthermore, other assignments are ruled out, since the answer would not address the question then:

(84)   Q: What happened on Wednesday 22 April 1500?
       A: Cabral landed at Monte Pascoal.

Anaphora to an indefinite antecedent is a more delicate subject matter. Since the antecedent is not referential, we cannot say that the pronoun and its antecedent co-refer. Nevertheless, there is a sense in which the first sentence in (86) makes some interval salient: this interval can be described informally as 'the time at which Mary woke up during the night'.

(86)   Mary woke up sometime during the night. She turned on the light.

We will therefore assume that the external argument of the past tense in the second sentence is interpreted as a free variable that picks up the interval that is made salient by the first sentence. Note that it is not trivial to give a recipe for constructing this interval from the interpretation of the antecedent. In (86), the first sentence is in the perfective aspect. This means that the existential quantification is over intervals inside which Mary woke up, and that are included in the night before the day of utterance. There are many such intervals. Indeed, since time is dense, there are infinitely many. In that case, it seems that the salient interval is the minimal interval in this set: indeed, it is the only interval that contains the event of waking up and that doesn't stretch beyond the boundary of this event. But there are cases where this will not work. Consider (97):

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(97)   Once, Mary had measles. She had to stay in bed.

The predicate of the first sentence is stative. For such predicates, the contrast between perfective and imperfective aspect is irrelevant. I take this to mean that tense combines directly with the verb phrase, and that it quantifies existentially over intervals throughout which Mary had measles. In that case, the salient interval is the maximal interval in this set. Indeed, the most accessible reading of the second sentence is that Mary had to stay in bed throughout her illness. What is a general recipe for constructing the salient interval then? I suggest that in all cases it is the most informative interval that satisfies the property in the scope of the existential quantifier in the antecedent. Given a relation between worlds and intervals R, the most informative interval that satisfies R in a world w is written $\mu(R)(w)$ and is defined as follows[7]:

(98)   Most informative interval satisfying a property of intervals R in a world w:
        $\mu(R)(w)$ is the unique interval $t \in I$ such that $R(w)(t) = 1$ and there is no other interval $t' \in I$ such that (i) $R(w)(t') = 1$ and (ii) $\lambda w.R(w)(t')$ entails $\lambda w.R(w)(t)$.

Let us now look at analogues of Donkey anaphora. The issue with (88) is that we require both that the time of going to Berlin be included in the time of visiting Germany, and that the time of visiting Germany may vary with each visitor. Therefore, although the temporal pronoun in the scope of the universal quantifier is not bound by its antecedent, it is not referential either.

(88)   Everyone who once visited Germany went to Berlin.

I analyze the temporal pronoun as an E-type pronoun, following the analysis of Heim & Kratzer (1998), which in turn follows Heim (1990) and Cooper (1979). Essentially, the external argument of the past tense in the scope of *every* in (88) is a definite description that reads *the maximally informative interval at which he visited Germany*, where *he* is bound by *every*. How do we get this description? Assume that English contains silent pronouns over relations between individuals and intervals. These pronouns are indexed and are treated as variables of the same type. As usual, pronouns with different indices are treated as different variables. A pronoun of this sort is used to form the E-type pronominal tense. In (99), a silent pronoun C_3 of type $\langle e, \langle it \rangle \rangle$ is combined with a silent individual pronoun d_1, and this constituent combines with a silent determiner m-inf that denotes μ. Since C_3 is a variable, its interpretation depends on the contextual assignment function g_c. In (88), the restriction of the universal quantifier makes a relation between individuals and times particularly salient: the relation between an individual x and an interval during which x visited Germany. Provided g_c maps C_2 to this relation, (99) will denote the minimal interval during which $g_c(d_1)$ visited Germany.

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[7]This definition is adapted from the definition of maximally informative intervals in degree semantics in Beck (2010).

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(99)
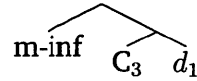
m-inf C_3 d_1

(100) $[\![C_3]\!]^{M,w,c} = \lambda x.\lambda t.\exists e[\tau(e) \subseteq t \land \mathbf{visited}(w)(e)(\mathbf{Germany})(x)]$

(101) $[\![[\text{m-inf }[C_3\ d_1]]]\!]^{M,w,c} = \mu(\lambda w.\lambda t.\exists e[\tau(e) \subseteq t$
$$\land \mathbf{visited}(w)(e)(\mathbf{Germany})(g_c(d_1)])(w)$$

We can now consider the whole LF of example (88) and its interpretation:

(102)
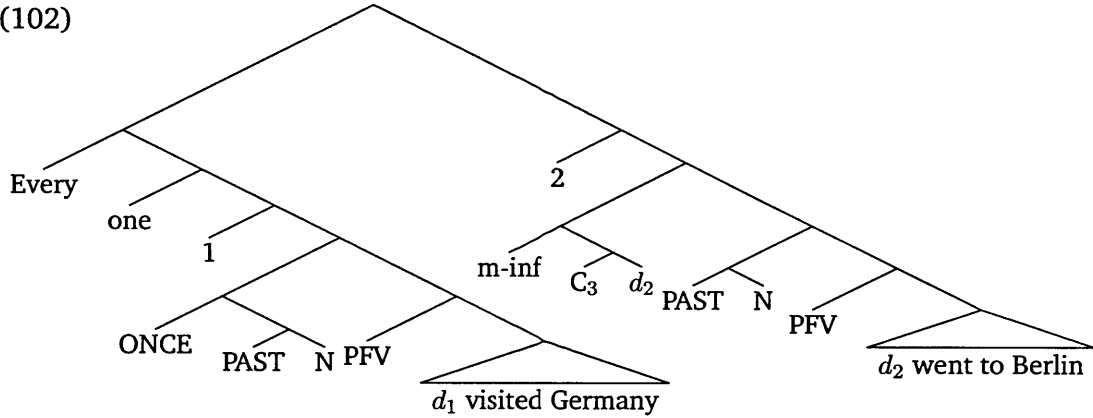
(103) $[\![(102)]\!]^{M,w,c} =$

$\forall x[\mathbf{person}(x) \land \exists t[t < TU \land \exists e[\tau(e) \subset t \land \mathbf{visit}(w)(e)(\mathbf{Germany})(x)]]] \rightarrow$
$[\mu(R(x)) < TU \land \exists e'[t' \subset \mu(\lambda w.\lambda t.\exists e[\tau(e) \subseteq t$
$\land \mathbf{visited}(w)(e)(\mathbf{Germany})(x)])(w) \land \mathbf{go}(w)(e')(\mathbf{Berlin})(x)]]$

$[\![(102)]\!]^{M,w,c} = 1$ iff for every $d \in D$, if d is a person and there is an interval before TU that includes an interval at which d visited Germany, then the minimal such interval precedes TU and includes an interval at which d went to Berlin.

This seems to be the correct interpretation of (88)

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Chapter 3

A theory of temporal implicatures

The use of a past or a future operator in a sentence commonly triggers an inference that the corresponding present sentence is false. For instance, an utterance of (1) or of (2) suggests that (3) is false.

(1)   John was a graduate student.

(2)   John will be a graduate student.

(3)   John is a graduate student.

In this chapter, I analyze these inferences as quantity implicatures. Since they are triggered by the use of temporal morphemes, I refer to them as temporal implicatures. The analysis I advocate is a modification of Magri's (2009) proposal. The main contribution is the integration of Magri's analysis with Katzir's (2007) theory of structurally defined alternatives, which greatly simplifies the theory.

3.1   The problem

In this section I argue that classical Gricean reasoning does not allow us to analyze the inferences observed in (1) and (2) as quantity implicatures. I begin with a reminder of the classical Gricean account of quantity implicatures, before I explain the challenges raised by temporal implicatures for this account.

3.1.1   The Gricean account of quantity implicature

According to Grice, when participants in a conversation interpret an utterance, they normally assume that the speaker is cooperative. This assumption is captured by the Cooperation Principle, which speakers are assumed to follow:

(4)   Cooperative principle (Grice 1975):

> Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged.

The cooperative principle is broken down into more specific conversational maxims:

(5)   Conversational maxims (Grice 1975):

   Maxim of Quantity:

   1.   Make your contribution as informative as is required (for the current purposes of the exchange).
   2.   Do not make your contribution more informative than is required.

   Maxim of Quality:

   1.   Do not say what you believe to be false.
   2.   Do not say that for which you lack adequate evidence.

   Maxim of Relation:

   Be relevant.

   Maxim of Manner:

   1.   Avoid obscurity of expression.
   2.   Avoid ambiguity.
   3.   Be brief.
   4.   Be orderly.

Interpreting an utterance under the assumption that the speaker was following the cooperative principle may lead to inferences that are not logical entailments of the proposition expressed by the utterance. Such inferences are called implicatures. Implicatures that arise from the assumption that the speaker is respecting a given maxim are named after it. Of special interest to us are Quantity Implicatures, an example of which is given in (6):

(6)   Q: What did John eat?
      A: John ate three cookies.

(6A) triggers an inference that John did not eat more than three cookies. This inference can be interpreted as a quantity implicature using Gricean reasoning in the following way:

(7)   John ate three cookies $\rightsquigarrow$ John didn't eat more than three cookies.

   1.   The speaker uttered *John ate three cookies*.

   2.   There is no reason to assume that the speaker is not cooperative. In particular, one may assume that her answer was as informative as required for the purpose of the conversation.

   3.   For any $n > 3$, if the speaker believed that John had eaten n cookies, it would have been more informative to say so.

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4. Therefore, for any $n > 3$, the speaker was not in a position to say that John ate n cookies, and still remain cooperative.

5. Therefore, it is not the case that the speaker believes that John ate more than 3 cookies.

6. Therefore, assuming that the speaker is optimally informed about the topic of the conversation, the speaker believes that John didn't eat more than 3 cookies.

I would like to make several comments on this procedure. First, interpreting (6A) under the assumption that the speaker is cooperative can at best generate the inference that it is not the case that the speaker believes that John ate more than three cookies. In order to generate the stronger inference that the speaker believes that John didn't eat more than 3 cookies, one must also assume that the speaker is opinionated about the topic of the conversation, i.e. that for every relevant alternative ψ to her utterance, either she believes that ψ is true, or she believes that ψ is false (see Soames 1982, Groenendijk & Stokhof 1984, Sauerland 2004).

Secondly, informativity was reduced to entailment in the following way: a proposition φ is more informative than a proposition ψ iff φ asymmetrically entails ψ, i.e. φ entails ψ and it is not the case that ψ entails φ.

Finally, Grice's formulation of the Maxim of Quantity requires not that an utterance be maximally informative, but rather that it be as informative as required by the current purposes of the conversation. Therefore, we expect the quantity implicature in (7) to be blocked whenever (6A) is uttered in a context that does not require the speaker to be precise about the exact number of cookies that John ate. In a sense, Grice's maxim of quantity has a condition of relevance built in itself.

3.1.2   Obstacles to an analysis of temporal implicatures

It is now easier to see the difficulty inherent in the analysis of temporal implicatures as quantity implicatures. In order to derive the inference illustrated in (8) using classical Gricean reasoning, the present tense sentence (9b) must be stronger than the past tense sentence (9a):

(8)   John was a graduate student. ↝ John is a graduate student.

(9)   a. John was a graduate student.
      b. John is a graduate student.

However, this is unexpected under most analyses of the present tense (an exception is Musan's (1995) analysis, which will be discussed in the next chapter). (10) and (11) are two different analyses of the pair of sentences in (9). (10b) is true iff John is from America at the time of utterance. (11b) is true iff there is a superinterval of the time of utterance at which John is from America. In both cases, the present tense sentence in (b) is not stronger than the past tense sentence in (a). Rather, the two sentences are logically independent:

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(10) a. [John was a graduate student]^{M,w,c} =
$$\exists t[t < TU \land \textbf{graduate-student}(w)(t)(\textbf{John})]$$
   b. [John is a graduate student]^{M,w,c} = $\textbf{graduate-student}(w)(TU)(\textbf{John})$

(11) a. [John was a graduate student]^{M,w,c} =
$$\exists t[t < TU \land \textbf{graduate-student}(w)(t)(\textbf{John})]$$
   b. [John is a graduate student]^{M,w,c} =
$$\exists t[TU \subseteq t \land \textbf{graduate-student}(w)(t)(\textbf{John})]$$

If the present sentence is not stronger than the past sentence, it cannot be negated by exploiting the maxim of quantity according to Gricean reasoning. One way to solve this problem is to adopt a theory of quantity implicatures that allows us to negate a wider range of alternatives. In the next section, following Magri (2009), I will adopt Fox's (2007) theory, according to which quantity implicatures are obtained by negating *innocently excludable* alternatives, rather than stronger ones. For the moment, let us assume that an alternative ψ to a sentence φ is innocently excludable iff $\varphi \land \neg\psi$ is not contradictory. According to this definition, the present tense sentences in (10) and (11) are innocently excludable alternatives to the past tense sentences. Therefore, it is predicted that an utterance of a past tense sentence triggers an implicature that its present alternative is false.

Unfortunately, this solution creates another problem: the past tense alternative to a present tense sentence is also innocently excludable, which means that the utterance of a present tense sentence should trigger an implicature that its past tense alternative is false, contrary to fact: an utterance of *John is a graduate student* does not suggest that John was not a graduate student before the time or utterance, and certainly does not suggest either that he will cease to be a graduate student after the time of utterance. This issue can be avoided by adopting Katzir's (2007) theory of structurally defined alternatives. Katzir argues that a sentence ψ is an alternative to a sentence φ only if ψ is at most as complex as φ. I argue that the present is structurally simpler than the past or the future, and therefore that while a past or a future sentence has present alternatives, a present sentence does not have past or future alternatives.

3.2 Grammatical implicatures and structurally defined alternatives

In this section, I propose an analysis of temporal implicatures that avoids the issues discussed in the previous section. There building blocks of this analysis are Katzir's (2008) theory of structurally defined alternatives and Fox's (2007) grammatical analysis of implicatures.

3.2.1 Theoretical background

Structurally defined alternatives Katzir (2007, 2008) proposes that the set of alternatives that is used in the computation of the quantity implicatures of a sentence φ consists of all and only those sentences that are at most as complex as φ. More precisely, let φ be the structural description of a sentence. We say that ψ is an alternative to φ iff ψ can be generated by applying a finite number of operations to ψ, such that none of these operations increases the complexity of the structural description they are applied to. The operations that Katzir discusses are deletion (removing edges and nodes), contraction (removing an edge and identifying its end nodes) and substitution. Katzir discusses two forms of substitutions: substitution of a terminal node for another terminal node or substitution of a subtree for another subtree. In general, the elements that are introduced in an alternative by substitution must be taken from a certain substitution source. The alternatives to a structural description are all those structural descriptions that are obtained from φ by applications of deletion, contraction and substitution and that are not more complex that φ. The definitions are as follows (from Katzir 2007):

(12) SUBSTITUTION SOURCE:
Let φ be a parse-tree. The substitution source for φ, written as $L(\varphi)$ is the union of the lexicon of the language with the set of all sub-trees of φ.

(13) STRUCTURAL COMPLEXITY:
Let φ, ψ be parse trees. If we can transform φ into ψ by finite series of deletions, contractions, and replacements of constituents in φ with constituents of the same category taken from $L(\varphi)$, we will write $\varphi \lesssim \psi$. If $\varphi \lesssim \psi$ and $\psi \lesssim \varphi$, we will write $\varphi \sim \psi$. If $\varphi \lesssim \psi$ and not $\psi \lesssim \varphi$, we will write $\varphi < \psi$.

(14) STRUCTURAL ALTERNATIVES:
Let φ be a parse tree. The set of structural alternatives for φ, written as $A_{str}(\varphi)$, is defined as $A_{str}(\varphi) := \{\varphi' : \varphi' \lesssim \varphi\}$.

The notion of structurally defined alternatives can be used to give a solution to the so-called symmetry problem (see Kroch 1972)[1]. Consider (15):

(15) John read some of the books.

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[1] The name 'symmetry problem' was coined by Heim and von Fintel, in pragmatics class notes.

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This sentence implicates that John did not read all the books. In order to generate this implicature, one recognizes that the speaker could have uttered the more informative sentence *John read all of the books*, and exploitation of the maxim of quantity together with the hypothesis that the speaker is well informed leads to the conclusion that the speaker believes that John didn't read all of the books. Therefore, the strengthened meaning of (15) is that John read some but not all of the book, in (17):

(16) John read all of the books.

(17) John read some but not all of the books.

The symmetry problem arises once we consider that this proposition itself could also be a relevant alternative to (15), and therefore that the set of alternatives to (15) could be (18):

(18) {John read all of the books, John read some but not all of the books}

Exploitation of the maxim of quantity applied to this set of alternatives results in the inference that it is the case neither that the speaker believes that John read all the books, nor that the speaker believes that John read some but not all of the books. No other inferences can be drawn. In particular, one cannot infer that the speaker believes that John did not read all the books, since this would contradict the ignorance inference that it is not the case that he believes that John did not read some but not all of the books.

One way to solve this problem is to assume that the alternatives of a sentence that are considered in the exploitation of the maxim of quantity are lexically restricted. One identifies sets of words such as *{some, all}*, and one posits that the alternatives to a sentence φ are all the sentences that are obtained from φ by substituting a word from one of these sets by another word from the same set. This proposal is due to Horn (1972). Horn originally proposed that these sets of lexical items form scales that are ordered by logical strength, hence the expressions *Horn Scale* and *Scalar Implicature*.

Katzir's theory of structurally defined alternatives offers a more principled solution, which does not rely on lexical stipulations. Indeed, (16) is an alternative to (15), since it is obtained by a single operation of substitution from the lexicon (*all* for *some*). On the other hand, (17) is not an alternative to (15), since *some but not all* is neither a lexical item nor a sub-tree of the structural description of (15). As a result, (17) cannot be obtained from (15) by substitution as defined in (12), and therefore (17) is not at most as complex as (15) according to the definition of structural complexity in (13).

Grammaticalization of quantity implicatures   I will now introduce the grammatical analysis of implicatures of Fox (2007), which builds on the work of Groenendijk & Stokhof (1984), Krifka (1995), Landman (1998), van Rooy & Schulz (2004),

Chierchia (2004) and Spector (2005). The quantity implicatures of a sentence φ are derived by adjoining to it a silent exhaustivity operator EXH, as defined in (19) to (21). A modified sentence [EXH φ] is interpreted as the conjunction of the denotation of φ and the negation of the denotation of all its excludable alternatives. Alternatives to a sentence φ are computed directly from the syntactic structure of φ as in (20). The set of excludable alternatives to φ is defined in (21) as the set of all stronger alternatives to φ. The computation of quantity implicatures is illustrated in (22) to (24), where I abstract away from tense:

(19) $[[\text{EXH } \varphi]]^{M,w,c} = [\![\varphi]\!]^{M,w,c} \bigwedge_{\psi \in \mathcal{E}xcl(\varphi)} \neg [\![\psi]\!]^{M,w,c}$

(20) The set $\mathcal{A}lt(\varphi)$ contains all and only those sentences ψ that can be obtained from φ by replacing one or more scalar items in φ with their Horn-mates.

(21) $\mathcal{E}xcl(\varphi) = \{\psi : \psi \in \mathcal{A}lt(\varphi) \wedge [\![\psi]\!] \models [\![\varphi]\!] \wedge [\![\varphi]\!] \not\models [\![\psi]\!]\}$

(22) φ = John read some of the books.

(23) $\mathcal{A}lt(\varphi) = \{$ John read all of the books $\}$

(24) $[[\text{EXH } \varphi]]^{M,w,c} = \exists x[\mathbf{book}(w)(x) \wedge \mathbf{read}(w)(x)(\mathbf{John})]$
$\wedge \neg \forall x[\mathbf{book}(w)(x) \rightarrow \mathbf{read}(w)(x)(\mathbf{John})]$

This analysis is a lexicalization of the exploitation of the maxim of quantity in Gricean reasoning: the negation of stronger alternatives is now part of the conventional meaning of the exhaustivity operator. Note that quantity implicatures are entailments of [EXH φ], which means that quantity implicatures are obligatory whenever EXH is adjoined to φ. If no exhaustivity operator is adjoined to φ, no implicature is triggered by exhaustification. Of course, traditional Gricean reasoning might still apply in that case. For now, I will assume that the adjunction of EXH to sentences is optional.

Arguments in favor of the existence of EXH come from the existence of embedded implicatures (see Landman 1998, Levinson 2000, Chierchia 2004). The argument I will sketch here comes from the analysis of the so-called Hurford constraint. Consider the following example, from Fox & Spector (2009) (see also Chierchia et al. 2009). (25) is a perfectly acceptable sentence. Note that the first disjunct of (25) is entailed by the second one. What is remarkable is that this configuration is generally unacceptable, as illustrated in (26). This generalization is known as the Hurford constraint (Hurford 1974). The acceptability of (26) can be explained if quantity implicatures can be computed in the scope of operators such as the disjunction *either ... or*. Indeed, under its strengthened meaning, *Every student solved most but not all of the problem*, the first disjunct is not entailed by the second one. Since there is no other explanation of the acceptability of (26) on the market, one concludes that quantity implicatures can be embedded. This is not possible if implicatures are the product of Gricean reasoning, since it applies to the meaning of complete sentences in context. However, the grammatical view of quantity implicatures can explain the existence of an embedded implicature in (25) by adjoining an exhaustivity operator to the first disjunct, in the scope of the disjunction.

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(25) Either every student solved most of the problems, or every student solved all of them.

(26) #John lives in France or in Paris.

Innocently excludable alternatives The version of the grammatical theory of quantity implicatures that I have just presented makes incorrect predictions with sentence (27). One infers from (27) that John met only one of Mary, Jane or Sue. Let us represent (27) schematically as in (28), with its set of structurally defined alternative in (29). The issue is that all the alternatives in this set are stronger than the prejacent φ, so that by (21), they are all excludable. Consequently, we predict that the exhaustification of φ, (30), is contradictory:

(27) John met Mary or Jane or Sue.

(28) $\varphi = [[\text{M or J}] \text{ or S}]$

(29) $Alt(\varphi) = \{$M, J, S, [M or J], [M or S], [J or S], [M and J], [M and S], [J and S], [[M and J] or S], [[M or J] and S], [[M and J] and S]$\}$

(30) $[[\text{EXH } \varphi]]^{M,w,c} = ([\![M]\!]^{M,w,c} \vee [\![J]\!]^{M,w,c} \vee [\![S]\!]^{M,w,c} \wedge \neg[\![M]\!]^{M,w,c} \wedge \neg[\![J]\!]^{M,w,c} \wedge \neg[\![S]\!]^{M,w,c}$

Sauerland (2004) solved this problem inside a Gricean analysis of quantity implicatures. Fox (2007) adopted Sauerland's proposal in his grammatical analysis of quantity implicatures, in the form of a revised definition of the set of excludable aternatives. The intuition behind this definition is that EXH negates as many alternatives as possible, without creating a contradiction and without choosing between alternatives in an arbitrary way. The following presentation of Fox's definition is from Magri (2009):

(31) a. A subset $X = \{\psi_1, \psi_2, \ldots\}$ of the set $Alt(\varphi)$ is called an *innocently excludable subset* w.r.t φ iff $\varphi \wedge \neg\psi_1 \wedge \neg\psi_2 \wedge \ldots$ is not a contradiction.
b. A subset $X \subseteq Alt(\varphi)$ of $Alt(\varphi)$ is called a *maximal* innocently excludable subset w.r.t φ iff there are no innocently excludable supersets of X in $Alt(\varphi)$.
c. The set $Excl(\varphi)$ of excludable alternatives w.r.t. φ is the intersection of all maximal innocently excludable subsets of $Alt(\varphi)$ w.r.t. φ.

Coming back to (28), there are three maximally excludable subsets of $Alt(\varphi)$, A, B and C. Their intersection in (33) is the set of excludable alternative. The reader can check that the exhaustification of (28) is equivalent to (34), which means 'John met only one of Mary or Jane or Sue'.

(32) $A = \{$M, J, [M or J], [M and J], [M and S], [J and S], [[M or J] and S], [[M and J] and S]$\}$
$B = \{$M, S, [M or S], [M and J], [M and S], [J and S], [[M and J] or S], [[M or J] and S], [[M and J] and S]$\}$
$C = \{$J, S, [J or S], [M and J], [M and S], [J and S], [[M and J] or S], [[M or J] and S], [[M and J] and S]$\}$

(33) {[M and J], [M and S], [J and S], [[M or J] and S], [[M and J] and S]}

(34) $(M \lor J \lor S) \land \neg(M \land J) \land \neg(M \land S) \land \neg(J \land S)$

3.2.2 Application to temporal implicatures

In chapter 2, we observed that only stative predicates or progressive activities and accomplishment VPs are acceptable in episodic present sentences, i.e. sentences that describe a single eventuality that is going on at the time of utterance. This is illustrated in (35) and (36). Perfective accomplishments and achievements are ungrammatical in the present tense, see (37) and (38), while activities without overt progressive aspect are interpreted habitually. There are exceptions to this generalization, such as the 'sportscast' present, but these are stylistically marked.

(35)   John is happy.

(36)   John is building a house.

(37)   *John builds a house.

(38)   *The train arrives.

(39)   John smokes.

Following Taylor (1977) and Dowty (1979), it was argued that this restriction on tense/aspect combinations is due to the fact that episodic present sentences assert that the property of time described by the extended VP (including aspect) holds of the time of utterance. In the system that I have adopted from Kusumoto (1999) and von Stechow (2009), this idea is captured most naturally by assuming that the T head of episodic present sentences is occupied solely by the pointer to the time of utterance, N. Coming back to our initial examples, this means that (1) and (3) are parsed as (40) and (41), respectively:

(1)   John was a graduate student.

(40)

(3)   John is a graduate student.

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(41)

```
                    TP
                   /  \
                  T    PredP
                  |    /    \
                  N   DP     Pred'
                      |     /    \
                    John   is a graduate student
```
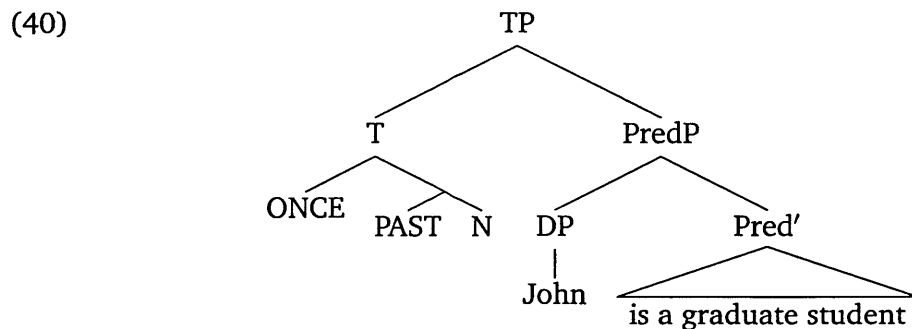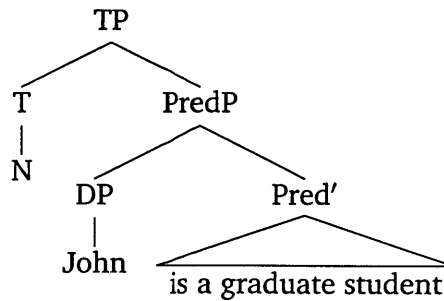
It is clear that (41) is simpler than (40) according to Katzir's metric. Indeed, (41) can be generated from (40) by an obvious series of deletions and contractions, while generating (40) from (41) would require the insertion of PAST and ONCE and of additional edges. In general, present tense sentences are structurally simpler than past tense sentences. As a consequence, a past tense sentence will have a present tense alternative, while a present sentence will not admit a past tense alternative. Therefore, if an exhaustivity operator is adjoined to (40), the sentence will be interpreted with a temporal implicature, as in (42). On the other hand, the adjunction of EXH to (41) cannot trigger a temporal implicature.

(42) $[\![\text{John was a graduate student}]\!]^{M,w,c} = \exists t[t < TU \wedge$
       $\textbf{graduate-student}(w)(t)(\textbf{John})] \wedge \neg\textbf{graduate-student}(w)(TU)(\textbf{John})$

3.3 Lifetime effects and obligatory implicatures

3.3.1 Magri's analysis of lifetime effects

The problem and a solution   So far we have only discussed temporal implicatures of sentences with stage-level predicates. Stage-level predicates describe temporary properties. They are opposed to individual level predicates, which describe permanent properties. When combined with the past tense, individual level predicates may trigger a so-called lifetime effect, which can manifest itself in three ways, depending on the context of utterance. Consider for instance (43):

(43)   Gregory was from America.

Uttered in a context where it is known that Gregory is alive at TU, (43) is infelicitous. Let us call this the lifetime infelicity. Uttered in a context where it is known that Gregory is dead at TU, (43) is felicitous. Finally, uttered in a context where it is not known whether Gregory is dead or alive at TU, (43) triggers the inference that Gregory is dead. Let us call this last manifestation of the lifetime effect the lifetime inference.

Both Musan (1995, 1997) and Magri (2009) have explained the lifetime effect as a result of a conflict between a temporal implicature triggered by the past tense and the properties of individual level predicate. Their theories will be compared in the next chapter. In this section, I will present Magri's analysis of the lifetime effect,

but I will recast it in the terms of the simple analysis of temporal implicatures that was proposed in the previous section. As we will see in the next chapter, Magri's original analysis of temporal implicatures is more complex.

The intuition behind Magri's proposal is simple. In a context where Gregory is alive, (43) triggers an obligatory implicature that Gregory is not from America at TU. Taken together with the premise that Gregory was from America, this implicature contradicts the piece of common knowledge that being from America is a common property. Magri assumes that implicatures that contradict common knowledge are infelicitous, which explains why (43) is unacceptable in this context. In a context where it is known that Gregory is dead at TU, Magri argues that the temporal implicature of (43) is blocked. Therefore, the sentence is felicitous. Magri does not really explain why (43) triggers an inference that Gregory is dead when the sentence is uttered in a context where it is not known whether Gregory is dead or alive. I will propose an analysis of this fact at the end of this section.

Non-Gricean aspects of Magri's proposal At this point, it is important to identify the aspects of Magri's analysis that are inconsistent with a Gricean view of implicatures. First of all, Magri's analysis relies on the assumption that implicatures are obligatory. The infelicity of (43) in contexts where it is known that Gregory is alive at TU depends on the computation of a temporal implicature, and if this implicature was not computed, the sentence would be felicitous in such contexts. However, Gricean reasoning predicts that an utterance cannot trigger a quantity implicature if this would result in a contextual contradiction. Indeed, in the traditional Gricean framework, quantity implicatures arise as a way to avoid the conclusion that the speaker violated the conversational maxims –more precisely, that her utterance was less informative than it could have been. But of course uttering a contradiction is a violation of the maxim of quality, so it is expected that a quantity implicature will be blocked if its generation would result in contradiction.

Secondly, Magri argues that the computation of quantity implicatures is blind to common knowledge. This is at odds with Gricean reasoning, which compares the information that is conveyed by a sentence φ in its context of utterance, to the information that would have been conveyed by an alternative sentence ψ in the same context. In order to see this we must first define the notion of contextual entailment. A proposition is the characteristic function of a set of worlds, namely the worlds in which the proposition is true. By abuse of language, we refer to a proposition and to the set of worlds that it characterizes interchangeably. We then say that a proposition φ logically entails a proposition ψ ($\varphi \models \psi$) iff φ is a subset of ψ, i.e. there is no world in which φ is true and ψ is false. Now, let us define the Context Set of a context c as the intersection of all the propositions that are collectively believed by the discourse participants (see Stalnaker 1978). A proposition φ contextually entails a proposition ψ in a context c ($\varphi \models_c \psi$) iff the intersection of φ and the Context Set at c (CS_c) is a subset of ψ, i.e. there is no

world in CS_c in which φ is true and ψ is false:

(44) $\quad \varphi \models \psi$ iff $\varphi \subseteq \psi$

(45) $\quad \varphi \models_c \psi$ iff $\varphi \cap CS_c \subseteq \psi$

Coming back to Gricean reasoning, we know that a quantity implicature arises when a speaker utters a sentence that is less informative than one of its relevant alternatives, where a sentence ψ is more informative than a sentence φ iff the proposition denoted by ψ asymmetrically entails the proposition denoted by φ. It is sometimes assumed (see Heim 1991) that the type of entailment that is relevant for the exploitation of the maxim of quantity is contextual entailment: an alternative ψ counts as more informative than a sentence φ in a context c iff ψ contextually and asymmetrically entails φ in c. The motivation of this assumption is conceptual. According to Grice, an interpreter will infer a conversational implicature from an utterance because not doing so would construe the utterance as a violation of the cooperative principle. In the case of the maxim of quantity, one infers from an utterance of φ that it is not the case that the speaker believes a relevant alternative ψ to φ, only if it would have been more informative for the speaker to utter ψ. But what if ψ is only logically stronger than φ, and ψ is contextually equivalent to φ? Uttering ψ and uttering φ would convey the same information to the addressee, since in that particular context both utterances would have the same effect on the common ground. Therefore, if the maxim of quantity is concerned with the information that is actually conveyed by a sentence in a particular context of utterance, we must conclude that informativity should be captured in terms of contextual entailment. The problem for Magri is that in a context where it is known that Gregory was alive before TU and is still alive at TU, the proposition that Gregory was from America and the proposition that he is from America are contextually equivalent. Therefore, in such a context, Gricean reasoning does not generate an implicature.

Finally, Magri argues that sentences whose implicatures contradict common knowledge are infelicitous. Magri attributes this idea to Hawkins (1991), and applies it to a range of phenomena beyond the lifetime effect of past tense i-level sentences. Here are some of the cases that Magri discusses:

(46)   #John is sometimes tall.

(47)   #John is tall after dinner.

(48)   #Some Italians come from a beautiful country.

Magri argues that (46) and (47) trigger the implicature that there are intervals of John's lifetime during which John is not tall. The conflict between this implicature and the common knowledge that being tall is a permanent property explains the infelicity of the sentence. (48) is an example of infelicity that does not depend on the fact that the predicate is i-level. (48) triggers the implicature that not all Italians come from a beautiful country. Of course, it is common knowledge that all Italians come from the same country, this being a consequence of the definition

of the word *Italian*. The mismatch of the implicature with this piece of common knowledge is what explains the infelicity of (48). In order to derive the infelicity of these sentences, Magri posits as a general principle that sentences whose implicatures conflict with common knowledge are infelicitous. He calls it the mismatch hypothesis. I don't think that this hypothesis is inconsistent with Gricean reasoning –although the claim that implicatures should be obligatory even in the face of contradiction is. However, it is worth emphasizing that the mismatch hypothesis does not follow from Gricean reasoning either.

Obligatory implicatures and exhaustification   Magri adopts Fox's (2007) grammatical theory of implicatures that was presented in the previous section. An immediate consequence of this move is that the computation of the set of alternatives to a sentence φ is blind to common knowledge, since Fox's notion of innocent exclusion only relies on logical entailment.

The obligatory nature of implicatures follows from the assumption that exhaustivity operators are adjoined at every scope site in the syntactic representation of sentences. A scope site is a node that denotes a truth value.[2] Without qualifications, this assumption is inconsistent with the observation that quantity implicatures are defeasible. It is well known that discourses like the following are felicitous:

(49)   John read some of the books. As a matter of fact, he read all of them.

In order to accommodate this fact, Magri argues that whenever a quantity implicature appears to be canceled, it has actually never been computed. The reason he invokes is that the exhaustivity operator only negates relevant alternatives. Whenever an alternative is not relevant in the context of utterance, it will be ignored by the exhaustivity operator. The contrast between the following dialogs brings some empirical support to this assumption. In (50), the alternative *John read all of the books* is relevant, since it is a possible answer to the question that is being addressed by A. Accordingly, the first sentence in the answer triggers an implicature that John didn't read all of the books, which explains why the follow up sentence is degraded. In (51), this same alternative is not relevant with respect to the question under discussion, and the follow up sentence is much more natural.

(50)   Q: What did John read?
       A: He read some of the books. ?Indeed, he read all of them.

(51)   Q: Who read some of the books?
       A: John did. Indeed, he read all of them.

The restriction of exhaustification by relevance is implemented directly in the definition of EXH:

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[2]Remember that possible worlds are treated as indices of the evaluation function in the system I have adopted. Therefore, sentences denote truth-values, with respect to a world index. These denotations can be mapped to propositions by abstracting over the world index of the interpretation function.

(52) $\quad [\![\text{EXH } \varphi]\!]^{M,w,c} = [\![\varphi]\!]^{M,w,c} \bigwedge_{\psi\in\mathcal{E}xcl(\varphi)\cap R} \neg\ [\![\psi]\!]^{M,w,c}$

Where R is the set of locally relevant propositions.

How do we determine the composition of the set of relevant propositions? To a great extent, the composition of this set depends on the context of utterance, and cannot be determined *a priori*. However, there are constraints on the composition of this set[3]. One such constraint should be that the prejacent of EXH is relevant: this follows from the general principle that an assertion should be relevant in its context of utterance, which is expressed in Grice's maxim of relevance. Another obvious constraint is that the set of relevant propositions is closed under negation. This follows from the truth-conditional identification of the meaning of a sentence with its truth-conditions. A proposition is relevant if and only if it is relevant to know the truth-conditions of this proposition. And since the truth-conditions of a proposition are uniquely determined by the truth-conditions of its negation, the relevance of a proposition entails the relevance of its negation. Finally, relevance is closed under conjunction. I will come back to the issue of the composition of the set of relevant propositions at several points in this dissertation, but for the moment, it is enough to assume this set of constraints.

A simple example Let us now see how Magri derives the infelicity of sentence (53) in the system that we have presented. The sentence *All Italians come from a beautiful country* is an excludable alternative with respect to (53). Assuming that this alternative is relevant, it is negated by EXH, which is obligatorily adjoined to (53). Consequently, the enriched meaning of (53) is that some but not all Italians come from a beautiful country, in (55). Since this sentence conflicts with the piece of common knowledge that all Italians come from the same country, it is infelicitous.

(53) $\varphi =$ #Some Italians come from a beautiful country.

(54) $\mathcal{E}xcl(\varphi) = \{$All Italians come from a beautiful country.$\}$

(55) $[\![\text{EXH } \varphi]\!]^{M,w,c} = \exists x[\textbf{Italian}(x) \wedge \textbf{come-from-a-beautiful-country}(w)(x)]\wedge$
$\neg\forall x[\textbf{Italian}(w)(x) \wedge \textbf{come-from-a-beautiful-country}(w)(x)]$

According to this reasoning, the infelicity of (53) depends on the relevance of the alternative to (53). But this is not guaranteed by the constraints on relevance that we have adopted. (53) itself must be relevant by the maxim of relevance, but the closure properties of the set of relevant propositions do not guarantee that the alternative to (53) is relevant when (53) is. To solve this problem, Magri adds one more closure condition for the set of relevant propositions: if two propositions are contextually equivalent in the context of utterance and one of them is relevant, then the other is relevant too. Given the common knowledge that all Italians come from the same country, (53) is contextually equivalent to its alternative, and the implicature is obligatory, which explains the infelicity of (53). Note that closing

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[3]See Groenendijk & Stokhof (1984) and Lewis (1988) for a more principled derivation of the closure properties of sets of relevant propositions.

relevance under contextual equivalence is conceptually well justified. Relevance is inherently a contextual notion: a proposition is relevant insofar as it addresses the issues that matter in the conversation when it is uttered. If two propositions convey the same information in the context of utterance, they address these issues in the same way, and therefore they should be equally relevant.[4]

3.3.2 Application to the lifetime effects of past tense i-level sentences

The generation of alternatives with i-level sentences is the same as with s-level sentences: since the syntactic structure of (56) in (57) is more complex than that of (58) in (59), the present sentence is an alternative to the past sentence, but not the other way around.

(56) Gregory was from America.

(57)
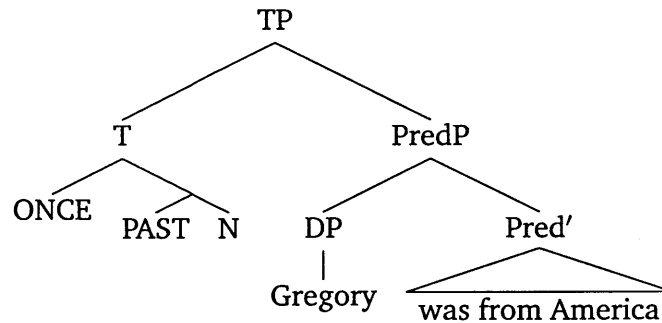
(58) Gregory is from America.

(59)
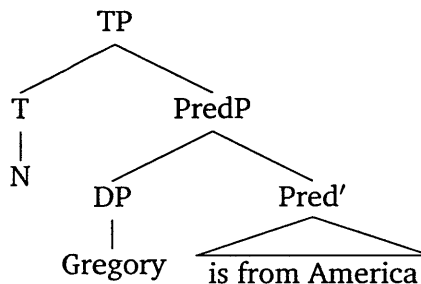
By assumption, exhaustivity operators are adjoined to every sentence. Therefore, the past tense sentence in (56) will be exhaustified as in (60) whenever its present tense alternative is relevant:

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[4]Closure under contextual equivalence also follows from a formalization of relevance along the lines of Groenendijk & Stokhof (1984). Let p and q be two propositions that are contextually equivalent in a context set CS. Assume that a proposition is relevant iff it addresses the Question Under Discussion Q, and that Q is a partition of CS. More precisely, p is relevant with respect to the partition of CS by Q iff for any two worlds w and w' that belong to the same cell of the partition, $p(w) = p(w')$. But if p and q are contextually equivalent in CS, then for any world w in CS, $p(w) = q(w)$. Therefore, if p is relevant, so is q.

(60) $\lambda w. \exists t[t < TU \wedge \textbf{be-from-America}(w)(t)(\textbf{Gregory})]$
$$\wedge \neg\textbf{be-from-America}(w)(TU)(\textbf{Gregory})$$

Let us see how these results can be used to explain the lifetime infelicity of (56), i.e. the fact that the sentence is infelicitous in contexts where it is known that Gregory is alive at TU. First, we must acknowledge that (56) presupposes that Gregory was alive at some time before TU[5]. Indeed, we can agree that both (56) and its negation would be infelicitous in a context where it is known that Gregory hasn't been born yet. The following example makes this point with a similar sentence:

(61)   Context: At the time of writing this dissertation, the incumbent president of the USA is its 44th president. Since the term of office is 4 years, we can safely assume that the 200th president of the USA has not been born yet.

    a. #The 200th president of the USA was from Switzerland.

    b. #The 200th president of the USA was not from Switzerland.

Furthermore, the same infelicity is observed when the i-level sentence is embedded in environments that are traditionally described as holes for presupposition projection, as the antecedent of a conditional in (62), and it can be blocked in environments that have been described as filters, as in (63):

(62)   #If the 200th president of the USA was from Switzerland, the constitution of the country must have changed.

(63)   Either the 200th president of the USA hasn't been born yet, or she was from Switzerland.

This presupposition can be attributed to a more general phenomenon that Musan (1995) called the lifetime presupposition of existence dependent predicates. Some predicates, like *be from America*, trigger a presupposition that their subject is alive at the time of evaluation of the predicate. When such predicates are used in the past tense, they trigger a presupposition that their subject was alive at some time before TU.

Now that this fact has been established, let us come back to the analysis of the lifetime infelicity of (56), *Gregory was from America*, uttered in a context where it is known that Gregory is alive at TU. Magri argues that the infelicity of the sentence is due to the fact that its temporal implicature is obligatorily and conflicts with common knowledge. In Magri's system, the temporal implicature can be blocked only if the present tense sentence is not relevant, but in this context, Magri argues that (56) is contextually equivalent to its present alternative, and therefore that the latter is obligatorily relevant. How can we derive the contextual equivalence of (56) and its present alternative in such a context? First of all, since (56) has been uttered, it is

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[5]I think that the sentence presupposes at least that there is some time before TU at which Gregory was alive. I don't rule out that it presupposes a stronger proposition.

taken for granted that this sentence is relevant –otherwise, its utterance would violate the maxim of relevance and would be infelicitous anyway. In addition to this, it is taken for granted that Gregory was alive before TU, since this is presupposed by the utterance of (56). Now, let us first assume that (56) is true. In this case it is entailed that there is a time in the past at which Gregory was alive and he was from America. Since it is known that Gregory is alive at TU and that being from America is a permanent property, it is also contextually entailed that Gregory is from America at TU. Let us then assume that the present tense alternative (58) is true, and Gregory is alive and from America at TU. Since it is presupposed that Gregory was alive at some past time, and being from America is a permanent property, it is contextually entailed that (56) is true. Therefore, (56) and (58) are contextually equivalent.

This explains the lifetime infelicity of (56), and more generally of past i-level sentences. Let us now discuss the felicity of this sentence in contexts where it is known that Gregory is dead at TU. Let us assume that (56) is true. Then there is a time before TU at which Gregory was from America. However, since Gregory is not alive at TU, the present tense alternative is not true, and the two sentences are not contextually equivalent. As a consequence, the present tense alternative is not obligatorily relevant in such a context. This predicts that the temporal implicature of (56) is not obligatory, and therefore that (56) can be felicitously uttered.

Finally, we must explain how (56) triggers the inference that Gregory is dead, in contexts where it is not known whether he is dead or alive. Magri doesn't address this issue. I propose that the inference arises because the addressee makes the assumption that the speaker knows whether Gregory is dead or alive, and tries to infer which he is. That is to say, the addressee tries to accommodate one of the following two propositions:

(64)   Gregory is alive at TU.
(65)   Gregory is dead at TU.

The addressee will reason that if she accommodates (64), (56) becomes contextually equivalent to its present tense, which turns the utterance into a contextual contradiction. On the other hand, if she accommodates (65), (56) is consistent with the contextually available information. Therefore, the addressee must accommodate the proposition that Gregory is dead at TU.

Let us go through this reasoning in more details. Upon hearing (56), the addressee tries to accommodate whether Gregory is dead or alive. First, she may try to accommodate the proposition that Gregory is alive at TU. Once this proposition is accommodated, (56) is interpreted in a context in which it is known that (i) Gregory was alive at some time before TU (by the lifetime presupposition of the predicate), (ii) Gregory is alive at TU (by accommodation) and (iii) being from America is a permanent property (by common knowledge). In such a context, (56) and its present alternative are contextually equivalent, hence (56) obligatorily triggers a

temporal implicature, and the sentence is ungrammatical. Now, the addressee tries to accommodate the proposition that Gregory is dead at TU. In that case, (56) is interpreted in a context in which it is known that (i) Gregory was alive at some time before TU, (ii) Gregory is dead at TU and (iii) being from America is a permanent property. In this context, (56) is not contextually equivalent to its present alternative. Therefore, if the addressee may assume that this alternative is not relevant, in which case (56) does not trigger a temporal implicature and is felicitous. In conclusion, the only way to assign a felicitous interpretation to (56) while accommodating one of (64) and (65) is to accommodate that Gregory is dead at TU.

Of course, it is predicted on this account that no inference will arise if the addressee does not try to accommodate an answer to the question whether Gregory is alive or dead at TU. In section 3.4, I argue that this is precisely what happens in sentences where the lifetime effects of past i-level sentences appear to be blocked.

3.3.3 A complication

The explanation I have proposed depends on the assumption that [ONCE [PAST N]] is not part of the substitution source. In normal conditions, the substitution source is the lexicon and the set of sub-constituents of the prejacent of the exhaustivity operator. Yet, Katzir (2007, 2008) argues that the substitution source must be extended to include constituents that are made salient in the linguistic context, as shown by the following example from Matsumoto (1995). (66) implicates that it was not a little bit more than warm yesterday. Clearly, *a little more than warm* is not a lexical item, and it is not a sub-constituent of the first clause. Hence we do not expect the implicature to arise given our current definition of the substitution source. To solve this problem, Fox & Katzir (2009) propose to extend the substitution source as in (67). Since the constituent *a little bit more than warm* is salient in (66), it enters the substitution source for the first conjunct.

(66) It was warm yesterday, and it is a little bit more than warm today.

(67) SUBSTITUTION SOURCE:
      Let φ be a parse-tree. The substitution source for φ in a context C, written as $L_C(\varphi)$ is the union of the lexicon of the language with the set of all sub-trees of φ and the set of salient constituents in C.

The issue for us is that this modification predicts that in (68), the constituent [ONCE [PAST N]] should be in the substitution source for the sentence *John is from America*. Indeed, it is a sub-constituent of the whole sentence and can be made salient by appropriate stress. But if this were so, *John was from America* should be able to count as an alternative to *John is from America* and since the two sentences are contextually equivalent when it is known that John was born before TU and is alive at TU, (68) should be strengthened as (70). This is not correct.

(68) Gregory was from Ukraine and John is from America.

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(69) [[ONCE [PAST N]] [Gregory [was from Ukraine]]] and [N [John [is from America]]].

(70) #Gregory was from Ukraine and John is from America but John wasn't from America.

In order to solve this problem, one may redefine the substitution source in such a way that sentences that are obtained from a prejacent S by substituting some constituent of S by a (non-lexical) contextually salient constituent are only optionally integrated to the set of alternatives to S:

(71) SUBSTITUTION SOURCE:
Let φ be a parse-tree. The substitution source for φ in a context C, written as $L_C(\varphi)$, is the union of the lexicon of the language with the set of all sub-trees of φ, unless the interpreter chooses to define $L_C(\varphi)$ as the union of the lexicon of the language with the set of all sub-trees of φ and the set of salient constituents in C.[6]

Note that the optionality of extending the substitution source to contextually salient constituents was already discussed in a footnote in Fox & Katzir (2009).

Coming back to i-level sentences, if the interpreter of (72) below decided to extend the substitution source to the set of contextually salient constituents in the context of utterance, in a context where it is known that John is alive and was born before TU, (72) would have to be strengthened as in (74), since *John is from America* is contextually equivalent to *John was from America*. As a result, the sentence would be infelicitous. However, choosing not to extend the substitution source in this way would avoid the issue by keeping (73) from the set of alternatives to *John is from America*.

(72) Gregory was from Ukraine and John is from America.

(73) John was from America.

(74) #Gregory was from Ukraine and John is from America but John wasn't from America.

Therefore, we must make sure that, when interpreting a sentence S, one does not extend the substitution source to include contextually salient constituents if this move would make S infelicitous. This behavior is expected if the decision to extend the substitution source is subject to Grice's maxims. Indeed, consider an agent A who is faced with the task of interpreting an utterance of S. Among other things, A must choose whether the potential implicatures of S are to be computed with respect to an unextended substitution source (lexicon + sub-constituents of S) or with an extended substitution source (lexicon + sub-constituents of S + contextually salient constituents). Assume then that if an extended substitution source is

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[6]One may also adopt a more fine grained definition according to which for each contextually salient constituent X, the interpreter has to choose whether to include X in the substitution source.

chosen, S must be strengthened to denote denote a proposition φ that contradicts common knowledge, whereas if an unextended substitution source is chosen, S can be assigned a non-contradictory denotation ψ. Since A assumes that the speaker follows the maxim of quality, A will assume that the speaker intended S to convey ψ, and therefore that S should be interpreted with respect to an unextended substitution source.

3.4 Blocking temporal implicatures

3.4.1 Blocking temporal implicatures of s-level sentences

The theory that I have adopted predicts that temporal implicatures of s-level sentences are blocked whenever the present alternative is not relevant. This phenomenon is illustrated in the following example from Klein (1994). In the context provided by the question, the proposition that the book is on the table at the time of utterance is irrelevant. Consequently, A's utterance does not suggest that the book is no longer on the table.

(75) Q: What did you notice when you looked into the room?
      A: There was a book on the table.   (Klein 1994)

I will now discuss two objections to this claim. The first issue is illustrated in (76).[7] In this example, the question determines a past topic time, and therefore we predict that the present tense alternative to the answer is not relevant. However, the answer does convey that the speaker is not happy at the time of utterance.

(76) Q: How did you feel at the picnic?
      A: Then, I was happy.

I suggest that in this case, *then* acts as a contrastive topic. Following Büring (2003), I assume that a contrastive topic in an utterance signals the presence of questions under discussion in addition to the question that the utterance was initially meant to address. In particular, the use of *then* in (76) signals that the question *How do you feel now?* should also be discussed. Consequently, the proposition *I am happy now* becomes relevant, and has to be negated by implicature.

This proposal is similar to Musan's (1995) analysis of sentences like (77), which is adapted from one of Musan's (1995) examples:

(77) On that day, I was introduced to Gregory and Eva-Lotta. #When I looked
      at him, Gregory was from America.

Musan suggests that the adverbial clause functions as a contrastive topic and forces the inference that Gregory is not from America at some other time, although she does not commit herself to a particular analysis of this effect. If the adverbial clause

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[7]I thank Daniel Altshuler for raising this objection and providing this example.

does indeed signal that some question of the form *Where was Gregory from at t* should be discussed, where t is some time other than the time at which the speaker looked at Gregory, then the sentence *Gregory was from America at t* will become relevant, and given Magri's assumptions (77) will trigger the obligatory implicature that Gregory was not from America at t, which contradicts common knowledge.

A second and more delicate issue is that Magri's analysis of quantity implicatures systematically generates what Sauerland (2004) calls secondary implicatures, even in contexts where primary or 'ignorance' implicatures are attested. This issue is illustrated for temporal implicatures in the following example from Klein (1994):

(78)   Q: Do you know where John is?
       A: Well, he was in the garden.

In (78), the proposition that John is in the garden is clearly relevant given the overt question under discussion. Yet, the answer does not trigger the secondary implicature that John is not in the garden, as expected in Magri's analysis. The implicature that is attested is a primary implicature, that it is not the case that the speaker believes that John is in the garden. The potential over-generation of secondary implicatures is a general issue of Magri's system, although I am not certain that this issue is serious enough to abandon his proposal. This being said, I suspect that there is more going on than meets the eye in examples such as (77). Firstly, note that the answer does not directly address the overt question. The proposition that John was in the garden is not in the extension of the question *Where is John?*[8] As such, the answer is literally irrelevant given the question under discussion. This is presumably why the speaker uses the particle *well* to introduce it. I suggest that this particle informs the addressee that the question that is being addressed is different from the overt question, although answering the former would provide some information that can help answer the latter. In (78), the covert question probably is *Where was John?* Now, under the assumption that it is this question that determines what is locally relevant, i.e. what counts as the set of relevant propositions for the exhaustivity operator adjoined to the answer, the proposition that John is in the garden is not locally relevant, and we should not expect an obligatory implicature to arise. The primary implicature can then be explained by invoking traditional Gricean reasoning. To wit, the addressee will wonder why the speaker did not address the overt question, and shifted the topic instead. Assuming that the speaker is cooperative and in particular that she does her best to be relevant, one infers that she does not have the information required to answer that question, i.e. that she does not know where John is.

3.4.2   Blocking temporal implicatures of i-level sentences

We have observed that an i-level sentence like (79) is infelicitous if it is known that Gregory is alive, is felicitous if it is known that Gregory is dead, and triggers the

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[8] I am assuming that asking *Do you known where John is?* is just a polite way of asking the question *Where is John?*

inference that Gregory is dead if it is not known whether he is dead or alive:

(79)   Gregory was from America.

This suggests that past i-level sentences trigger an obligatory implicature that their present alternative is false. Yet, Musan (1995) showed that these implicatures can be blocked in some contexts, such as (80). (81) is another relevant example from Klein (1994).

(80)   On that day, I was introduced to Gregory and Eva-Lotta. Gregory was from America, and Eva-Lotta was from Switzerland.

(81)   Q: What did you notice when you looked into the room?
       A: A man was lying on the floor. He was Chinese or Japanese.

Are these facts surprising, given the theory of implicatures that I have adopted? Not necessarily. What is relevant here is Magri's assumption that an alternative A to a sentence S is obligatorily relevant whenever it is contextually equivalent to S. In (80), the proposition that Gregory is from America is contextually equivalent to the proposition that he was from America only if it is common knowledge that Gregory is alive. Therefore, if (80) was uttered in a context where it is not known whether Gregory is dead or alive, we would expect no obligatory implicature that Gregory is not from America. I propose that sentences like (80) and (81) are only acceptable in contexts where the truth or falsity of the present alternative is not common knowledge. One may find apparent counter-examples to that claim, such as the dialog in (82), which may take place between a child and her grandmother, in the presence of her grandfather:

(82)   A: Tell me the story of how you met grandpa again.
       B: Well, on my 20th birthday, I went to a party with my friends. It was there that I was introduced to Gregory. He was from America, and at that time I thought that was extraordinary.

However, I think that (82) belongs to a particular register used in narratives, where the speaker acts as if her interlocutor doesn't have any information about Gregory, whom she introduces in the narration for the first time. Therefore it is reasonable to assume that the interlocutor interprets B's utterance as if she didn't know whether Gregory was dead or alive at the time of utterance.

This cannot be the whole story, however. This explanation of the absence of lifetime effect in (80) seems to conflict with our analysis of (79). When (79) is uttered out of the blue, and we know nothing about Gregory, we infer that Gregory is dead. Yet in this context, no obligatory implicature can arise, since the present alternative and its prejacent are not contextually equivalent. Therefore, it would seem that (79), just like (80), shouldn't license an inference that Gregory is dead at TU. How can we derive the lifetime effect of (79) then?

I think that the crucial difference between (79) and (80) is that in the former case, but not in the latter, the proposition that Gregory is alive at TU is usually relevant. To see this, it will be useful to consider a more realistic example, like (83), which could be part of a biographical sketch on the back cover of a contemporary edition of the collected works of Montague:

(83)   Richard Montague was an American logician.

Imagine that the reader knows nothing about Montague. One of the functions of the back cover is to provide her with some information about him. If the biographical sketch begins with (83), she will certainly conclude that Montague was dead at the time the sketch was written. In this context, the proposition that Montague is alive at the time of writing is relevant –this is just one of these things the reader expect to learn from a biographical sketch. Furthermore, it is assumed that the author of the sketch (henceforth, the author) knows whether Montague is dead or alive at the time of writing.

Coming back to Musan's and Klein's examples (80) and (81), we observe that in both cases, the proposition that the subject of the sentence is alive at TU is not relevant. Consequently, there is no reason to accommodate this information. It might be the case that the speaker in (80) knows whether Gregory is alive, or that the speaker in (81) later befriended the man who was lying on the floor and still knows that person, but since this information would not be relevant, the speaker will not try to accommodate it. Therefore, if the interpreter ignores whether the subject of the past i-level sentence is alive, he will not strengthen the sentence, and no lifetime effect will be observed.

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Chapter 4

Previous theories of Temporal Implicatures

In this chapter, I compare two existing theories of Temporal Implicatures: Musan (1995, 1997) and Magri (2009). Both Musan and Magri are actually not directly interested in temporal implicatures but in the use and interpretation of individual level predicates, as in (1):

(1) Gregory was from America.

As was observed in chapter 3, individual level predicates may trigger a so-called lifetime effect when they are combined with the past tense, which manifests itself with (1) in two different ways. First, (1) is infelicitous in contexts where it is known that Gregory is alive at TU. Second, if it is not known whether Gregory is dead, one infers from an utterance of (1) that he is. According to both Musan and Magri, this effect is due to a scalar implicature that Gregory is not from America at TU. Nevertheless, their proposals differ significantly. The general idea behind Musan's proposal is that, since being from America is a permanent property, an assertion that Gregory was from America and that it is not true that Gregory is from America can only be true and felicitous if Gregory was from America at a previous time but has since died. This reasoning presupposes that an implicature that *it is not the case that Gregory is from America* is true if Gregory is dead. In sum, Musan capitalizes on the assumption that a felicitous utterance of (1) does implicate that it is not the case that Gregory is from America. On the contrary, Magri's analysis is built on the assumption that (1) is felicitous only if the implicature that Gregory is not from America is blocked, and that this is possible only in contexts where it is known that Gregory is dead. In contexts where it is known that Gregory is alive at TU, the implicature that he is not from America goes through, and this implicature, together with the assertion that he was from America, contradicts the piece of common knowledge that being from America is a permanent property, which Magri argues renders the sentence unacceptable.

The first section is devoted to a review of Musan's analysis of TI. I examine two versions of her proposal, Musan (1995) and Musan (1997). The second section fo-

cuses on Magri's analysis. Since the core of Magri's analysis was already introduced in chapter 3, I will focus in this chapter on Magri's treatment of tense in i-level sentences, which differs significantly from the treatment adopted in this dissertation.

4.1 Musan's analysis of Temporal Implicatures

Musan analyses temporal implicatures as quantity implicatures in a classical Gricean framework. As a consequence, she must argue that past tense sentences are weaker than their present alternatives and give a non-standard semantic to the present tense. Musan actually proposes two different analyses of the present tense, one in Musan (1995) and the other in Musan (1997). I begin by reviewing each of the analyses in turn. Then, I discuss Musan's account of the lifetime effects of past i-level sentences.

4.1.1 Musan 1995 on the generation of TIs

Tenses are analyzed as relations between intervals. Rather than following Musan's analysis to the letter, I will continue to assume that in matrix clauses, tense combines first with a silent indexical N, and then with a silent temporal quantifier ONCE:

(2) $[\![\text{PAST}]\!]^{M,w,c} = \lambda t.\lambda t'.[t' < t]$

(3) $[\![[\text{ONCE } [[\text{PAST N}] \text{ [Gregory be happy]}]]]\!]^{M,w,c} =$
$$\exists t[t < TU \wedge \textbf{happy}(w)(t)(\textbf{Gregory})]$$

Musan's (1995) analysis of TIs relies heavily on a non-standard analysis of the present tense. The definition of the present tense invokes the auxiliary notion of an interval t' being an environment of an interval t, $ENV(t)(t')$. An interval t' is an environment of t iff t is included in t', and there are subintervals of t' preceding and following t:

(4) $ENV(t)(t') \equiv t \subset t' \wedge \exists t'', t'''[t'' \subset t' \wedge t'' < t \wedge t''' \subset t' \wedge t''' > t]$

The present tense sentence *Gregory is happy* is true iff there is an environment of TU throughout which Gregory is happy:

(5) $[\![\text{PRES}]\!]^{M,w,c} = \lambda t.\lambda t'.ENV(t)(t')$

(6) $[\![[\text{ONCE } [[\text{PRES N}] \text{ [Gregory be happy]}]]]\!]^{M,w,c} =$
$$\exists t[ENV(TU)(t) \wedge \textbf{happy}(w)(t)(\textbf{Gregory})]$$

Musan's definition of the present is such that a present sentence asymmetrically entails its past alternative[1]. This allows her to derive temporal implicatures of the past tense using classical Gricean reasoning. The derivation of the implicature of *John was happy* given in (7) is not from Musan but is, I believe, faithful to her analysis:

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[1]Where the past alternative of a mono-clausal present sentence is obtained by replacing the present tense operator PRES in the latter by a past tense operator PAST.

(7) John was happy ⤳ John is not happy.

1. The speaker uttered *John was happy*.

2. There is no reason to assume that the speaker is not cooperative. In particular, one may assume that her answer was as informative as required for the purpose of the conversation.

3. If the speaker believed that John was happy at the time of utterance, it would have been more informative to say so.

4. Therefore, the speaker was not in a position to say that John is happy, and still remain cooperative.

5. Therefore, it is not the case that the speaker believes that John is happy.

6. Therefore, assuming that the speaker is opinionated about the topic of the conversation, the speaker believes that John is not happy.

While Musan's (1995) account of TI is technically correct, it relies on giving a very strong meaning to the present tense. I see two issues with it. First of all, by evaluating present tense sentences at an interval rather than at an instant, Musan loses the explanation of the ungrammaticality of non-stative non-imperfective sentences in the present tense, as in (8). We have seen in chapter 2 that Taylor (1977) and Dowty (1979) accounted for this fact by arguing that non-stative non-imperfective predicates cannot be true at instants and that present tense sentences are evaluated at the time of utterance, which is an instant:

(8) *John eats an apple right now.

A related and more serious problem is that by letting present tense sentences be true at an interval that is an environment of the time of utterance, Musan predicts that non-imperfective present tense sentences with eventive predicates should be true in contexts where the event described by the verb holds at some interval in the past, but does not hold at a superinterval of the time of utterance. Consider for instance sentence (9). If we interpret this sentence with the perfective aspect, its extended verb phrase denotes a property of intervals that include an interval throughout which John eats an apple. As we just said, this interpretation is usually blocked by assuming that present tense sentences are true at an instant, and that non-stative non-imperfective sentences are undefined at instants. But in Musan's (1995) analysis, this sentence would be well defined, since it would be interpreted at an interval. What is worse, the sentence would then be true if John ate an apple a few minutes before the time of utterance, and is not eating anything at the time of utterance, a situation that we would describe with the past tense sentence *John ate an apple*. This is clearly undesirable.

(9) *John eats an apple.

One way to avoid these problems would be to assume both that non-stative sentences must always combine with viewpoint aspect and that perfective aspect is ungrammatical in the present tense. The first assumption can be derived in a theory that takes non stative VPs to denote properties of events. The use of aspect is then required as a type shifter, which maps a property of events to a property of times that can then combine with tense. It seems to me that the second assumption is bound to remain a syntactic stipulation if we adopt Musan's analysis of the present.

4.1.2 Musan 1997 on the generation of TIs

Musan (1997) abandons her analysis of the present tense using the notion of environment, and adopts a weaker subset analysis:

(10) $[\![PRES]\!]^{M,w,c} = \lambda t.\lambda t'.t \subset t'$

(11) $[\![[ONCE\ [[PRES\ N]\ [Gregory\ be\ happy]]]]\!]^{M,w,c} =$
$$\exists t[TU \subset t \wedge \mathbf{happy}(w)(t)(\mathbf{Gregory})]$$

An immediate consequence of the new treatment of the present tense is that a present sentence no longer entails its past alternative. Therefore, Musan must adopt a new strategy to derive the TI of the past sentences.

Unfortunately, it is hard to make sense of Musan's (1997) proposal. Musan claims that although a present tense sentence is not in general stronger than its past alternative, it is stronger than its past alternative in a context in which the truth of the alternative has been established. She reasons as follows:

> Suppose *Gregory was from America* is true. In this case we know the following: if *Gregory is from America* is also true, then the situation time of *be from America* obviously reaches into the past (because of the truth of *Gregory was from America*), i.e., the implication from the present tense clause to the past tense clause is guaranteed. But how about the case where *Gregory was from America* is false? For practical purposes in a concrete discourse, this possibility can be disregarded because conversation takes place under the assumption that utterances are truthful. Hence, when a past tense clause is uttered, for practical purposes — which only care about cases where the past tense clause is true — the present tense clause is justified to count as more informative than the past tense clause.

If we interpret it literally, Musan's argument is a fallacy; it is based on the observation that, in a context in which the truth of *Gregory was from America* has been established, *Gregory is from America* contextually entails the truth of *Gregory was from America*. But of course, given any proposition p, if the truth of p has already been established in a context c, then any proposition q contextually entails p in c, for the simple matter that c itself entails p!

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Maybe what Musan had in mind is this: since *be from America* is a permanent property, *Gregory is from America* contextually entails *Gregory was from America* in any context in which it is known that Gregory was born before the time of utterance. We can also safely assume that any context in which Gregory is alive is a context in which Gregory was born before the time of utterance. Assuming then that *Gregory is from America* presupposes that Gregory is alive, *Gregory is from America* contextually entails *Gregory was from America*. I am not sure how much mileage we can get out of this interpretation of Musan's analysis of TI of individual level predicate. In any case, this reasoning cannot be extended to stage level predicates, which means that it cannot be used to account for temporal implicatures of s-level sentences. Therefore, Musan's (1997) account of TI is partial at best.

In conclusion, only Musan's (1995) account of TI is technically correct, but it comes with the undesirable assumption that present sentences are evaluated at an environment of the time of utterance.

4.1.3 Lifetime effects

Overview   In the introduction to this chapter, I remarked that the lifetime effect of past individual level sentences like *Gregory was from America* manifests itself in two different ways. Let us call these the lifetime infelicity and the lifetime inference. The lifetime inference is that an utterance of a past i-level sentence in a context where it is not known whether the subject is dead triggers an inference that she is dead. The lifetime infelicity is that an utterance of a past i-level sentence is infelicitous in contexts where it is known that the subject of the i-level predicate is alive.

Musan accounts for the lifetime inference as follows. A past tense i-level sentence implicates the falsity of its present alternative. In the case of *Gregory was from America*, we infer that *it is not the case that Gregory is from America*. The lifetime inference is a consequence of this implicature together with the proposition that if an i-level predicate holds of an individual at some moment during her lifetime, it holds of this individual until her death. From these two propositions it follows that the subject of the i-level predicate is dead at the time of utterance. In more general terms, the lifetime inference of a past tense i-level sentence is a consequence of the TI of the sentence and the fact that i-level predicates are permanent properties of individuals.

Moving on, Musan argues that the lifetime infelicity of i-level past sentences is due to a violation of the principle of cooperation. In a context where it is known that Gregory is alive, an utterance of *Gregory was from America* is odd because the alternative sentence *Gregory is from America* could have been uttered instead and would have been more informative. I take it that Musan thinks that the TI of the sentence is blocked in this context. If the implicature arose, it would be inconsistent with the common knowledge that Gregory is alive at TU and that being from America is a permanent property. One might think that this inconsistency is what

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triggers the infelicity of the utterance, and this is indeed Magri's (2009) proposal. On the other hand, in the Gricean framework that Musan adopts, quantity implicatures arise as a way to avoid the conclusion that the speaker was not cooperative. Of course, uttering a contradiction is a violation of the the maxim of quality, so it is expected that a quantity implicature will be blocked by the maxim of quality if it would result in contradiction, albeit a contextual one.

More on the lifetime inference First, I would like to discuss the interaction of presuppositions with implicatures in Musan's treatment of the lifetime inference. Consider the fact that, as noted by Musan, certain present tense predications are infelicitous when their subject is dead at the time of utterance. This is true both with i-level and with s-level predicates:

(12) [Gregory is dead] #Gregory is happy.

(13) [Gregory is dead] #Gregory is from America.

Musan proposes to treat cases like (12) and (13) as presupposition failures: both sentences presuppose that Gregory is alive at TU. This presuppositional analysis is supported by the fact that the infelicity of (12) and (13) in contexts where Gregory is dead survives when these sentences are negated. Musan implements this analysis by assuming that *happy* and *be from America* denote relations between times and individuals that are defined at a time t only if their individual argument is alive at t:

(14) For all x, t, [be from America]$^{M,w,c}(t)(x)$ is defined only if x is alive at t; if defined, [be from America]$^{M,w,c}(t)(x)$ is true iff x is from America at t

One may wonder whether the facts in (12) and (13) and their analysis by Musan are problematic for her analysis of TIs and lifetime effects. Musan wants to predict that *Gregory is from America* carries a semantic presupposition that Gregory is alive at TU. This means that this sentence denotes a proposition that is only defined in worlds in which Gregory is alive at TU. But since presuppositions project under negation, the negation of this sentence, *it is not the case that Gregory is from America*, should also denote a proposition that is defined only in worlds in which Gregory is alive at TU. The question is whether this presupposition conflicts with the explanation of the lifetime effect of the past tense sentence *Gregory was from America*.

Following Stalnaker (1978), let us assume that at any time in a conversation, the participants share a set of beliefs that can be represented as a set of propositions. This set contains all the propositions that are believed by every participant in the conversation at this time. Furthermore, we assume that this set is closed under entailment. Stalnaker called this set the Common Ground (CG). The intersection of the propositions in CG is called the Context Set (CS). CS is the set of all worlds in which every proposition in CG is true. Propositions may be added to CG by way of

assertion: when an assertion is made and is accepted by the participants, the proposition that it expresses is added to CG. Stalnaker formulates a number of additional principles that capture the conditions under which an assertion is felicitous, one of which establishes a link between semantic presuppositions and pragmatic presuppositions: an assertion is felicitous only if the proposition that it denotes has a value in all worlds of the context set.

Coming back to our question, we note that Musan's explanation of the lifetime effect of *Gregory was from America* relies on the computation of the TI that *it is not the case that Gregory is from America*. From this TI, together with the knowledge that being from America is a permanent property, one should infer that Gregory is dead at TU. But this requires that the TI *it is not the case that Gregory is from America* be added to CG, and according to Musan's analysis of the predicate *be from America*, this sentence carries a semantic presupposition that Gregory is alive at TU. The problem is that the only contexts in which the lifetime effect arises are contexts in which it is not known whether Gregory is dead. What this means is that the proposition *Gregory is dead* is true in some worlds in CS, and false in others. It appears then that the proposition that *Gregory is not from America* cannot be added to CG. Is that a problem? As pointed out by Irene Heim (p.c.), the hearer may then reason that the speaker did not utter the stronger alternative *Gregory is from America* because it would presuppose too much. This allows us to predict that the hearer will infer that it is not the case that the speaker believes that Gregory is from America, a proposition that can be safely added to CG since the presupposition of *Gregory was from America* will not project through *believe*. There is a complication however. It is usually assumed since Karttunen (1974) that if p presupposes q, then *a believes p* presupposes that *a believes q*. If this assumption is correct, then the hearer in our reasoning should add to CG the proposition that the speaker believes that Gregory is alive at TU. But in this case, since the set of beliefs of an agent is closed under entailment, the hearer should infer that the speaker believes that Gregory is from America at TU. This is wrong. Let us try another strategy then. Upon hearing *Gregory was from America*, the hearer may infer that it is not the case that the speaker believes that Gregory is from America and with the additional epistemic step, that Gregory is not from America. In order to add this proposition to the CG, the hearer may then accommodate the proposition that Gregory is alive and eliminate from CS the worlds in which Gregory is dead. But CS would then be reduced to the empty set, since CG would include the following inconsistent set of propositions:

(15)   Propositions to be added to the common ground:

1.   There is a time before TU at which Gregory was from America
2.   It is not the case that Gregory is from America at TU
3.   Gregory is alive at TU
4.   If an individual is from America at some time in her life, she is from America until her death.

Therefore, it seems to me that Musan's reasoning will run into problems if she assumes that *be from America* carries a semantic presupposition that Gregory is alive at the evaluation time. One possible way out is to assume that quantity implicatures don't have presuppositions. This idea may be implemented by treating the negation that is used in quantity implicatures as a plug for presuppositions (see Karttunen 1973), but this would be a strong stipulation.

More on the lifetime infelicity Musan's explanation of the lifetime infelicity is incompatible with a purely pragmatic account of quantity implicatures. In order to see this we must first define the notion of contextual entailment. A proposition is the characteristic function of a set of worlds, namely the worlds in which the proposition is true. By abuse of language, we refer to a proposition and to the set of worlds that it characterizes interchangeably. We then say that a proposition φ logically entails a proposition ψ ($\varphi \models \psi$) iff φ is a subset of ψ, i.e. there is no world in which φ is true and ψ is false. A proposition φ contextually entails a proposition ψ in a context c ($\varphi \models_c \psi$) iff the intersection of φ and the Context Set at c (W_c) is a subset of ψ, i.e. there is no world in CS in c in which φ is true and ψ is false:

(16) $\varphi \models \psi$ iff $\varphi \subseteq \psi$

(17) $\varphi \models_c \psi$ iff $\varphi \cap W_c \subseteq \psi$

Coming back to Gricean reasoning, we know that a quantity implicature arises when a speaker utters a sentence that is less informative than one of its relevant alternatives, where a sentence S is more informative than a sentence S' iff the proposition denoted by S asymmetrically entails the proposition denoted by S'. It is sometimes assumed (see Heim 1991) that the type of entailment that is relevant for the exploitation of the maxim of quantity is contextual entailment: an alternative A counts as more informative than a sentence S in a context c iff A contextually and asymmetrically entails S in c. The motivation is conceptual. According to Grice, an interpreter will infer a conversational implicature from an utterance because not doing so would construe the utterance as a violation of the cooperative principle. In the case of the maxim of quantity, one infers from an utterance of S that it is not the case that the speaker believes a relevant alternative A to S, only if it would have been more informative for the speaker to utter A. But what if A is only logically stronger than S, and A is contextually equivalent to S? Uttering A and uttering S would convey the same information to the interpreter, since in that particular context both utterances would have the same effect on the common ground. Therefore, if the maxim of quantity is concerned with the information that is actually conveyed by a sentence in a particular context of utterance, we must conclude that informativity should be captured in terms of contextual entailment.

The problem for Musan is that, in a context in which it is known that Gregory is alive at TU, the sentence *Gregory was from America* and the sentence *Gregory is from America* denote contextually equivalent propositions. Therefore, under a

conservative interpretation of Gricean reasoning, one predicts not only that an utterance of *Gregory was from America* does not trigger a TI, but also that such an utterance is not under-informative, since an utterance of *Gregory is from America* would have had the same effect on the common ground. In order to avoid this issue, Musan must posit that the notion of entailment that is used in the exploitation of the maxim of quantity is logical entailment rather than contextual entailment. An interesting consequence of this fact is that Musan's account of quantity implicatures then becomes much more similar to theories of grammaticalized implicatures than one would have expected, with particular emphasis on the analysis of lifetime effects of Magri (2009) that will be discussed in section (4.2). Indeed, the maxim of quantity then becomes more a linguistic rule than a general principle of rationality: why would it be more rational or cooperative for the speaker to a utter p rather than q, if p and q convey exactly the same information to her addressees in the context of utterance, even though p logically entail q? The impact on the shared information of the discourse participants would be the same.

4.1.4 Blocking lifetime effects

Musan observed that lifetime effects are blocked in some cases. In the following examples, the italicized sentences are felicitous even though Gregory is alive at the time of utterance, and they do not entail that their present tense alternative is false:

(18) On that day, I was introduced to Gregory and Eva-Lotta. *Gregory was from America*, and Eva-Lotta was from Switzerland.

(19) I had a chance to have a closer look at him. *Gregory had blue eyes*.

(20) Suddenly I realized a remarkable thing: *Gregory resembled Jörg Bieberstein*.

These examples all have in common that the linguistic context describes a past event, and the underlined sentences are interpreted as comments on this event: the speaker's introduction to Gregory and Eva-Lotta, the speaker's visual examination of Gregory and the speaker's moment of epiphany are all established as the topics of the following discourse. Crucially, these topics are events in the past. Musan argues that as a consequence, the existential quantification over tense in the italicized sentence is restricted to the times of these events. The blocking of the lifetime effect is a consequence of this domain restriction.

Let us examine Musan's proposal in more details, using example (18) as an illustration. Existential tense may be restricted by a covert predicate overt time, that I will represent with the letter C_I in the LF:

(21)

ONCE

PAST N C_1 Gregory   was from America
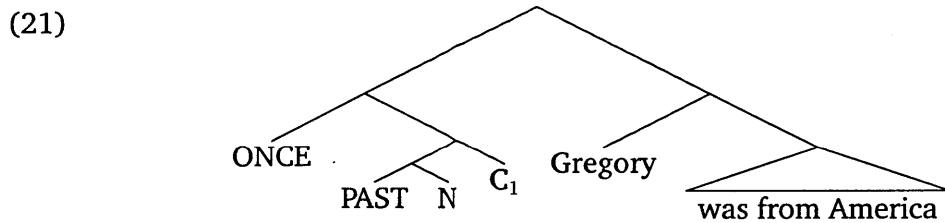
C_1 denotes a predicate of intervals, of type $\langle it \rangle$. I indexed C to indicate that it is treated as a free pronoun, and therefore that its interpretation depends on the contextual assignment function g_c. In (22), C_1 is mapped to the (characteristic function of the) set of intervals at which the speaker was introduced to Gregory and Eva-Lotta, on the particular day that is referred to in the first sentence:

(22) $[\![C_1]\!]^{M,w,c} = g_c(C_1) =$ the characteristic function of set of intervals at which c_s was introduced to G. and E.

The whole sentence ends up being true in w iff there is an interval t that precedes TU and on which the speaker was introduced to Gregory and Eva-Lotta on that day in w, such that Gregory was from America at t in w

(23) $[\![(21)]\!]^{M,w,c} = \exists t[t < TU \wedge g_c(C_1)(t) \wedge \textbf{from-America}(w)(t)(\textbf{Gregory})]$

The reason this restriction on the domain of the existential quantification blocks the lifetime effects, Musan argues, is that it must be maintained in the alternatives that are taken into account in the Gricean reasoning. In other words, the only present tense alternative to (21) that one should consider in this context is (24), which is interpreted as in (25):

(24)
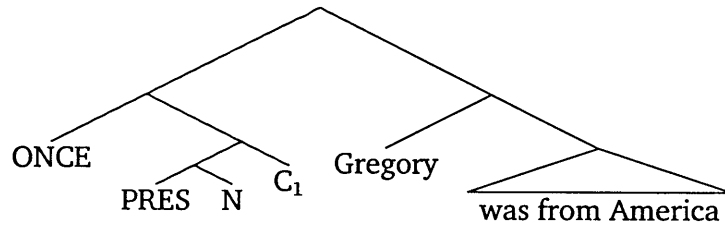
(25) $[\![(24)]\!]^{M,w,c} = 1$ iff there is an interval t which is an environment of TU and on which I was introduced to Gregory and Eva-Lotta in w, such that Gregory was from America at t in w

But since the day the speaker was introduced to Gregory and Eva-Lotta precedes the time of utterance, (25) is a contradiction, and therefore it is not more informative than the prejacent. As a consequence, no temporal implicature or lifetime effect arises.

In short, Musan argues that past tense sentences that are restricted to specific past intervals do not give rise to temporal implicatures. One obvious objection to this analysis is that overt realization of the temporal restrictions in (18) to (20) would be infelicitous, as illustrated in the following example:

(26) #On that day, I was introduced to Gregory and Eva-Lotta. When I was introduced to them, he was from America.

Musan argues that in this case, the overt adverbial functions as a contrastive topic, which triggers an inference that Gregory was not from America at other times. This

inference is infelicitous because it contradicts our knowledge that being from America is a permanent property.

Having introduced restriction on the domain of quantifiers over times, one may wonder what restriction, if any, is present in sentences that do trigger lifetime effects, such as (27) uttered out of the blue. Musan argues that in this case, quantification over time is restricted to the lifetime of the subject:

(27)   Gregory was from America.

(28) $[\![(27)]\!]^{M,w,c} = 1$ iff there is an interval t before TU that is part of Gregory's lifetime in w, such that Gregory was from America at t in w

As evidence that the subject provides the restriction on the domain of quantification over times, rather than another argument, Musan remarks that i-level transitive verbs in the past tense trigger a lifetime effect on their subject argument, but not on other arguments. (29) is infelicitous in a context in which Gregory is alive and JB is dead, but is felicitous in a context in which Gregory is dead and JB is alive. In Musan's system, this is expected under the assumption that the past tense is restricted to the lifetime of Gregory. If it is known that Gregory is alive, there are intervals in his lifetime that include the time of utterance and at which he resembles JB, even though JB is dead at these intervals. Therefore, the present alternative to (29) is relevant in this case, and the TI creates a lifetime effect. On the other hand, if the domain of quantification was restricted to JB's lifetime, there would be no present interval included in JB's lifetime at which Gregory resembles JB, and so there would be no TI and lifetime effect, contrary to facts.

(29)   Gregory resembled Jörg Bieberstein.

4.2   Magri's analysis of Temporal Implicatures

The core of Magri's analysis of lifetime effects of past i-level sentences was already presented in chapter 3. Let us remind ourselves of the essential points of this analysis. Magri argues that exhaustivity operators EXH are obligatorily inserted at every scope site in LFs. On the semantic side, the adjunction of EXH to an LF ϕ denotes the conjunction of ϕ and the negation of the relevant innocently excludable alternatives to ϕ. Since the adjunction of EXH is obligatory, a quantity implicature $\neg\psi$ can be blocked only when the alternative ψ is not relevant (or not excludable, of course). This reasoning is applied to the analysis of lifetime effects of past i-level sentences in the following way. When it is known that Gregory is alive at TU, Magri argues that the sentence *Gregory was from America* is contextually equivalent to its alternative *Gregory is from America*, which is therefore relevant and triggers an implicature that conflicts with common knowledge. The sentence is infelicitous as a consequence. When it is known that Gregory is dead at TU, the sentence *Gregory was from America* is not contextually equivalent to its present tense sentence, and the temporal implicatures is not obligatory. As a consequence, the sentence can be

felicitously uttered. Magri is silent about the inference that is observed in contexts where it is not known whether Gregory is dead or alive at TU, but I proposed an explanation of this inference in terms of accommodation, see chapter 3.

In this section, I will focus on Magri's treatment of tense in i-level sentences and its consequences for the analysis of the lifetime effect. As we will see, this treatment is significantly different from the one I proposed in chapter 3, insofar as it is argued that (i) tense is generically quantified in i-level sentences and (ii) the present tense is vacuous. This last point is particularly interesting since it has been argued independently in Sauerland (2002). It will be the topic of the next chapter.

4.2.1   Temporal Implicatures and lifetime effects

The interpretation of tense   Magri's assumptions about the interpretation of past tense i-level sentences are quite different from Musan's. First of all, Magri argues that i-level sentences are generic, where the generic operator quantifies over times. Tense is mapped in the restriction of the generic quantifier, along with a contextual restriction on the domain of quantification, which by default is identified as the set of sub-intervals of the subject of the i-level predicate. (31) is a possible syntactic structure of (30), interpreted as in (32). The restriction to sub-intervals of Gregory's lifetime is represented as $L_{Gregory}$ in the syntactic structure, which is interpreted as $\lambda t.\text{in}(\text{Gregory})(t)$. For simplicity, I treat the generic operator as a universal quantifier. (32) is true iff all past intervals in Gregory's lifetime are intervals throughout which Gregory was from America.

(30)   Gregory was from America.

(31)
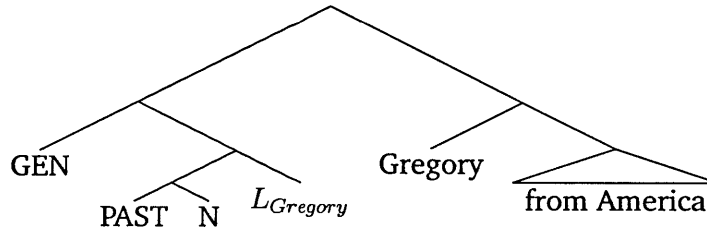
(32) $[\![(31)]\!]^{M,w,c} = \forall t[t < TU \wedge \text{in}(\text{Gregory})(t)]$
$\rightarrow [\text{from-America}(w)(t)(\text{Gregory})]$

Magri also assumes that the present tense is vacuous. The present i-level sentence *Gregory is from America* in (33) is therefore parsed as in (34) and interpreted as in (35). Since the present is vacuous, the generic operator quantifies over all intervals in Gregory's lifetime:

(33)   Gregory is from America.

(34)
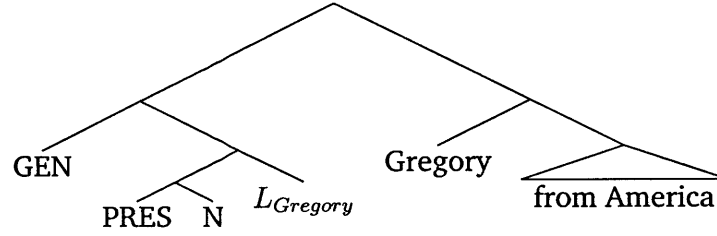
(35) $[\![(34)]\!]^{M,w,c} = \forall t[\text{in}(\textbf{Gregory})(t)] \rightarrow [\textbf{from-America}(w)(t)(\textbf{Gregory})]$

$[\![\text{PRES}]\!]^{M,w,c} = \lambda t.\top$

Deriving the lifetime effect Let us assume that the present tense and the past tense operators PRES and PAST are Horn-mates, and that the generic operator is not a member of any Horn set. In this case, the set of alternatives to *Gregory was from America* in (30) only contains the present tense sentence *Gregory is from America* in (33). Since (33) is stronger than (30) and there is no other alternative, it is also excludable. If this alternative is relevant, (30) gets exhaustified as *Gregory was from America and it is not the case that he is from America*, which is true iff all past intervals in Gregory's lifetime are intervals throughout which he was from America, and there are intervals in his lifetime throughout which he is not from America:

(36) $[\![[\text{EXH } \varphi]]\!]^{M,w,c} =$
$\forall t[t < TU \wedge \text{in}(\textbf{Gregory})(t)] \rightarrow [\textbf{from-America}(w)(t)(\textbf{Gregory})]$
$\wedge \exists t[\text{in}(\textbf{Gregory})(t) \wedge \neg\textbf{from-America}(w)(t)(\textbf{Gregory})]$

Given the piece of common knowledge that being from America is a permanent property, (30) and its alternative (33) are contextually equivalent. Therefore, (33) is necessarily relevant, and (30) is always strengthened as in (36). Since (36) contradicts common knowledge, (30) is predicted to be infelicitous. This is unfortunate. Indeed, while we want to derive the infelicity of (30) in contexts where it is known that Gregory is alive at TU, we should predict that (30) is felicitous in contexts where it is known that Gregory is dead at TU. Magri solves this problem by arguing that EXH is obligatorily inserted at every scope site, i.e. at every node in a tree that denotes a proposition. In particular, EXH should be adjoined to the restriction of the generic operator in (31) and (34):

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(37)

GEN
2
EXH
t_2
PAST N $L_{Gregory}$
Gregory from America

(38)

GEN
2
EXH
t_2
PRES N $L_{Gregory}$
Gregory from America
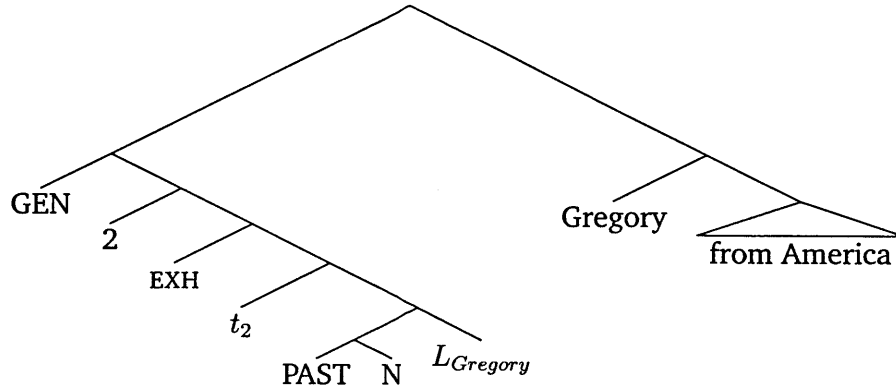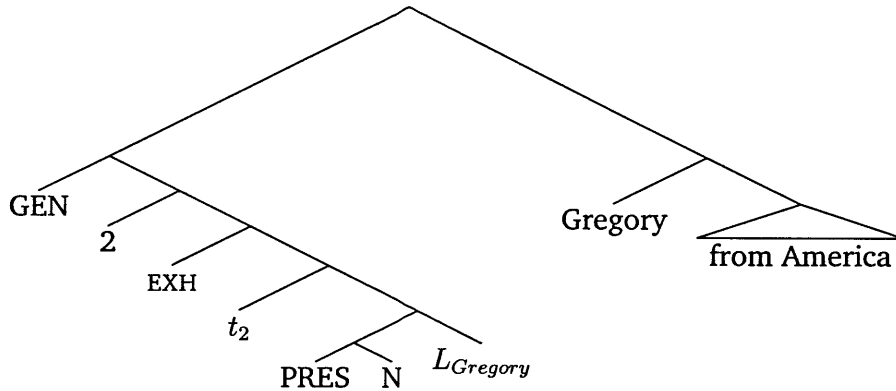
Let us examine the interpretation of the two restrictors of GEN. The restrictor of the past tense sentence in (39) is stronger than the restrictor of the present tense sentence in (40). But the only alternative to (39) is (40), which means that (39) has no excludable alternative. As a consequence, the embedded exhaustivity operator is vacuous in the past tense sentence in (37). The situation is reversed with the present tense sentence in (38). Its restriction (40) has (39) as its only alternative, and this alternative is excludable. If it is relevant, the restriction of the generic quantifier is exhaustified as (41): it is the set of times that are in Gregory's lifetime and that are not in the past of the time of utterance.

(39) $[\![\, t_2 \,[\, [\, \mathrm{PAST}\ N \,]\ L_{Gregory} \,]\,]\!]^{M,w,c} = g_c(t_2) < TU \wedge \mathbf{in}(\mathbf{Gregory})(g_c(t_2))$

(40) $[\![\, t_2 \,[\, [\, \mathrm{PRES}\ N \,]\ L_{Gregory} \,]\,]\!]^{M,w,c} = \mathbf{in}(\mathbf{Gregory})(g_c(t_2))$

(41) $[\![\, \mathrm{EXH} \,[\, t_2 \,[\, [\, \mathrm{PRES}\ N \,]\ L_{Gregory} \,]\,]\,]\!]^{M,w,c} =$
$$\mathbf{in}(\mathbf{Gregory})(g_c(t_2)) \wedge \neg(g_c(t_2) < TU)$$

What are the consequence of this state of affair for the computation of the TI of (30)? Let us first place ourselves in a context in which it is known that Gregory is dead at TU. The only alternative to (37) is (38). Do we need to exhaustify the restriction of the generic quantifier in this alternative? Yes, since in this context, (39) and (40) are contextually equivalent: the set of times in Gregory's lifetime is identical to the set of times that are both in the past of TU and in Gregory's lifetime. As a consequence, the restriction of the generic quantifier in the alternative

is strengthened as in (41): it denotes the set of times that are in Gregory's lifetime but that are not in the past. But this set is empty, since in this context, Gregory is dead at TU. As a consequence, the restriction of the generic quantifier is empty, which means either that (38) suffers from presupposition failure (assuming that the generic operator presupposes that its domain is not empty *and* that presuppositions have to be satisfied even in implicated propositions), or that (38) is a tautology. In both cases, (38) is not contextually equivalent to (37), and can be kept out of the set of relevant propositions. In this case, the exhaustification of (37) is vacuous, and the sentence is predicted to be felicitous.

Let us now interpret (30) in a context in which it is known that Gregory is alive at TU. In this context, (39) and (40) are not contextually equivalent, since there are times in Gregory's lifetime that are not in the past of TU. As a consequence, (39) does not have to be included in the local set of relevant propositions, in which case the exhaustification of the restrictor of the generic operator in (38) is vacuous. The alternative (38) is well defined and contextually equivalent to the prejacent (37), which is exhaustified as in (36). This derives the infelicity of (30). What if (39) was kept in the local set of relevant propositions? After all, Magri's analysis only predicts that (39) does not have to be included in this set when it is known that Gregory is alive at TU, but it doesn't predict that (39) cannot be included in this set in these contexts. Be that as it may, making (39) relevant for the embedded exhaustivity operator would not save the sentence. Indeed, the restrictor of the generic operator in (38) would be exhaustified as in (41), but in this case, the set of times in Gregory's lifetime that are not in the past is not empty, since Gregory is alive at TU. (38) would be true iff all times in Gregory's lifetime time that are not in the past are times at which Gregory is from America. This proposition is contextually equivalent to the prejacent, therefore it gets negated by the matrix exhaustity operator, which contradicts common knowledge and makes (30) infelicitous all the same.

Finally, what does Magri's analysis predict about the utterance of (30) in a context in which it is not known whether Gregory is dead or alive? In such a context, (39) and (40) are not equivalent, so that (30) should be infelicitous, just as it is when it is known that Gregory is alive. This prediction is clearly incorrect, since in the absence of information about Gregory, one infers from (30) that he is dead. This inference can be accounted for if we assume that an utterance of (30) can lead to the accommodation of the information that Gregory is dead, as I argued in chapter 3.

4.3   Conclusion

In this chapter, I have discussed two major analyses of lifetime effects. A significant differences between Musan's and Magri's analyses is that Musan's is meant to be based on a pragmatic Gricean analysis of TIs, while Magri's analysis is based

on a grammatical theory of TIs. I have argued that this difference is nuanced by the fact that a consistent implementation of Musan's analysis requires treating the notion of 'more informative' in the exploitation of the Maxim of Quantity as logical entailment rather than contextual entailment, therefore isolating the exploitation of the Maxim from contextual information and treating the Maxim more like a linguistic rule than a general principle of rational behavior. The conclusion seems to be that some degree of grammaticalization of the computation of TIs is required in both analyses, which I think plays in favor of Magri's analysis. Indeed, there is a general understanding that a purely pragmatic theory of quantity implicatures is conceptually more desirable than a grammatical theory, since it explains quantity implicatures by reference to general principles of rationality and cooperativeness whose adoption is motivated independently of the phenomenon of quantity implicatures. Proponents of grammatical analyses of quantity implicatures argue that this conceptual advantage is less important than the need to grammaticalize the computation of quantity implicatures in order to explain phenomena such as embedded implicatures. By invoking a contextually blind notion of informativity, Musan's analysis loses the conceptual advantage of a Gricean analysis, yet doesn't gain the additional empirical power of grammatical analyses. Therefore, it is reasonable to adopt Magri's analysis.

Another weakness of Musan's analysis is that it relies on a very strong semantic of the present tense. However, this disadvantage may be counterbalanced by Magri's assumption that present tense is vacuous in i-level sentences. Indeed, I argue in the next chapter that the arguments that have been put forward in favor of a vacuous analysis of the present tense are flawed. All in all, it seems to me that the most satisfying analysis of temporal implicatures and lifetime effects of i-level analysis is obtained by combining Magri's theory of obligatory and mismatching implicatures with a simpler analysis of tense and Katzir's theory of structurally defined alternatives, as was proposed in chapter 3.

Chapter 5

Is the present tense vacuous?

In this chapter, I discuss Sauerland's (2002) argument that the present tense is vacuous in English, and triggers an antipresupposition with respect to the past tense. In other words, the past tense is presuppositional, and a present tense sentence is felicitous only in contexts where its past tense alternative is infelicitous. As mentioned in chapter 4, Magri invokes Sauerland (2002) to justify his claim that the present tense is vacuous in present tense i-level sentences. I will argue that Sauerland's argument that the present tense is vacuous is flawed, and I will propose an alternative analysis of his examples as futurates, which maintains that the present tense conveys truth at the time of utterance. The chapter is structured as follows. In section (5.1), I introduce the notion of antipresupposition, following mostly Percus (2006). In section (5.2), I discuss Sauerland's (2002) argument that the present tense is vacuous. In section (5.3), I raise a number of objections against Sauerland's analysis of his paradigm of examples, and I propose an alternative analysis.

5.1 Antipresuppositions

It has been observed that singular indefinites are infelicitous in contexts where a singular definite could be used instead, as the following pair of examples from Heim (1991) illustrates:

(1) a. #I interviewed a father of the victim.
    b. I interviewed the father of the victim.

One may suggest that (1a) asserts that the victim has more than one father and therefore that the sentence is infelicitous because it contradicts the common knowledge that every human being has only one (biological) father. Heim (1991) notes that this analysis makes incorrect predictions with a different set of examples. (2) certainly does not entail that there are more than one 20ft. long catfish in the world, nor does (3) entail that the speaker has more than one pathologically nosy neighbor.

(2) Robert caught a 20ft. long catfish.

(3) A pathologically nosy neighbor of mine broke into the attic.

Heim proposes that what (1a), (2) and (3) have in common is that they cannot be used in contexts in which the presuppositions of the sentence with the definite article are satisfied. (1a) cannot be used if it is known that the victim has a unique father, and since this is common knowledge, the sentence is generally infelicitous. (2) and (3) cannot be used if it is known that there is a unique 20ft. long catfish or that I have a unique pathologically nosy neighbor, respectively.

It has been remarked that Heim's proposal can be used to explain the distribution of many expressions other than the indefinite article. The following list of examples is from Percus (2006). (4a) is felicitous only if it is not taken for granted that Jane is pregnant, (5a) is felicitous only if it is not taken for granted that Mary has exactly two students, and (6a) is felicitous in contexts in which it is not taken for granted that every professor is female[1]:

(4)   a. Mary thinks that Jane is pregnant.
      b. Mary knowns that Jane is pregnant. [Jane is pregnant]

(5)   a. John assigned the same exercises to all of Mary's students.
      b. John assigned the same exercises to both of Mary's students.
                                      [Mary has exactly two students]

(6)   a. Every professor was decorating his office.
      b. Every professor was decorating her office. [Every professor is female]

All these pairs of sentences have at least two properties in common. First, the presuppositions of the (b) sentence are stronger than the presuppositions of the (a) sentence. Secondly, in contexts where the presuppositions of the (b) sentence are satisfied, the two sentences are (contextually) equivalent. For instance, if the proposition that Jane is pregnant is true in every world in a set W, then for every w in W, (4a) is true in w iff (4b) is true in w. We may then characterize the conditions of felicity of the (a) sentences using the following generalization: in every pair of sentences, the (a) sentence is felicitous only if the presuppositions of the (b) sentence are not satisfied. Following Percus, I will call these conditions of felicity *antipresuppositions*, and I will say for instance that (4a) anti-presupposes that Jane is pregnant.

How can we predict the antipresuppositions of a sentence φ? The examples that we have discussed so far suggest a simple recipe, which I is usually called Maximize Presupposition, following Sauerland (2002):

(7)   Maximize Presupposition, first version:
      An utterance of φ in a context c is infelicitous if there is a sentence ψ that is contextually equivalent to φ but that has stronger presuppositions.

This however cannot be right. Consider the following example, from Sauerland (2008). There was a murder, and the father of the victim arrived on the crime scene

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[1] This is true only in dialects of English in which *his* rather than *her* is used as a gender neutral pronoun.

wearing pyjamas, so that it is taken for granted both that the victim has a unique father and that the father of the victim is wearing pyjamas. In this context, (8a) and (8b) are contextually equivalent, and the presuppositions of (8b) –there is a unique victim, the victim has a unique father and he is wearing pyjamas– are stronger than the presuppositions of (8a). Yet, (8a) does not antipresuppose that the father of the victim is wearing pyjamas.

(8)   a. The father of the victim identified his son.
      b. The father of the victim who is wearing pyjamas identified his son.

One way to avoid over-generating antipresuppositions like these is to reformulate our recipe, so that the set of sentences to which (8a) is compared does not include (8b). Following Percus, I will assume that a sentence φ should only be compared to sentences that are obtained by substitution of at least one expression ε in φ by a lexically specified alternative to ε. Clearly, we must define lexical sets of alternatives so that the pair of sentences in (1) and (5) to (7) are good competitors, as illustrated in (9).

(9)   ALT(a) = {the, ...}
      ALT(thinks) = {knows, ...}
      ALT(all) = {both, ...}
      ALT(his) = {her, ...}

We arrive at the revised version of Maximize Presupposition in (10). This formulation of the principle avoids the problem in (8).

(10)   Maximize Presupposition, second version (adapted from Percus 2006):

1. Certain expressions are associated with alternatives. Alternatives are only defined for lexical items. For any lexical item, the alternatives consist of all items of the same syntactic category.

2. Let the Alternative-family of a sentence φ be the set of sentences that you get by replacing at least one alternative-associated expression in φ with an alternative.

3. Do not use φ in a context c if there is a felicitous member of its Alternative-Family ψ that has fewer worlds in its domain but that is contextually equivalent to φ in c.

Using (10), one derives the attested antipresuppositions of the (a) sentences in (1) and (4) to (6). Nevertheless, Percus noted that (10) under-generates antipresuppositions with so-called presupposition filters. Consider (11). The presupposition triggered by *both* in the nuclear scope of the universal quantifier is 'filtered out' by the restrictor (see Karttunen 1973), which means that (11b) as a whole does not inherit any presupposition from its consequent. As a consequence, (11b) is not presuppositionally stronger than (11a). Yet, (11a) is infelicitous, and we would like to predict its infelicity as a violation of Maximize Presupposition.

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(11) a. #Everyone with exactly two students assigned the same exercise to all of his students.

b. Everyone with exactly two students assigned the same exercise to both of his students.

A plausible reason to rule out (11a) as infelicitous is that, although the sentence as a whole has the same presuppositions as its alternative (11b) and is equivalent to it, it makes use of the expression *all*, which is presuppositionally weaker than the alternative expression *both* in (11b). In other words, Maximize Presupposition has to be reformulated so that the injunction to use stronger presuppositions applies not to sentences, but to lexical items inside sentences. To do so, we must define what it means for a word to be presuppositionally stronger than another word. This is done in (12), following Percus's proposal. In this definition, it is assumed that presuppositions are conditions on the domain of functions:

(12) 'Presuppositionally stronger' (adapted from Percus 2006):
A is "presuppositionally stronger" than B iff the domain of $(\lambda w.[\![B]\!]^{M,w,c})*$ properly includes the domain of $(\lambda w.[\![A]\!]^{M,w,c})*$, where $(\lambda w.[\![A]\!]^{M,w,c})*$ is the result of uncurrying $\lambda w.[\![A]\!]^{M,w,c}$.

Consider for instance the verbs *thinks* and *knows*, whose uncurried denotations are as in (13a) and (13b)[2]. Whereas $(\lambda w.[\![thinks]\!]^{M,w,c})*$ is defined for all triples $\langle w, p, x \rangle$, the function $(\lambda w.[\![knows]\!]^{M,w,c})*$ is only defined for triples $\langle w, p, x \rangle$ such that p is true in w. Therefore, the domain of $(\lambda w.[\![knows]\!]^{M,w,c})*$ is a proper subset of the domain of $(\lambda w.[\![thinks]\!]^{M,w,c})*$, which means that *knows* is presuppositionally stronger than *thinks*.

(13) a. $(\lambda w.[\![thinks]\!]^{M,w,c})*(\langle w, p, x \rangle) = 1$ iff x believes p in w.
b. $(\lambda w.[\![knows]\!]^{M,w,c})*(\langle w, p, x \rangle)$ is defined only if p is true in w.
If defined $(\lambda w.[\![knows]\!]^{M,w,c})*(\langle w, p, x \rangle) = 1$ iff x believes p in w.

We can derive the infelicity of (11a) using the revised principle of Maximize Presupposition in (14). (11b) belongs to the alternative family of (11a). Furthermore, both sentences have the same presuppositions and are logically equivalent. Therefore, (11b) should be used instead of (11a) in any context.

(14) Maximize Presupposition (adapted from Percus 2006):

1. Certain expressions are associated with alternatives. Alternatives are only defined for lexical items. For any lexical item, the alternatives consist of all "presuppositionally stronger" items of the same syntactic category.

2. Let the Alternative-family of a sentence φ be the set of sentences that you get by replacing at least one alternative-associated expression in φ with an alternative.

3. Do not use φ if a member of its Alternative-Family is felicitous and contextually equivalent to φ.

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[2]Here we are abstracting away from tense.

5.2 Sauerland's argument on the vacuity of the present tense

Sauerland (2002) argues that the present tense in English is lexically vacuous, and that the past tense is presuppositional. The non-past meaning of present tense sentences is an antipresupposition: a present tense sentence is felicitous only in contexts where its past tense alternatives cannot be used. His argument is based on the analysis of the pair of sentences in (15) and (16). (15) can be felicitously uttered any day in the month until and including the last Tuesday. (16) can be felicitously uttered only after the last Tuesday of the month. Sauerland argues that these felicity conditions can only be derived if one assumes that the present tense is vacuous and antipresupposes the presupposition triggered by the past tense in (16). In this section, I will discuss Sauerland's argument, and I will ask whether, if it is right, it might jeopardize Magri's analysis of lifetime effects.

(15) On every Tuesday this month, I fast.

(16) On every Tuesday this month, I fasted.

But first of all, I would like to clarify a possible confusion about the felicity conditions of (16). One might think that this sentence can be felicitously uttered as long as there is at least one past Tuesday in the month, in which case it is true iff the speaker fasted on every past Tuesday of the month. If this were correct, the sentence would be felicitous and true if uttered for instance between the second and the third Tuesdays of the month, provided the speaker fasted on the first and the second Tuesdays. This interpretation is clearly licensed in (17), where the adverbial *so far* is used.

(17) On every Tuesday this month so far, I fasted.

Is it licensed in (16)? I think that it is, but in this case I claim that the domain of the universal quantifier is contextually restricted to a set of times that precede the time of utterance. This restriction is expressed overtly in (17) by the adverbial *so far*. Sauerland's argument presupposes that the universal quantifier in (16) is not restricted in this way. One way to check that the felicity conditions of (16) under this condition are as Sauerland claims they are is to compare it with an alternative sentence where the restriction on the domain of the universal quantifier is explicit, as in (18). In this sentence, the domain of quantification of the universal quantifier clearly includes every Tuesday of the month of utterance, and the felicity conditions are clearer: (18) is felicitous only if all the Tuesdays of the month precede the time of utterance. I will continue to discuss (15) and (16), but it should be kept in mind that it is assumed all along that the domain of the universal quantifier is not contextually restricted.

(18) On each of the four Tuesday of this month, I fasted.

5.2.1 Temporal Prepositional Phrases

A careful evaluation of Sauerland's argument will not be possible without a theory of temporal Prepositional Phrases (PPs) and their interaction with tense. Since

Sauerland himself is not very explicit on these issue, I will adopt a theory based on von Stechow (2002), which is in turn a reaction to Pratt & Francez (2001). This theory should answer at least two questions, which I address in turn.

How do temporal PPs combine with the VP? The truth-conditions of (19) in an event semantics are quite clear: the sentence is true iff there is a time before TU that includes an event of John dying, and the time of that event is included in the interval denoted by *November 1st, 1975*. How do we get these truth-conditions compositionally? It is reasonable to assume that the preposition *on* denotes a relation between intervals, and that the NP *November 1st, 1975* rigidly designates an interval. However, since the VP denotes a property of events, we want to be able to use the PP to relate the running time of VP-events to its internal argument. To do so, I assume with von Stechow (2002) that temporal prepositions denote relations between intervals and/or events. When such a relation is given an event as an argument, this event is mapped to its running time. For clarity, I will use the letter l in the metalanguage to refer to variables ranging over both times and events:

(19)   John died on November 1st, 1975.

(20) $[\![\text{on}]\!]^{M,w,c} = \lambda l.\lambda l'.l' \subseteq l^3$
        $[\![\text{November 1st, 1975}]\!]^{M,w,c} = \textbf{11/01/1975}$

Given this much, the temporal PP can be adjoined to the VP, where the two constituents are combined intersectively.

(21)
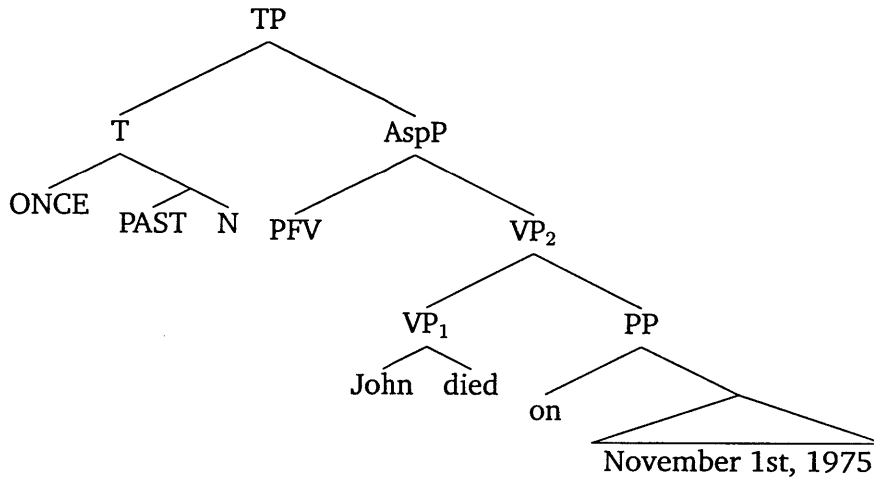
(22) $[\![\text{PP}]\!]^{M,w,c} = \lambda l.l \subseteq \textbf{11/01/1975}$
        $[\![\text{VP}_1]\!]^{M,w,c} = \lambda e.\textbf{die}(w)(e)(\textbf{John})$
        $[\![\text{VP}_2]\!]^{M,w,c} = \lambda e.\textbf{die}(w)(e)(\textbf{John}) \wedge \tau(e) \subseteq \textbf{11/01/1975}$
        $[\![\text{PFV}]\!]^{M,w,c} = \lambda P_{\langle vt\rangle}.\lambda t.\exists e[P(e) \wedge \tau(e) \subseteq t]$
        $[\![\text{AspP}]\!]^{M,w,c} = \lambda t.\exists e[\textbf{die}(w)(e)(\textbf{John}) \wedge \tau(e) \subseteq \textbf{11/01/1975} \wedge \tau(e) \subseteq t]$

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[3]A more precise notation would be $\lambda l.\lambda l'.f(l') \subseteq f(l)$, where for any l, $f(l) = l$ if l is of type i, $f(l) = \tau(l)$ if l is of type e, and $f(l)$ is undefined otherwise.

$$[\![\text{TP}]\!]^{M,w,c} =$$
$$\exists t[t < TU \wedge \exists e[\textbf{die}(w)(e)(\textbf{John}) \wedge \tau(e) \subseteq \textbf{11/01/1975} \wedge \tau(e) \subseteq t]]$$

The situation is a bit more complicated with quantificational PPs. Consider (23). The DP *every day between 06/01/2011 and 07/01/2011* denotes a property of sets of intervals. This expression is not of the right type to combine with the preposition *on* in situ, and therefore I assume following von Stechow (2002) that it is QR-ed over AspP, in an inverse-linking configuration:

(23) John called on every day between 06/01/2011 and 07/01/2011.

(24) $[\![\text{every day between 06/01/2011 and 07/01/2011}]\!]^{M,w,c} =$
$$\lambda P_{\langle it\rangle}.\forall t[\textbf{day}(w)(t) \wedge \textbf{06/01/2011} \le t \le \textbf{07/01/2011}] \rightarrow P(t)$$

(25)
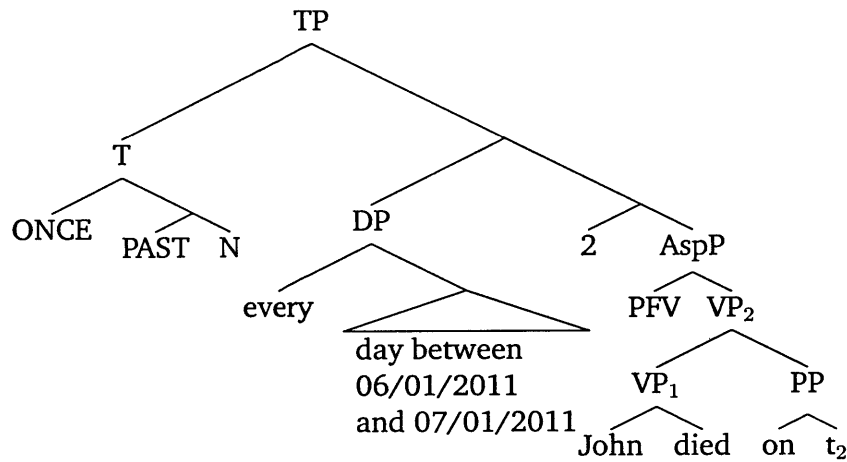
Can tense restrict the domain of temporal PPs? Consider (26). According to the analysis of temporal PPs that we have developed so far, this sentence should be interpreted as in (27a). This sentence is true iff there is some past interval t such that every Monday includes some event of John calling and that is itself included in t. Since t precedes TU, this means that every Monday is at least partly in the past. Therefore, given the common knowledge that Mondays are linearly ordered and the assumption that there is no last Monday, (27a) contextually entails that every Monday is in the past. This analysis is clearly undesirable. We could also allow the temporal PP to be QR-ed over tense, in which case (26) would be interpreted as in (27b). This sentence is true iff for every Monday t, there is a past interval that includes an event of John calling. Again, this sentence entails that every Monday is at least partly in the past, and therefore it contextually entails that every Monday is in the past. Neither analysis derives the correct truth-conditions of (26) then.

(26) John called on every Monday.

(27) a. $\exists t[t < TU \wedge \forall t'[\textbf{Monday}(w)(t')]$
$$\rightarrow \exists e[\textbf{call}(w)(e)(\textbf{John}) \wedge \tau(e) \subseteq t' \wedge \tau(e) \subseteq t]]$$
b. $\forall t[\textbf{Monday}(w)(t)]$
$$\rightarrow \exists t'[t' < TU \wedge \exists e[\textbf{call}(w)(e)(\textbf{John}) \wedge \tau(e) \subseteq t' \wedge \tau(e) \subseteq t]]$$

A reasonable interpretation of (26) is that every Monday in some past interval includes an interval at which John called. In other words, the domain of quantification of the universal quantifier must be restricted to times included in a past interval. At this point, one may follow two different strategies. First, one may assume that the restriction on the domain of the quantifier inside the PP is due to tense quantifying inside its restrictor, as in (28a). Alternatively, one may assume that this phenomenon is a classical case of contextual domain restriction, which can be implemented by intersecting the restrictor of the adverbial quantifier with a contextually salient predicate of intervals, written as C' in (28b). It is not clear how to distinguish between these two alternative analyses. Insofar as tense is itself contextually restricted, both analyses posit a form of contextual restriction of the domain of the quantifier in the PP. Showing that there is a contextual restriction on the domain of this quantifier that is independent from the contextual restriction of tense would eliminate the first analysis, but I can't see how to do this. In the rest of the dissertation, I will assume that temporal PPs are restricted contextually, since this seems to be the null hypothesis (this strategy being independently motivated with non-temporal quantifiers). In any case, nothing in the discussion of Sauerland's argument depends on this choice.

(28) a. $\exists t[t < TU \wedge C(t) \wedge \forall t'[\mathbf{Monday}(w)(t') \wedge t' \subseteq t] \rightarrow \exists e[\mathbf{call}(w)(e)(\mathbf{John}) \wedge \tau(e) \subseteq t' \wedge \tau(e) \subseteq t]]$
      b. $\exists t[t < TU \wedge C(t) \wedge \forall t'[\mathbf{Monday}(w)(t') \wedge C'(t')] \rightarrow \exists e[\mathbf{call}(w)(e)(\mathbf{John}) \wedge \tau(e) \subseteq t' \wedge \tau(e) \subseteq t]]$

If the relation between temporal PP and tense is due to contextual domain restriction, we expect that it might be absent in some cases. As we have seen, this ought to be the case in Sauerland's examples.

5.2.2   Non-presuppositional analysis of tense

We can now go back to Sauerland's examples (15) and (16), and ask first of all if a non-presuppositional analysis of tense can account for their felicity conditions.

(15)   Every Tuesday this month, I fast.

(16)   Every Tuesday this month, I fasted.

Consider first (16). Clearly, *this month* refers to the month that includes the time of utterance, hence the sentence does not entail that this month precedes TU. This means that the past tense does not restrict the PP *(on) this month*. Does it restrict the PP *(on) every Tuesday?* (16) would then be interpreted as in (30)[4]:

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[4]Where $\delta t[month(w)(t)]$ is the minimal interval that is a month and that includes TU.

(29)

```
                        TP
              ┌──────────┴──────────┐
              T                     2 ──── AspP₂
         ┌────┴────┐          ┌───────────┴───────────┐
       ONCE    ┌───┴───┐     DP                      AspP₂
             PAST      N  ┌───┴────┐            ┌──────┴──────┐
                        every      ...          1          AspP₁
                     ┌────┴────┐              ┌──┴──┐   ┌─────┴─────┐
                  Tuesday   ┌──┴──┐          on  ...  t₂         ...
                           on   C₃        this month
```

     (29) tree: TP → [T [ONCE [PAST N]]] [2 AspP₂]; AspP₂ → DP [every [Tuesday [on C₃]] [on [this month]]] , [1 AspP₁]; AspP₁ → t₂ [PFV VP₂]; VP₂ → VP₁ [I fasted] PP [on t₁]
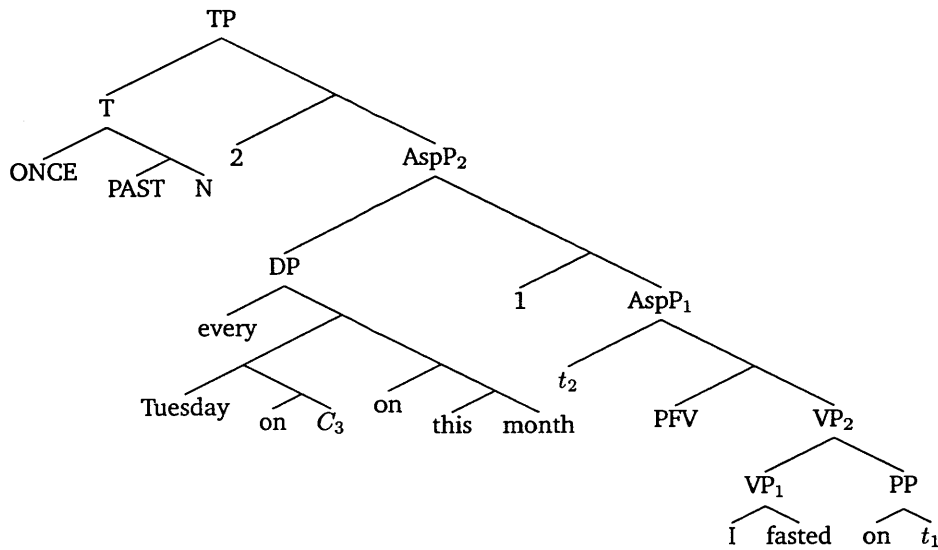
(30) $\exists t[t < TU \land \forall t'[\textbf{Tuesday}(w)(t') \land t' \in g_c(C_3) \land t' \subseteq \delta t[\textbf{month}(w)(t)]] \rightarrow$
$\exists e[\textbf{fast}(w)(e)(\textbf{I}) \land \tau(e) \subseteq t' \land \tau(e) \subseteq t]]$

(30) is true in a world w iff every Tuesday in $g_c(C_3)$ the month of utterance includes an event of the speaker fasting. Assuming that $g_c(C_3)$ is the set of all past times, it is correctly required that John fasted on every Tuesday that is both included in the month of utterance and that precedes the time of utterance. But according to these truth-conditions, the sentence would be true if John fasted on at least one Tuesday of the month of utterance, before the time of utterance, and there are still some Tuesdays left in the month, on which he might fast or not. Therefore, these truth-conditions are too weak.

If there is no contextual domain restriction in *(on) every Tuesday*, (16) is interpreted as in (31): the sentence is true iff there is a time t in the past such that for every Tuesday in the month of utterance, there is an event of the speaker fasting that is included in t and in this Tuesday. Under this reading, the sentence entails that every Tuesday in the month is (at least partly) in the past. In particular, the sentence is false if it was uttered before the last Tuesday of the month. Sauerland would argue that this analysis does not allow us to account for the felicity conditions of (16). According to him, an utterance of (16) triggers a presupposition failure in contexts where there is still a Tuesday left in the month at the time of utterance. Although I agree that an utterance of (16) is infelicitous in such contexts, I don't think that it is necessary to analyze this infelicity as an instance of presupposition failure. In section 5.3, I will argue that this infelicity can be explained as a violation of the maxim of quality. But for now, let us bear with Sauerland's argument, and assume that this analysis of (16) is insufficient.

(31) $\exists t[t < TU \land \forall t'[\textbf{Tuesday}(w)(t') \land t' \subseteq \delta t[\textbf{month}]]$
$\rightarrow \exists t''[\textbf{fast}(w)(t'')(\textbf{I}) \land t'' \subseteq t' \land t'' \subseteq t]]$

Note that scoping the universal quantifier over tense would produce the same truth-conditions, as illustrated in (32):

(32) $\forall t'[\textbf{Tuesday}(w)(t') \land t' \subseteq \delta t[\textbf{month}]]$
$$\rightarrow \exists t[t < TU \land \exists e[\textbf{fast}(w)(e)(\textbf{I}) \land \tau(e) \subseteq t' \land \tau(e) \subseteq t]]$$

How about the present tense sentence (15)?

(15) Every Tuesday this month, I fast.

Presumably, we need to use the imperfective rather than the perfective aspect with the present tense. In the preceding chapters, I have argued that the TP of present tense sentences is headed by an indexical pointer to the time of utterance. Given this analysis, (15) would be interpreted as in (33):

(33) $\forall t[\textbf{Tuesday}(w)(t) \land t \subseteq \delta t'[\textbf{month}(w)(t')]]$
$$\rightarrow \exists e[\textbf{fast}(w)(e)(\textbf{I}) \land \tau(e) \subseteq t \land TU \subseteq \tau(e)]$$

(33) is true iff every Tuesday of the month of utterance includes an event of the speaker fasting, and that event includes TU. This has the unfortunate consequence that every Tuesday in the month of utterance overlaps with TU. This analysis is obviously an non starter.

A subset analysis of the present in (34) faces the same issue. Since we use the imperfective aspect, it is predicted that every (contextually salient) Tuesday in the month of utterance includes an event that includes a superinterval of TU.

(34) $[\![\text{PRES}]\!]^{M,w,c} = \lambda t.\lambda t'.t \subseteq t'$
$[\![\text{PRES N}]\!]^{M,w,c} = \lambda t'.TU \subseteq t'$

(35) $\exists t[TU \subseteq t \land \forall t'[\textbf{Tuesday}(w)(t') \land t' \in g_c(C_3) \land t' \subseteq \delta t[\textbf{month}(w)(t)]]$
$$\rightarrow \exists e[\textbf{fast}(w)(e)(\textbf{I}) \land \tau(e) \subseteq t' \land t \subseteq \tau(e)]]]$$

These two analyses of (15) are certainly not on the right track. From Sauerland's perspective, this is an argument in favor of the claim that the present tense is vacuous and that the felicity conditions of (15) should be obtained by antipresupposition with respect to its past tense alternative (16). I will discuss Sauerland's analysis in the next subsection. However, it is important to point out that we have not exhausted all possible analyses of (15). Therefore that we cannot exclude that a more refined analysis of this sentence might allow us to account for its truth and felicity conditions without assuming that the present tense is vacuous. Indeed, in section 5.3 I will argue that once we recognize that sentences like (15) really are futurates (see e.g. Copley 2002), we can maintain a conservative analysis of the present tense.

5.2.3 A presuppositional analysis of tense

The next step in the argument is to check whether the felicity conditions of (15) and (16) can be accounted for using a presuppositional analysis of tense. I will assume with Sauerland that semantic presuppositions are conditions on the domain of functions denoted by natural language expressions, following Heim & Kratzer (1998):

(36) $[\![\text{PRES}(t)(t')]\!]^{M,w,c}$ is defined only if $[\![t']\!]^{M,w,c} = [\![t]\!]^{M,w,c}$;
if defined, $[\![\text{PRES}(t)(t')]\!]^{M,w,c} = [\![t']\!]^{M,w,c}$

(37) $[\![\text{PAST}(t)(t')]\!]^{M,w,c}$ is defined only if $[\![t']\!]^{M,w,c}$ precedes $[\![t]\!]^{M,w,c}$;
if defined, $[\![\text{PAST}(t)(t')]\!]^{M,w,c} = [\![t']\!]^{M,w,c}$

Let us illustrate this analysis with two simple examples:

(38) $\varphi :=$ [John [[[PRES N] t_1] [is happy]]].
$[\![\varphi]\!]^{M,w,c}$ is defined only if $g_c(t_1) = $ TU in w; if defined $[\![\varphi]\!]^{M,w,c} = 1$ iff John is happy at $g_c(t_1)$ in w.

(39) $\psi :=$ [John [[[PAST N] t_1] [was happy]]].
$[\![\psi]\!]^{M,w,c}$ is defined only if $g_c(t_1) < $ TU in w; if defined $[\![\varphi]\!]^{M,w,c} = 1$ iff John is happy at $g_c(t_1)$ in w.

Given the denotations in (36) and (37), we have to assume that tense is pronominal. Then the proposition denoted by *John is happy* is defined only in worlds where $g_c(t_1)$ is identical to TU, and if defined, it is true in a world w iff John is happy at $g_c(t_1)$ in w. The proposition denoted by *John was happy* is defined only in worlds where $g_c(t_1)$ precedes TU, and if defined, it is true in a world w iff John is happy at $g_c(t_1)$ in w. Note that the presupposition of (38) and (39) is very weak. What is presupposed in (38) is not that John is happy at TU (in which case the assertion would be uninformative) but only that the time that the sentence is about is TU. Likewise, (39) only presupposes that the time that the sentence is about precedes TU.

We can now go back to sentences (15) and (16). (16) is analyzed as follows:

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(40)

```
                          TP
              ┌────────────┴──────────┐
              T                       2
         ┌────┴────┐          ┌───────┴────────┐
        t3    PAST   N                        AspP₂
                            ┌──────────────────┴──────┐
                           DP                          1      AspP₁
                      ┌─────┴──────┐                  ┌────────┴──────┐
                    every          │                 t2       PFV      VP₂
                    Tuesday    ┌───┴───┐                        ┌───────┴────┐
                              on   ┌───┴───┐                   VP₁          PP
                                  this  month              ┌────┴────┐   ┌───┴───┐
                                                           I  fasted  on   t1
```
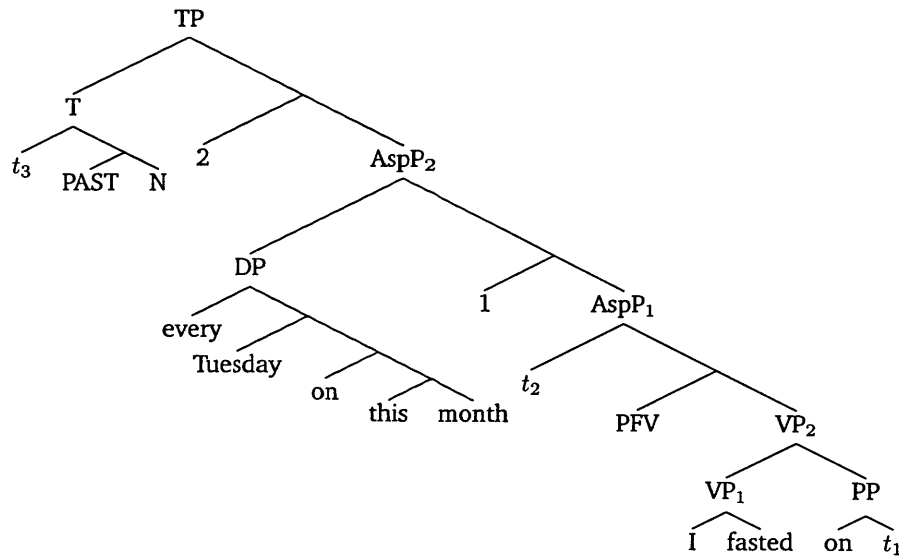
(41) $[(40)]^{M,w,c}$ is defined only if $g_c(t_3)$ precedes TU;

if defined, $[(40)]^{M,w,c} = 1$ iff $\forall t[\textbf{Tuesday}(w)(t) \land t \subseteq \delta t[\textbf{month}(w)(t)]] \rightarrow$
$$\exists e[\textbf{fast}(w)(e)(\textbf{I}) \land \tau(e) \subseteq t \land \tau(e) \subseteq g_c(t_3)]]$$

Just as (39), (41) only presupposes that the time that the sentence is about precedes TU. As a consequence, the sentence would be false rather than infelicitous, if it is uttered before the first Tuesday of the month, provided the external argument of the past tense denotes a salient interval that precedes TU.

Sauerland bypasses this issue by assuming that the universal quantifier binds into tense. A simple way to implement this idea is to analyse *every Tuesday this month* not as the complement of a silent preposition that modifies the VP, but as an adverbial quantifier that binds the external argument of tense, as in (42).

(42)

```
                          TP₂
              ┌────────────┴──────────────────┐
             DP                                1      TP
        ┌─────┴──────┐                        ┌───────┴─────────┐
      every          │                        T               AspP
      Tuesday    ┌───┴───┐                ┌───┴───┐        ┌────┴────┐
                on   ┌───┴───┐           t1  PAST  N      PFV        VP
                    this  month                               ┌──────┴───┐
                                                              I       fasted
```
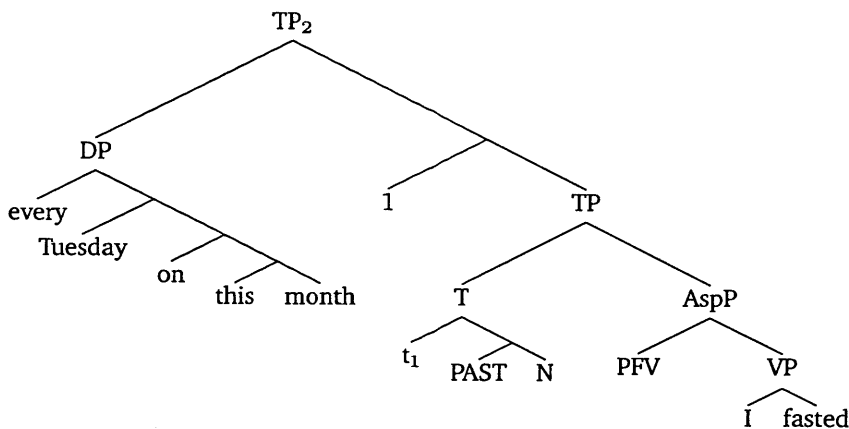
As a result, the universal quantifier binds into the presupposition triggered by the past tense. This has significant consequences for the computation of the presupposition of the sentence. It is generally agreed that presuppositions that are bound

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by a universal quantifier in its nuclear scope project universally. For instance, (43) presupposes that every student in Mary's class tried to get an NSF grant.

(43)   Every student in Mary's class managed to get an NSF grant.

Consequently, Sauerland predicts that (16) projects a universal presupposition, that every Tuesday in the month of utterance precedes TU, and is true iff every Tuesday in the month of utterance includes a time at which the speaker fasted. These are the correct truth and felicity conditions:

(44) $[\![(16)]\!]^{M,w,c}$ is defined only if every Tuesday in the month of utterance precedes TU;
if defined $[\![(16)]\!]^{M,w,c} = 1$ iff $\forall t[\mathbf{Tuesday}(w)(t) \land t \subseteq \delta t[\mathbf{month}(w)(t)]] \rightarrow$
$\exists e[\mathbf{fast}(w)(e)(\mathbf{I}) \land \tau(e) \subseteq t]]$

The present tense is sentence (15) is analyzed in a similar fashion. However, if we adopt the analysis of the present tense in (36), we predict the absurd presupposition that every Tuesday is identical to the time of utterance:

(45)
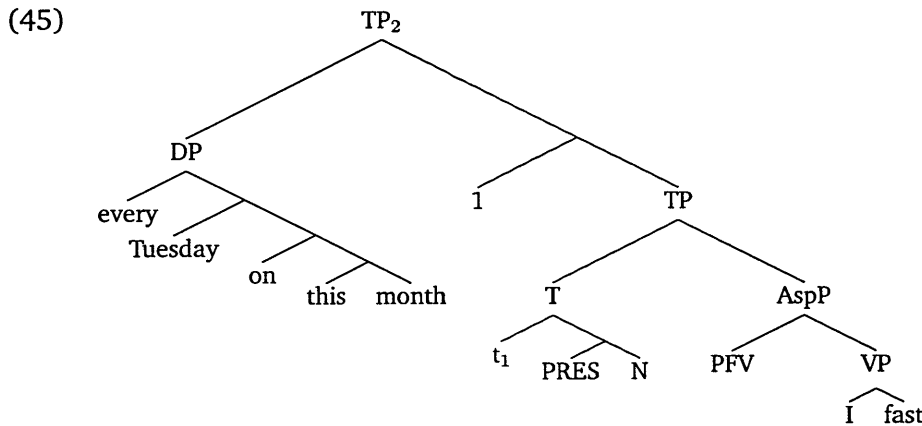
(46) $[\![(15)]\!]^{M,w,c}$ is defined only if every Tuesday in the month of utterance is identical to TU;
if defined $[\![(16)]\!]^{M,w,c} = 1$ iff $\forall t[\mathbf{Tuesday}(w)(t) \land t \subseteq \delta t[\mathbf{month}(w)(t)]] \rightarrow$
$\exists e[\mathbf{fast}(w)(e)(\mathbf{I}) \land \tau(e) \subseteq t]]$

We may try to improve this result by adopting a weaker analysis of the present tense. Sauerland considers a non-past analysis, as in (47). This would still not predict the correct felicity conditions, since the sentence would be infelicitous any time after the first Tuesday of the month:

(47) $[\![PRES(t)(t')]\!]^{M,w,c}$ is defined only if $[\![t']\!]^{M,w,c} \geq [\![t]\!]^{M,w,c}$;
if defined, $[\![PRES(t)(t')]\!]^{M,w,c} = [\![t']\!]^{M,w,c}$

(48) $[\![(15)]\!]^{M,w,c}$ is defined only if for every Tuesday t in the month of utterance, either t is identical to TU or t follows TU;
if defined $[\![(15)]\!]^{M,w,c} = 1$ iff $\forall t[\mathbf{Tuesday}(w)(t) \land t \subseteq \delta t[\mathbf{month}(w)(t)]] \rightarrow$
$\exists e[\mathbf{fast}(w)(e)(\mathbf{I}) \land \tau(e) \subseteq t]]$

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However, assuming that the present is vacuous and is an alternative to the past tense for the purposes of Maximize Presupposition predicts the correct felicity conditions. (15) would then be felicitous only in contexts where (16) is infelicitous, i.e. only in contexts where it is not taken for granted that every Tuesday in the month of utterance precedes TU:

(49) $[\![\text{PRES}(t)(t')]\!]^{M,w,c} = [\![t']\!]^{M,w,c}$

(50) $[\![(15)]\!]^{M,w,c}$ is felicitous only if it is not taken for granted that every Tuesday in the month of utterance precedes TU.
$[\![(15)]\!]^{M,w,c} = 1$ iff
$\forall t[\textbf{Tuesday}(w)(t) \land t \subseteq \delta t[\textbf{month}(w)(t)]] \rightarrow \exists e[\textbf{fast}(w)(e)(\textbf{I}) \land \tau(e) \subseteq t]]$

In conclusion, we can account for the felicity conditions of Sauerland's examples if we adopt a presuppositional analysis of the past tense combined with the assumption that the present tense is vacuous and competes with the past tense in Maximize Presupposition. If this result cannot be achieved with a non-presuppositional analysis or a presuppositional analysis without anti-presupposition, this is a very strong argument in favor of Sauerland's analysis of the present and the past tenses. Nevertheless, I will argue in the next section that Sauerland's argument that the present tense is vacuous is not convincing and that his analysis of the present tense faces a number of issues.

5.3 An alternative account of Sauerland Constructions

5.3.1 Objections to Sauerland's analysis

Sauerland's analysis relies on the assumption that the universal quantifier *every Tuesday this month* in (15) and (16) can bind the external argument of tense. In the preceding section, I suggested this assumption was met by treating *every Tuesday this month* not as the complement of a PP headed by a silent preposition *on*, but rather as an adverbial quantifier that takes a TP as its nuclear scope. Independently of whether this is the right analysis of Sauerland's examples, we can find pairs of sentences that cannot be analysed in this way. Consider for instance (51) and (52). These sentences have felicity conditions that are similar to (15) and (16). (51) can be felicitously uttered on any day until the last lunch of the month, and is infelicitous afterwards. (52) can be felicitously uttered only after the last lunch of the month, once again with the caveat that the universal quantifier should not be contextually restricted, i.e. provided the sentence is interpreted as (53) – assuming there are 31 days on the month of utterance.

(51) After every lunch this month, I take a nap.

(52) After every lunch this month, I took a nap.

(53) After each of the 31 lunches of this month, I took a nap.

The issue is the following. (51) and (52) entail that after every lunch in the month of utterance, there is a time at which the speaker takes a nap. The relation

of precedence between the times at which the speaker has a lunch and the time at which she takes a nap is contributed by the preposition *after*. In other words, there is no escaping the assumption that the universal quantifier *every lunch this month* binds a variable embedded in a PP, which modifies the VP. This means that the universal quantifier must bind both the external argument of tense and the internal argument of the preposition.

(54)
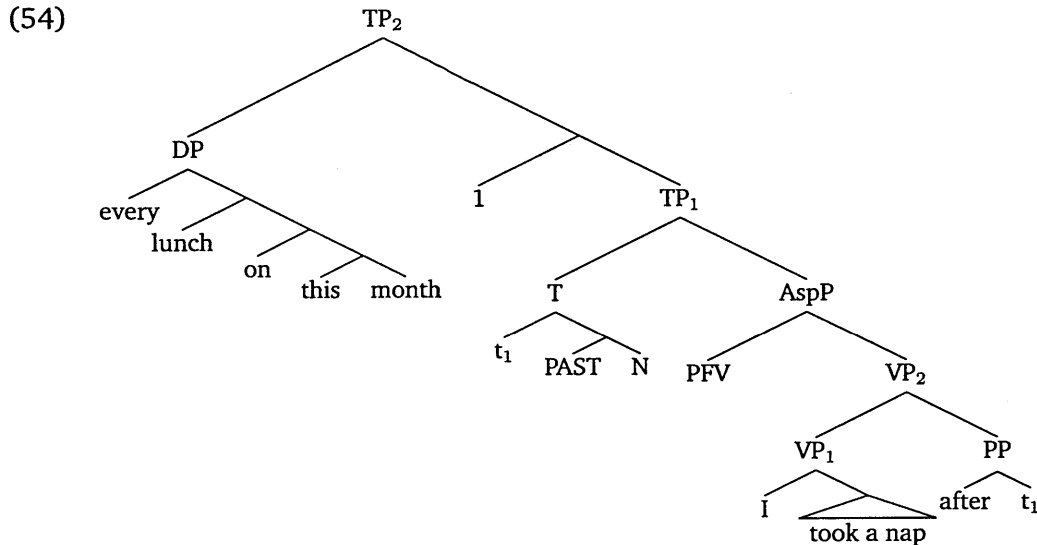
It is not obvious how to generate this LF. The relation between the universal quantifier and the PP is simple enough: the quantifier can be moved out of the PP, and binds its trace by the process of QR. However, how does it come to bind the external argument of tense? The universal quantifier *every lunch this month* is presumably generated inside the temporal PP, and would have to be QR-ed in a position where it c-commands the external argument of the past tense. This argument can then be treated as a silent pronoun that is bound by the universal quantifier. The issue with this analysis is that the movement of the quantifier over the temporal pronoun is a case of weak cross-over (Higginbotham 1980), which should make the sentence ungrammatical.

An even more serious issue with Sauerland's analysis is that it predicts that the English present tense is actually a non-past tense, and always licenses future reference. Indeed, consider the simple present tense sentence (55) and its past tense alternative (56). As shown in (57) and (58), (55) should be infelicitous in contexts where it is taken for granted that the evaluation time of the sentence is in the past. In particular, the sentence should be felicitous if the evaluation time is either in the present or in the future. But (55) cannot be used to describe a future event of John sleeping. The only situation in which the sentence is true is one in which there is an event of John sleeping that includes the time of utterance.

(55)   [[t_1 [PRES N]] John is sleeping].

(56)   [[t_1 [PAST N]] John is slept].

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(57) $[\![(56)]\!]^{M,w,c}$ is defined only if it is taken for granted that $g_c(t_1)$ precedes TU. If defined, $[\![(56)]\!]^{M,w,c}$ is true iff John sleeps at $g_c(t_1)$.

(58) $[\![(55)]\!]^{M,w,c}$ is felicitous only if it is not taken for granted that $g_c(t_1)$ precedes TU. If felicitous, $[\![(55)]\!]^{M,w,c}$ is true iff John sleeps at $g_c(t_1)$.

One may try to solve this problem by assuming that the future sentence (59) is an alternative of (55) and presupposes that the evaluation time of the sentence follows TU. This way, (55) would also antipresuppose that its evaluation time is in the future.

(59) $[[\ t_1\ [\text{FUT N}]]$ John is sleeping].

(60) $[\![(59)]\!]^{M,w,c}$ is defined only if it is taken for granted that $g_c(t_1)$ follows TU. If defined, $[\![(59)]\!]^{M,w,c}$ is true iff John sleeps at $g_c(t_1)$.

The problem with this analysis is that it makes incorrect predictions with Sauerland's initial examples. Indeed, by Sauerland's logic, we would then expect (61) to presuppose that every Tuesday in the month of utterance is in the future, and therefore its present tense alternative should antipresuppose this, contrary to facts: *Every Tuesday this month, I fast* is felicitous when it is uttered before the first Tuesday of the month.

(61) On every Tuesday this month, I will fast.

In the rest of this chapter, I propose an alternative analysis of Sauerland's examples that does not face these issues.

5.3.2 An alternative account

Quantifiers and events Before I present my analysis of Sauerland's examples, I would like to make some modifications to the analysis of temporal quantifiers. These modifications are not necessary but will permit a more natural analysis of the interaction between temporal PPs, aspect and modal operators. The modifications that I will adopt come from Kratzer's (2005) and Ferreira's (2005) discussion of the distributivity of *every* in event-semantics.

Kratzer (2005) notes that (62) can have a cumulative reading (see also Schein 1993). Under this reading, (62) is true if two copy editors found one mistake each, and the last copy editor found the rest of the mistakes:

(62) Three copy editors caught every mistake in the manuscript.

A simple formalization of (62) –abstracting away from tense– does not capture this reading:

(63) $[\![(62)]\!]^{M,w,g} = \exists x[\textbf{3-copy-editors}(w)(x) \land \forall y[\textbf{mistake}(w)(y)]$
$$\rightarrow \exists e[\textbf{find}(w)(e)(x)(y)]]$$

(63) says that there is a plural individual x who consists of three copy editor, and for every mistake y, there is an event of x finding y. This entails that for every mistake y, each copy editor either found y or at least took part in a collective effort of finding y. (64) is a more satisfying representation of the truth-conditions of the sentence. In this formalization, the agent argument of *find* has been severed from the denotation of its verb and is introduced by a separate operator **agent**. The sentence is true iff there is an event e whose agent is a plurality of three copy editors and for every mistake y, there is an event e' that is a part of ($\leq_m$) the event e and that is an event of finding y. This entails that every mistake was found without entailing that for every mistake y, each copy editor took part in a finding of y.[5]

(64) $[\![(62)]\!]^{M,w,g} = \exists e \exists x [\textbf{3-copy-editors}(w)(x) \wedge \textbf{agent}(e)(x) \wedge \forall y [\textbf{mistake}(w)(y)$
$$\rightarrow \exists e'[e' \leq_m e \wedge \textbf{find}(w)(e')(y)]]$$

The next question is how to derive these truth-conditions compositionally. (62) is parsed as in (65). The agent argument of the verb is not introduced inside the VP but in an additional projection headed by an agentive head v. The universal quantifier *every* is analyzed as in (67).[6]

(65)
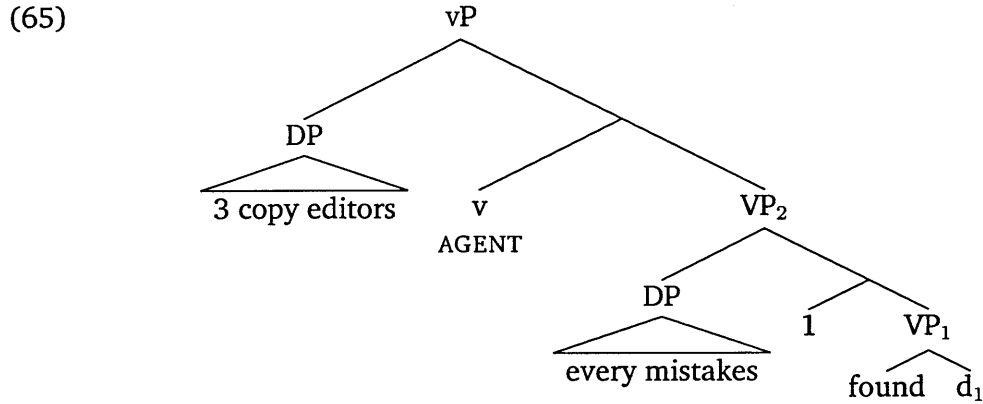
[5]What (64) does not entail however is that every copy editor took part in an event of finding some mistake. Indeed, nothing in (64) requires that e be an event of finding mistakes, provided that for every mistake y, e includes an event of finding y. As a consequence, (62) is predicted to be true in a context in which one copy editor found every mistake, and the two other copy editor had a nap. In that case, e is a complex event that includes sub-events of finding mistakes and sub-events of napping. The formalization in (1) addresses this issue. (1) adds the requirement that e be an event of finding mistakes –no more napping allowed.

(1) $[\![(62)]\!]^{M,w,g} = \exists e \exists x [\textbf{3-copy-editors}(w)(x) \wedge \textbf{agent}(e)(x) \forall y [\textbf{mistake}(w)(y)] \rightarrow \exists e'[e' \leq_m e \wedge$
$\textbf{find}(w)(e')(y)] \wedge \exists y [\textbf{mistakes}(w)(y) \wedge \textbf{find}(e)(y)]]$

I will ignore this refinement in the rest of the discussion, in order to keep the formulas simple.

[6]In order to derive the more complex truth-conditions discussed in the previous footnote, it suffices to adopt the following denotation for *every*:

(1) $[\![\textbf{every}]\!]^{M,w,c} = \lambda P_{\langle e,t \rangle} . \lambda Q_{\langle e,vt \rangle} \lambda e. \forall x [P(x)] \rightarrow \exists e'[e' \leq_m e \wedge Q(x)(e')] \wedge \exists x [P(x) \wedge Q(x)(e)]$

(66) $\llbracket \text{agent} \rrbracket^{M,w,c} = \lambda e.\lambda x.\mathbf{agent}(e)(x)$

(67) $\llbracket \text{every} \rrbracket^{M,w,c} = \lambda P_{\langle e,t\rangle}.\lambda Q_{\langle e,vt\rangle}\lambda e.\forall x[P(x)] \rightarrow \exists e'[e' \leq {}_m e \wedge Q(x)(e')]$

The derivation proceeds as follows. In order to combine the denotations of the agentive v head and the VP, a new rule of composition must be adopted, which identifies the event arguments of the VP and the v head. In order to obtain the truth-conditions in (64), one may assume default existential quantification of the vP denotation in (68).

(68) $\llbracket \text{found} \rrbracket^{M,w,c} = \lambda x.\lambda e.\mathbf{find}(w)(e)(x)$
$\llbracket \text{every mistake} \rrbracket^{M,w,c} = \lambda Q_{\langle e,vt\rangle}.\lambda e.\forall x[\mathbf{mistake}(w)(x)] \rightarrow \exists e'[e' \leq {}_m e \wedge Q(x)(e')]$
$\llbracket \text{VP}_2 \rrbracket^{M,w,c} = \lambda e.\forall x[\mathbf{mistake}(w)(x)] \rightarrow \exists e'[e' \leq {}_m e \wedge \mathbf{find}(w)(e')(x)]$
$\llbracket [\text{AGENT VP}_2] \rrbracket^{M,w,c} = \lambda y.\lambda e.\mathbf{agent}(e)(y) \wedge \forall x[\mathbf{mistake}(w)(x)]$
$\qquad\qquad\qquad\qquad \rightarrow \exists e'[e' \leq {}_m e \wedge \mathbf{find}(w)(e')(x)]$
$\llbracket 3 \text{ copy editors} \rrbracket^{M,w,c} = \lambda P_{\langle e,vt\rangle}.\lambda e.\exists x[\mathbf{3\ copy\ editors}(w)(x) \wedge P(x)(e)]$
$\llbracket \text{vP} \rrbracket^{M,w,c} = \lambda e.\exists y[\mathbf{3\ copy\ editors}(w)(y) \wedge \mathbf{agent}(e)(y) \wedge \forall x[\mathbf{mistake}(w)(x)]$
$\qquad\qquad\qquad\qquad \rightarrow \exists e'[e' \leq {}_m e \wedge \mathbf{find}(w)(e')(x)]]$

This analysis can be applied directly to temporal quantifiers. Consider sentence (69).

(69) On every Tuesday this month, I fasted.

(70)
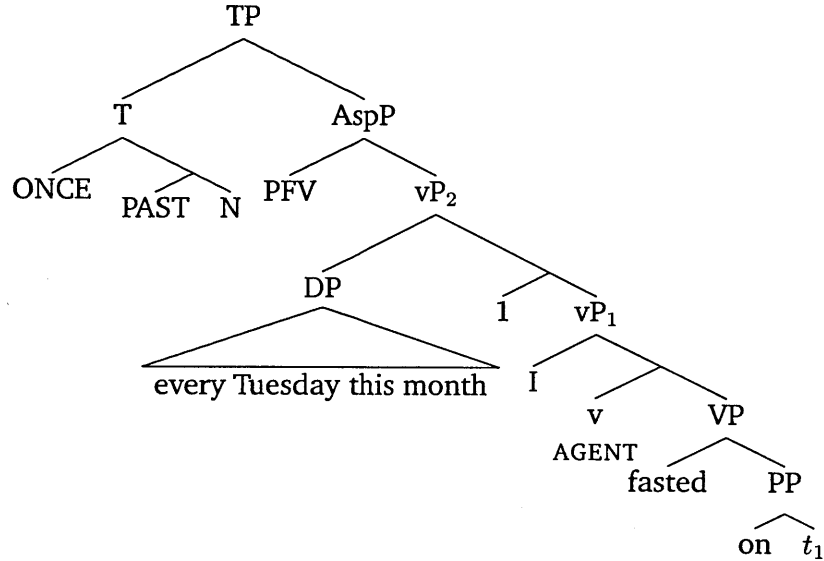
(71) $\llbracket \text{every Tuesday this month} \rrbracket^{M,w,c} =$
$\lambda Q_{\langle i,vt\rangle}.\lambda e.\forall t[\mathbf{Tuesday}(w)(t) \wedge t \subseteq \mathbf{this\ month}] \rightarrow \exists e'[e' \leq {}_m e \wedge Q(t)(e')]$
$\llbracket \text{vP}_1 \rrbracket^{M,w,c} = \lambda e.\mathbf{fast}(w)(e) \wedge \text{AGENT}(e)(\mathbf{I}) \wedge \tau(e) \subseteq g_c(t_1)$
$\llbracket \text{vP}_2 \rrbracket^{M,w,c} = \lambda e.\forall t'[\mathbf{Tuesday}(w)(t') \wedge t' \subseteq \mathbf{this\ month}]$
$\qquad\qquad \rightarrow \exists e'[e' \leq {}_m e \wedge \mathbf{fast}(w)(e') \wedge \text{AGENT}(e')(\mathbf{I}) \wedge \tau(e') \subseteq t']$
$\llbracket \text{AspP} \rrbracket^{M,w,c} = \lambda t.\exists e[\tau(e) \subseteq t \wedge \forall t'[\mathbf{Tuesday}(w)(t') \wedge t' \subseteq \mathbf{this\ month}]$
$\qquad\qquad \rightarrow \exists e'[e' \leq {}_m e \wedge \mathbf{fast}(w)(e') \wedge \text{AGENT}(e')(\mathbf{I}) \wedge \tau(e') \subseteq t']$
$\llbracket \text{TP} \rrbracket^{M,w,c} = \exists t[t < TU \wedge \exists e[\tau(e) \subseteq t \wedge \forall t'[\mathbf{Tuesday}(w)(t') \wedge t' \subseteq \mathbf{this\ month}]$
$\qquad\qquad \rightarrow \exists e'[e' \leq {}_m e \wedge \mathbf{fast}(w)(e') \wedge \text{AGENT}(e')(\mathbf{I}) \wedge \tau(e') \subseteq t']]]$

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According to this analysis, (69) is true iff there is a past time t that includes a plural event e, such that for every Tuesday in the month of utterance, there is a part of e that is an event of the speaker fasting and that is included in that Tuesday. These are the truth conditions that we attributed to this sentence in a non-presuppositional analysis of tense. There is however one important question to answer. If e is a plural event that consists of several events of fasting that occur on different Tuesday, what is the running time of e? In this case, the running time of each fasting by the speaker is a convex set of times, i.e. an interval. But the union of all these intervals is not convex: it has gaps in it. Following Ferreira (2005), I assume that natural language ontology includes both singular intervals, which are convex, and plural intervals, which may be convex or not. For any intervals t_1 and t_2 (singular or plural), we define the plural interval consisting of their sum $t_1 \oplus t_2$ as their set theoretic union. The notion of inclusion for intervals is redefined as follows:

(72) Inclusion for intervals:
An interval t_1 is included in an interval t_2 ($t_1 \subseteq t_2$) iff the left boundary of t_1 follows the left boundary of t_2 and the right boundary of t_1 precedes the right boundary of t_2.

In the rest of the dissertation, I will assume this revised analysis of temporal PPs. Let us now go back to the discussion of Sauerland's examples.

Sauerland Constructions (SCs) in the past tense Sauerland argues that a non-presuppositional analysis of (73) is incorrect (e.g. (71)), because it predicts that the sentence is false rather than infelicitous when uttered before the last Tuesday of the month:

(73) On every Tuesday this month, I fasted.

However, there is one obvious reason why one might not utter this sentence – under this parse– in such a context: it would be false, and knowingly so. Indeed, if the speaker and her addressee know on which day of the month the sentence is uttered, and it is part of the common ground that they know, the addressee should interpret (16) as a violation of the maxim of quality: do not say what you believe to be false. I claim that (16) is judged infelicitous when uttered before the last Tuesday of the month for this reason.

Note that if the speaker and her addressees do not know whether the last Tuesday of the month is in the past, and they all know that none of them know this, (16) is also predicted to be a violation of the maxim of quality: do not say that for which you lack adequate evidence. The reason is that, according to the analysis I proposed, (16) entails that all the Tuesdays in the month are (at least partly) in the past, and so in order to utter it with adequate evidence, the speaker must know that there is no Tuesday left in the month. It is not easy to see this with (16), because contexts in which the speaker doesn't know on how many Tuesdays in the month of utterance she fasted are not so natural. A different example will allow us to see

that this prediction is borne out. Consider (74), which is intended as a statement about the Major League Baseball season. We find that (74) is infelicitous if it is uttered before the last Monday of the season. Once again, the judgments are clearer in (75), where the domain of the universal quantifier is completely explicit. If the speaker and the addressee do not know whether all the Mondays of the season are in the past, and they both know that they don't know it, (74) is infelicitous, c.f. (76). As expected, the judgments are clearer in (77).

(74) On every Monday this season, there was no game.

(75) On each of the 24 Mondays during this season, there was no game.

(76) Context: It is Monday in the morning. A wants to watch a baseball game on TV that night, but he finds out that there is no game scheduled. Wondering whether the baseball season is over, he asks B:
A: Is the baseball season over?
B: ?I don't know, but on every Monday this season, there was no game.

(77) Context: It is Monday in the morning. A wants to watch a baseball game on TV that night, but he finds out that there is no game scheduled. Wondering whether the baseball season is over, he asks B:
A: Is the baseball season over?
B: ?I don't know, but on each of the 24 Mondays during this season, there was no game.

The only context in which (74) can be felicitously uttered are contexts in which the speaker believes that all the Mondays of the season are in the past. Of course, this belief needs not be shared by the addressee, as is shown by the acceptability of the following examples:

(78) Context: A noticed that John, a Baseball fan, is quite upset. He asks B:
A: Why is John so upset?
B: Because he can only watch MLB games on Monday nights, and on every Monday this season, there was no game.

(79) Context: A noticed that John, a Baseball fan, is quite upset. He asks B:
A: Why is John so upset?
B: Because he can only watch MLB games on Monday nights, and on each of the 24 Mondays of the season, there was no game.

In both dialogs, one infers from B's answer that all the Mondays in the MLB season are in the past. In the analysis I propose, this much is actually entailed by (78) and (79). What is important here is that B is felicitous even if A didn't know whether all the Mondays of the MLB season were in the past before she heard B's utterance. On the contrary, a presuppositional analysis of the past tense would predict that B's answer is a presupposition failure in such a context. However, one may still assume that the presupposition of B's utterance is accommodated, and as a consequence, I don't think that these examples provide a convincing objection to Sauerland's analysis.

Note that I have not given any argument against the presuppositional analysis of the past tense. I have only argued that the phenomenon that Sauerland (2002) describes as a case of projection of a temporal presupposition from the nuclear scope of a universal quantifier can be analyzed without invoking any presupposition. As a matter of fact, the analysis of present SCs that I propose in this chapter is compatible with a presuppositional analysis of the past tense.

SCs in the present tense are futurates   The analysis of present tense sentences is more delicate. First of all, I would like to draw the reader's attention on the contrast between (80) and (81):

(80)   *Right now, I fast.

(81)   On every Tuesday this month, I fast.

What is striking is that *fast* being an activity verb, it is unacceptable in the 'regular' present, as shown in (80). However, the use of the present tense with *fast* is completely natural in (81). I take this contrast to show that the tense/aspect combination of the two sentences are different. In particular, whatever analysis of the present tense that we adopt in (81) need not carry over to sentences like (80).

A second fact to observe is that SCs cannot be built with just any VP, and the restriction that these sentences impose on the choice of VP are strikingly similar to those of so-called futurates (see Copley 2002). Futurates are sentences with morphologically present VPs whose evaluation time can be a future time. It is generally agreed that futurates describe planned eventualities, which is shown by the fact that VPs that denote eventualities that are not easily understood as part of a plan cannot be used in this construction, as illustrated by the contrast between (82) and (83):

(82)   The Red Sox play the Yankees tomorrow.

(83)   #The Red Sox lose against the Yankees tomorrow.

(84) show that a VP that is acceptable in a SC such as (81) is also acceptable in a futurate. This is not surprising, since fasting is an activity that can be planned by the speaker. (85) and (86) show that a canonical futurate VP can be used in an SC, while a non-futurate VP cannot. An additional pair of examples is given in (87) and (88):

(84)   Tomorrow, I fast.

(85)   On every Tuesday this month, the Red Sox play the Yankees.

(86)   #On every Tuesday this month, the Red Sox lose against the Yankees.

(87)   #On every Tuesday this month, I miss my bus to Northampton.

(88)   #Tomorrow, I miss my bus to Northampton.

There is however a significant distinction between futurates as usually conceived and SCs in the present: futurates are usually taken to be future oriented, they describe a plan that will be realized in the future, or maybe more precisely a plan that is in its preparatory stage at the time of utterance. However, part of the plans that are described in SCs can precede the time of utterance. Indeed, although (81) describes a plan to fast on every Tuesday of the month, it can be uttered after the first Tuesday of fasting. Likewise, while (85) describes a plan for the Red Sox to play the Yankees on every Tuesday of the month, it can be uttered after the first game of the month. I take this to mean that the future orientation of futurates must be analyzed in a less direct way than was proposed in previous analyses. In the rest of this section, I will introduce Copley's (2002) analysis of futurates, and I will propose a modification of it that can account for the felicity conditions of present tense SCs.

5.3.3 Futurates

Copley on futurates One must distinguish progressive futurates such as (89), from non-progressive futurates such as (90):

(89)   The Red Sox are playing the Yankees tomorrow.

(90)   The Red Sox play the Yankees tomorrow.

Let us begin with progressive futurates. (89) conveys that there is a plan for the Red Sox to play against the Yankees tomorrow. In that case, the plan is made by whoever has the authority on scheduling baseball games between the Red Sox and the Yankees, namely the Major League Baseball. One might think then that what is going wrong with infelicitous futurates like (91) is that there is no plan behind the futurate, but this wouldn't be quite right. It might be that I have a plan for the Red Sox to lose against the Yankees tomorrow, and yet my utterance of (91) is not felicitous. The issue here is that the person who has the plan –the director of the plan– does not have the ability to realize it. Copley captures this idea by assuming that progressive futurates trigger a presupposition that the director of the plan has the ability to realize the plan that the futurate describes.

(91)   #The Red Sox are losing against the Yankees tomorrow.

This not enough however. Futurates also convey that the director of the plan is committed to the plan happening. One understands from (89) not only that someone is able to make a game between the Red Sox and the Yankees happen, but also that this someone wants the game to happen –and therefore that the game will happen in the normal course of events. The following examples show that this additional element of meaning is not a presupposition of progressive futurates, but an assertion. (92) questions the existence of a plan for the Red Sox to play the Yankees tomorrow, and (93) is understood as an assertion that there is no such plan.

(92)   Are the Red Sox playing the Yankees tomorrow?

(93) The Red Sox aren't playing the Yankees tomorrow.

Given the presupposition that the MLB has the ability to make the game happen, and the assertion that it is committed to make it happen, does it follow that the game will happen? Normally yes. But there might be some unforeseen events that could prevent the MLB from realizing their plan. In other words, the game should happen tomorrow, in all the worlds that follow 'the normal course of events'. One may therefore analyse the meaning of (89) as follows (this is an informal rendition of Copley's analysis):

(94) (89) is defined only if the MLB has the ability to make the Red Sox play against the Yankees tomorrow. If defined, (89) is true iff the Red Sox play the Yankee tomorrow in every world that is compatible with the normal course of events and in which the commitments of the MLB are as in the actual world.

Non-progressive futurates are essentially the same, except that the proposition that the director of the plan is committed to make it happen is presupposed rather than asserted. Indeed, (95) does not question that there is a plan for the Red Sox to play the Yankee, this is taken for granted. Rather, what is questioned is whether the plan will be realized tomorrow. Likewise, (96) does not assert that the plan doesn't exist, but only that it won't be realized tomorrow. This difference between progressive and non-progressive futurates also explains the contrast between sentences (97) and (98), uttered in a context in which the speaker is informing a friend of his marriage plans:

(95) Do the Red Sox play the Yankees tomorrow?

(96) The Red Sox don't play the Yankees tomorrow.

(97) Guess what? We're getting married in June.

(98) #Guess what? We get married in June.

It appears then that the information conveyed by the temporal adverbial is not part of the presuppositions of non-progressive futurates. Copley analyses (90) roughly as follows:

(99) (90) is defined only if the MLB has the ability to make the Red Sox play against the Yankee and is committed to that plan happening. If defined, (90) is true iff the Red Sox play the Yankee tomorrow in all worlds compatible with the normal course of events and in which the commitments of the MLB are as in the actual world..

From now on, I will only discuss progressive futurates, since I believe that the interpretation of present tense SCs is more like that of progressive than non-progressive futurates. In particular, (100) can be felicitously uttered in a context in which it is not taken for granted that the speaker is committed to fasting at some future time, and (101) can be used as an announcement that the Red Sox will play the Yankees every month during the baseball season:

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(100) (Guess what?) On every Tuesday this month, I fast.

(101) (Guess what?) On every month this season, the Red Sox play the Yankees.

This raises the question why there is no imperfective morphology in these constructions. One possible answer is that there is, but it is not visible. Indeed, the presence of temporal quantifiers with present activity or accomplishment sentences generally licenses a habitual reading, and habitual aspect has often been analyzed as a form of imperfective aspect (see in particular Ferreira 2005). (102) is an example of such a sentence, which is not a futurate. An analysis of this sentence along the lines of Ferreira (2005), modulo different assumptions about tense and a simplified analysis of universal quantifiers, would be as in (103). This formalization says that the time of utterance is included in the runtime of a plural event e such that for every morning t' in the running time of e, there is a part e' of e that is an event of John smoking a cigarette in t'. In order to generate these truth conditions, Ferreira posits two imperfective aspects, a singular one and plural one, see (104). Ferreira argues that habitual sentences can only be formed with the plural imperfective aspect. The reader is referred to Ferreira (2005) for a detailed exposition of these ideas.

(102) John smokes a cigarette every morning.

(103) $\exists t[t = TU \wedge \exists e[\text{PLURAL}(e) \wedge t \subseteq \tau(e) \wedge \forall t'[\mathbf{morning}(t') \wedge t' \subseteq \tau(e)] \rightarrow$
$\exists e' \exists x[e' \leq_m e \wedge \text{AGENT}(e')(\mathbf{John}) \wedge \mathbf{smoke}(w)(e')(x) \wedge \mathbf{cigarette}(w)(x) \wedge$
$\tau(e') \subseteq t']]]$

(104) $[\![\text{IMP}_{sg}]\!]^{M,w,c} = \lambda P_{\langle vt \rangle}.\lambda t.t \subseteq \tau(e) \wedge \text{SINGULAR}(e)$
$[\![\text{IMP}_{pl}]\!]^{M,w,c} = \lambda P_{\langle vt \rangle}.\lambda t.t \subseteq \tau(e) \wedge \text{PLURAL}(e)$

This would also explain why present SCs are degraded with overt imperfective morphology, as illustrated in (105). The same fact can be observed with habituals in (106) and may be explained by positing that the plural imperfective aspect is silent.

(105) ?On every Tuesday this month, I am fasting.

(106) *John is smoking a cigarette every morning.

All these considerations should not hide the more difficult question of the relation between perfective/imperfective aspect and the interpretation of futurates. Why is it that futurates that do not presuppose the existence of their plan combine with imperfective aspect? Why is it that futurates that do presuppose it are incompatible with imperfective aspect? Copley (2002) actually does not answer these questions. She proposes an analysis of progressive futurates that is compatible with the presence of imperfective aspect (and of non-progressive futurates with its absence), but the presence or absence of imperfective aspect does not predict the presence or absence of a presupposition that there is a plan. I will not improve on her analysis on this point, and this question will remain unanswered.

Copley's analysis At the core of Copley's analysis of futurates is a modal operator that we may call PLAN[7]. The following is a simplication of Copley's final definition of PLAN, which among other things leaves the notion of ability to realize a plan undefined:

(107) $[\![\text{PLAN}]\!]^{M,w,c}(d_e)(P_{\langle s,vt\rangle})(t_i)$ is defined only if at t in w, d has the ability to make $\lambda w.\exists e[\tau(e) > t \wedge P(w)(e)]$ true. If defined, $[\![\text{PLAN}]\!]^{M,w,c}(d_e)(P_{\langle v,it\rangle})(t_i)$ = 1 iff for every world w' that is metaphysically accessible from w and that is consistent with d's commitments at t in w, $\exists e[\tau(e) > t \wedge P(w')(e)]$.

Following Copley, this definition invokes quantification over worlds in a metaphysical modal base. A world w' is metaphysically accessible from w at a time t iff w and w' are factually identical, which means that w and w' have the same history until and including t. What (107) says then is that, if defined, $[\![\text{PLAN}]\!]^{M,w,c}(d_e)(P_{\langle s,vt\rangle})(t_i)$ is true iff in every realistic world in which d's commitments at t are the same as in w, there is a P event in the future of t. This definition captures the future orientation of futurates by building quantification over future times inside the meaning of PLAN. Let us see PLAN at work in one example. I assume that (89) is parsed as in (108). This LF follows the syntactic assumptions that I have adopted in this dissertation. I am going to ignore the contribution of aspect for the moment.

(108)
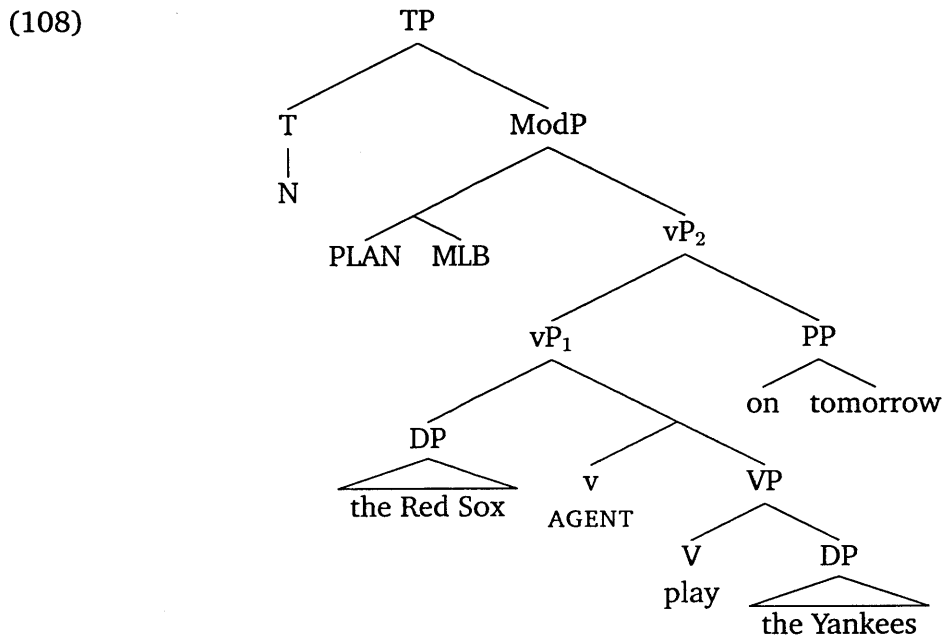
vP$_2$ denotes a property of events of the Red Sox playing the Yankees that are included in the day that follows the time of utterance. It combines with PLAN by functional intensional application. In (109), $\mathcal{M}(w)(w')(t)$ abbreviates "w' is metaphysically accessible from w at t" and $\mathcal{C}(d)(w)(w')(t)$ abbreviates "w' is consistent with d's commitments in w at t":

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[7]Copley first uses the name 'PLAN' for this operator, and then renames it 'ALL'. I think 'PLAN' makes more sense, so I will stick with it.

(109) $[\![vP_2]\!]^{M,w,c} = \lambda e.\mathbf{play}(w)(e)(\mathbf{Yankees}) \wedge \text{AGENT}(e)(\mathbf{Red~Sox}) \wedge \tau(e) \subseteq \mathbf{tomorrow}$

(110) $[\![TP]\!]^{M,w,c}$ is defined only if at TU in w, the MLB has the ability to make $\lambda w.\exists e[\tau(e) > t \wedge [\![VP]\!]^{M,w,c}(w)(e)]$ true.
If defined, $[\![TP]\!]^{M,w,c} = 1$ iff $\forall w'[\mathcal{M}(w)(w')(TU) \wedge \mathcal{C}(\mathbf{MLB})(w)(w')(TU)] \rightarrow$
$\exists e[\tau(e) > TU \wedge \mathbf{play}(w')(e)(\mathbf{Yankees}) \wedge \text{AGENT}(e)(\mathbf{Red~Sox}) \wedge \tau(e) \subseteq \mathbf{tomorrow}]$

$[\![108]\!]^{M,w,c}$ is defined only if the MLB has the ability to make the Red Sox play the Yankees tomorrow, and if defined, it is true iff in every world metaphysically accessible from w at TU that is consistent with the MLB commitments at TU in w, there is a event of the Red Sox playing the Yankees in the future of TU that is included in tomorrow.

The issue with present SCs This semantics captures the future orientation of futurates, but it would fail to predict the correct truth and felicity conditions for SCs in the present. Indeed, consider the following analysis of Sauerland's example, *on every Tuesday this month, I fast*:

(111)
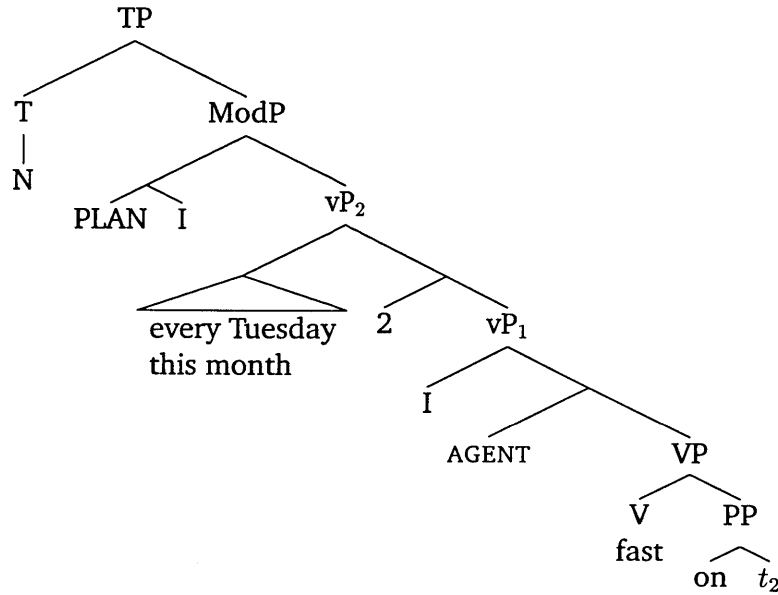
(112) $[\![TP]\!]^{M,w,c}$ is defined only if at TU in w, the speaker has the ability to make $\lambda w.\exists e[\tau(e) > TU \wedge [\![vP_2]\!]^{M,w,c}(w)(e)]$ true. If defined, $[\![TP]\!]^{M,w,c} = 1$ iff $\forall w'[\mathcal{M}(w)(w')(TU) \wedge \mathcal{C}(\mathbf{I})(w)(w')(TU)] \rightarrow \exists e[\tau(e) > TU \wedge \forall t[\mathbf{Tuesday}(t) \wedge t \subseteq \delta t'[\mathbf{month}(t')] \rightarrow \exists e'[e' \leq_m e \wedge \mathbf{fast}(w')(e') \wedge \text{AGENT}(e')(\mathbf{I}) \wedge \tau(e') \subseteq t]]$

I assume that the director of the plan is the speaker herself, so that the silent director argument of PLAN is a first person pronoun *I*. If defined, $[\![(111)]\!]^{M,w,c}$ is true iff in every world metaphysically accessible at TU from w that is consistent with the commitments of the speaker at TU in w, there is an event e that follows TU such that for every Tuesday t in the month of utterance, there is a part of e that is an event of the speaker fasting in t. These truth conditions make perfect sense,

but they are too strong: they predict that the sentence should be false in a context where some Tuesday of the month precedes TU, since there is then no future event whose running time includes every Tuesday of the month.[8]

It appears that building a future orientation directly in the semantics of futurates does not allow us to predict the correct truth and felicity conditions of present tense SCs, because it requires that the plan described by the sentence be completely in the future. I propose to solve that problem by getting rid of the future orientation altogether and adopting the following interpretation of PLAN:

(113) $[\![\text{PLAN}]\!]^{M,w,c}(d_e)(t_i)(P_{\langle s,vt \rangle})(t'_i)$ is defined only if at t' in w, d has the ability to make $\lambda w.\exists e[\tau(e) \subseteq t_i \wedge P(w)(e)]$ true.
If defined, $[\![\text{PLAN}]\!]^{M,w,c}(d_e)(t_i)(P_{\langle s,vt \rangle})(t'_i) = 1$ iff for every world w' that is metaphysically accessible from w and that is consistent with d's commitments at t' in w, $\exists e[\tau(e) \subseteq t_i \wedge P(w')(e)]$.

According to this definition, PLAN has two temporal argument. The most internal t is used as the evaluation time of the property denoted by the complement of PLAN. This argument is denoted by a free temporal pronoun in the LF, and must be a contextually salient time. The second argument t' is used as the time of perspective of the modal operators built in PLAN, and is bound by tense in the LF:

(114)
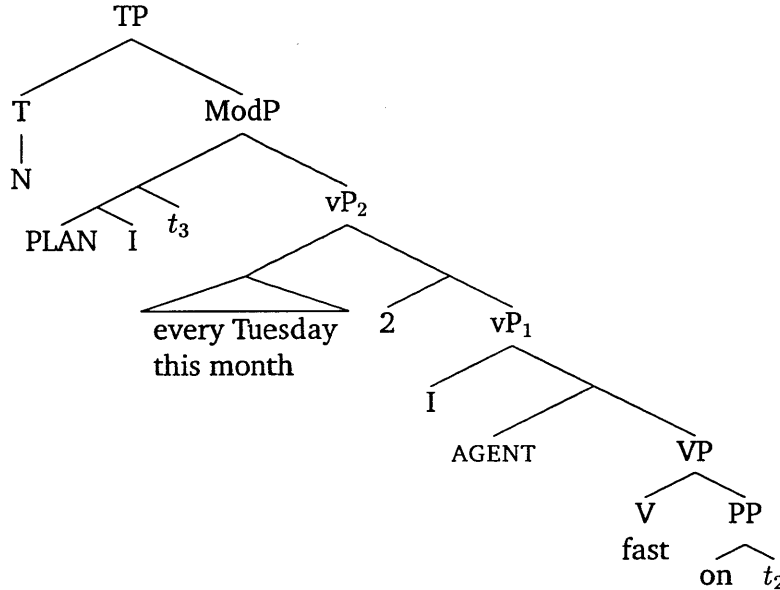
(115) $[\![\text{TP}]\!]^{M,w,c}$ is defined only if at TU in w, the speaker has the ability to make $\lambda w.\exists e[\tau(e) \subseteq g_c(t_3) \wedge [\![\text{vP}_2]\!]^{M,w,c}(w)(e)]$ true. If defined, $[\![\text{TP}]\!]^{M,w,c} = 1$ iff $\forall w'[\mathcal{M}(w)(w')(TU) \wedge \mathcal{C}(\mathbf{I})(w)(w')(TU)] \rightarrow \exists e[\tau(e) \subseteq g_c(t_3) \wedge \forall t[\textbf{Tuesday}(t) \wedge t \subseteq \delta t'[\textbf{month}(t')] \rightarrow \exists e'[e' \leq_m e \wedge \textbf{fast}(w')(e') \wedge \text{AGENT}(e')(\mathbf{I}) \wedge \tau(e') \subseteq t]]$

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[8]Actually, the sentence is probably predicted to be infelicitous in such a context, since the speaker doesn't have the ability to make the VP true at some future time, given that $[\![\text{vP}_2]\!]^{M,w,c}$ can't be true at a future time.

$[\![(114)]\!]^{M,w,c}$ is defined only if at TU in w, the speaker has the ability to make true the proposition that there is an event e such that for all Tuesday in the month of utterance, there is a part of e that is an event of the speaker fasting on that day, and e is included in $g(t_3)$. If defined, $[\![(114)]\!]^{M,w,c}$ is true iff in every world metaphysically accessible from w at TU that is consistent with the commitments of the speaker at TU in w, there is an event e such that for all Tuesday in the month of utterance, there is a part of e that is an event of the speaker fasting on that day, and e is included in $g(t_3)$.

These truth-conditions do not entail that every Tuesday of the month is in the future. This is good, but what price did we have to pay to achieve this result? At first sight, nothing in the definition of PLAN prevents us from using a past time frame adverbial inside a futurate, c.f. (116) and (117), and as far as (114) is concerned, we don't predict the infelicity of the sentence when uttered after the last Tuesday of the month. Or so it seems. I will now argue that the appropriate restrictions on the temporal orientation of futurates follow from general restriction on the use of metaphysical modality, following Condoravdi (2002).

(116)   *I fast yesterday.

(117)   *I am fasting yesterday.

A constraint on metaphysical modality   The modal *might* in (118) can be interpreted as a metaphysical modal. In this interpretation, (118) means that there was a time in the past at which the world could have evolved to a point where John won the game. This reading is the only one that is available in (119). Note that the time of perspective of the modal is in the past then: (118) interpreted metaphysically and (119) do not mean that there is now a possibility that John won the game at some past time, but rather that there was a past time at which it was (still) a possibility that John would win the game, even though he actually came to lose it. Condoravdi (2002) points out that the metaphysical interpretation of *might* in (118) cannot be obtained when the modal has a present perspective, in which case the only available reading is epistemic. Under this reading, (118) means that for all we know at the time of utterance, the actual world might be such that there is a past time at which John won the game.

(118)   John might have won the game.

(119)   At that point, John might still have won the game.

Why is it that the metaphysical reading of *might* is unavailable with a present perspective? It is of course conceivable that there are two lexical entries for *might*, one metaphysical and one epistemic, and that the differences follow from the lexical semantics of these operators. But Condoravdi proposes that the same modal operator is involved in each case, and that the sentences differ with respect to the

scope that a perfect operator takes with respect to the modal. (118) may be parsed either as (120) or as (121)[9]:

(120) [[ONCE [PRES N]] PERF [might [PFV [John won]]]

(121) [[ONCE [PRES N]] [might [PERF [PFV [John won]]]

Might is interpreted as follows. MB stands for the modal base of the modal, i.e. the set of worlds that are accessible from some world at some time. Its exact interpretation is left to context (modulo some temporal constraints that we are now discussing) and can be epistemic or metaphysical. $[\![might]\!]^{M,w,c}$ combines with an evaluation world w and a perspective time t and asserts that there is some world w' in the set MB of worlds accessible from w at t, such that P is true in w' at $[t,\_)$, where $[t,\_)$ denotes the interval that is bounded by t on the left (included) and that is not bounded on the right, i.e. the interval that stretches from t to infinity.

(122) $[\![might]\!]^{M,w,c} = \lambda P_{\langle s,it\rangle}.\lambda t.\exists w'[w' \in MB(w)(t) \wedge P(w')([t,\_))]$

The perfect and perfective aspects are interpreted as in (123) and (124), and so (120) and (121) are interpreted as in (125) and (126) respectively:

(123) $[\![PERF]\!]^{M,w,c} = \lambda P.\lambda t.\exists t'[t' < t \wedge P(t')]$

(124) $[\![PFV]\!]^{M,w,c} = \lambda P.\lambda t.\exists e[\tau(e) \subseteq t \wedge P(e)]$

(125) $[\![(120)]\!]^{M,w,c} = \exists t[t = TU \wedge \exists t'[t' < t \wedge \exists w'[w' \in MB(w)(t') \wedge \exists e[\tau(e) \subseteq [t',\_)$
$\wedge \textbf{win}(w')(e) \wedge \textsc{agent}(e)(\textbf{John})]]]]$

(126) $[\![(121)]\!]^{M,w,c} = \exists t[t = TU \wedge \exists w'[w' \in MB(w)(t) \wedge \exists t'[t' < [t,\_)$
$\wedge \exists e[\tau(e) \subseteq t' \wedge \textbf{win}(w')(e) \wedge \textsc{agent}(e)(\textbf{John})]]]]$

$[\![(120)]\!]^{M,w,c}$ is true iff there is a time t' in the past of TU such in that some world MB-accessible from w at t', John won at t' or in the future of it. This is the desired interpretation of (118) under the metaphysical reading of *might*[10]. $[\![(121)]\!]^{M,w,c}$ is true iff there is a world w' that is MB-accessible from w at TU and a time t'' before TU such that John won in w' at t''. This is the desired interpretation of (118) under the epistemic reading of *might*.

What we need to explain now is why MB cannot be a metaphysical modal base in (126) with the LF (121). Condoravdi's explanation depends on the notion of a proposition being settled at a certain time in a context set[11]. The definition of

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[9]Condoravdi does not represent the perfective aspect PFV in the LF but assumes that its effect are obtained by a special operator AT inside the denotation of the modal, which determines the aspectual interpretations of the complement of the modal depending on its *aktionsart*. In a way, grammatical aspect is lexicalized inside the modal operator, see Condoravdi (2002) for details.

[10]We probably want to say that the sentence is infelicitous if John won at t' itself under this reading. This is not taken care of by the truth conditions in (125) but by the general constraint on the interpretation of metaphysical modality that I am about to introduce.

[11]Condoravdi's initial definition of settledness applies to relations between times and worlds, rather than to propositions. I have recast it and the related diversity condition in terms of propositions to obtain more general notions that will be useful in the study of futurates. See Condoravdi (2002) for the original definitions

settledness invokes the auxiliary notion of worlds having the same history up to a time t: $w \simeq_t w'$ iff the histories of w and w' are identical up to and including t. We can now say that a proposition p is settled at a time t in a common ground CS iff in every world w of CS, p is true in w iff p is true in every world that has the same history as w up to and including t:

(127) A proposition p is settled at a time t in a context set CS iff:

For any world w in CS and any world w' such that $w \simeq_t w'$, $p(w) \leftrightarrow p(w')$

Let us illustrate this notion. The stative proposition *John had the flu*, interpreted as $\lambda w.\exists t[t < TU \wedge \textbf{have-flu}(w)(t)(\textbf{John})]$ is settled at the time of utterance in any context set CS. Indeed, we might not know whether John had the flu or not, but we know that for every world w in CS and every world w' that has the same history as w until TU, either *John had the flu* is true at TU in both w and w', or *John had the flu* is false at TU in both w and w', since the truth of the proposition only depends on facts in the past of TU and these facts are the same in w and w'. On the other hand, the proposition *John will have the flu*, interpreted as $\lambda w.\exists t[t > TU \wedge \textbf{have-flu}(w)(t)(\textbf{John})]$, is not settled in CS at TU. Indeed, for any world w in CS, there is a world w' that has the same history as w until TU, and such that *John will have the flu* has a different value in w and in w' at TU.

Condoravdi then proposes that the use of a metaphysical modal base is infelicitous if the proposition in the scope of the modal operator is settled in the context set at the time of perspective of the modal[12]. More precisely, the use of a metaphysical modal base MB with respect to a proposition p and a time of perspective t is subject to the following diversity condition:

(128) Diversity condition:

There is a world w in CS and worlds w', w'' in $MB(w)(t)$ such that $p(w') = 1$ and $p(w'') = 0$

This condition cannot be satisfied if p is settled in CS at t, since for every world w in CS and every worlds w', w'' that are metaphysically accessible from w at t, w and w' have the same history up to and including t, by the definition of metaphysical modality. This explains why MB cannot be metaphysical in (126): there, the perspective of the modal is TU but its complement P is such that $\lambda w.P(w)([TU, \_])$ is settled at TU, i.e. the proposition *that John won* is settled in CS at TU. We are now equipped to explain the future orientation of PLAN.

The source of the future in futurates Consider our revised definition of PLAN in (129). $[\![\text{PLAN}]\!]^{M,w,c}(d_e)(t_i)(P_{\langle s,it \rangle})(t'_i)$ asserts that $\lambda w.P(w)(t)$ is true in every world that is metaphysically accessible from w at t'. Therefore, if $\lambda w.P(w)(t)$ is settled at t', the use of PLAN violates the diversity condition, and since the use of a

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[12]Again, Condoravdi's original definition is not expressed in terms of propositions but in terms of relations between times and worlds.

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metaphysical modal base is wired down in the semantics of PLAN, the sentence is infelicitous:

(129) $[\![\text{PLAN}]\!]^{M,w,c}(d_e)(t_i)(P_{\langle s,vt \rangle})(t'_i)$ is defined only if at t' in w, d has the ability to make $\lambda w.\exists e[\tau(e) \subseteq t \wedge P(w)(e)]$ true.
If defined, $[\![\text{PLAN}]\!]^{M,w,c}(d_e)(t_i)(P_{\langle s,vt \rangle})(t'_i) = 1$ iff for every world w' that is metaphysically accessible from w and that is consistent with d's commitments at t' in w, $\exists e[\tau(e) \subseteq t \wedge P(w')(e)]$.

This predicts that the futurate is infelicitous if the truth of $\lambda w.\exists e[\tau(e) \subseteq t \wedge P(w)(e)]$ only depends on facts in the past of the modal's perspective time t'. As we will see, this is enough to predict the future orientation of futurates and by the same device, to explain the infelicity of present tense SCs. Consider first a bad futurate with a past tense frame adverbial, such as (130):

(130) *John is fasting yesterday.

(131)
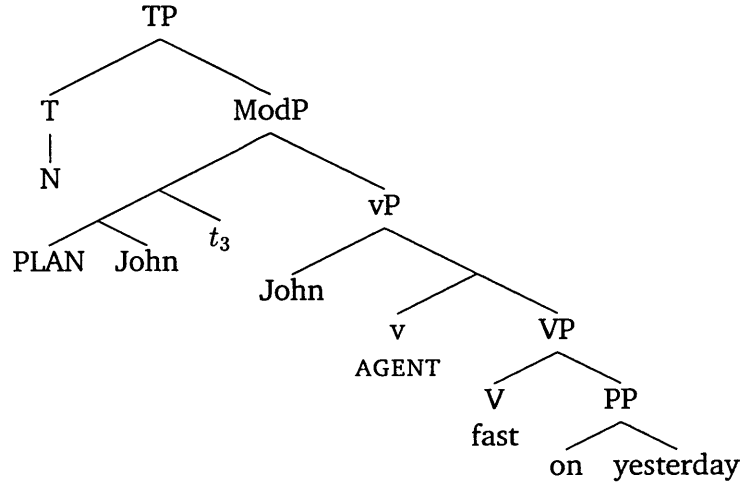
(132) $[\![\text{TP}]\!]^{M,w,c}$ is defined only if at TU in w, John has the ability to make $\lambda w.\exists e[\tau(e) \subseteq g_c(t_3) \wedge [\![\text{vP}]\!]^{M,w,c)}(w)(e)]$ true. If defined, $[\![\text{TP}]\!]^{M,w,c} = 1$ iff $\forall w'[\mathcal{M}(w)(w')(TU) \wedge \mathcal{C}(\mathbf{I})(w)(w')(TU)] \rightarrow \exists e[\tau(e) \subseteq g_c(t_3) \wedge \text{AGENT}(e)(\textbf{John}) \wedge \textbf{fast}(w')(e) \wedge \tau(e) \subseteq \textbf{yesterday}]]$

Note that the use of *yesterday* in (130) is not directly contradictory with the use of the present tense, since TU is not asserted to be part of yesterday. The issue with (130) is that the proposition $\lambda w.\exists e[\tau(e) \subseteq g_c(t_3) \wedge \text{AGENT}(e)(\textbf{John}) \wedge \textbf{fast}(w)(e) \wedge \tau(e) \subseteq \textbf{yesterday}]$ is settled in CS at TU for any value of t_3. Indeed, if t_3 includes the time of John fasting yesterday, then the proposition is true in some worlds but its truth only depends on facts that precede TU (here I am assuming that yesterday is indexical and mean 'the day before TU'). If t_3 does not include the time of John fasting yesterday, then the proposition is false in any world and therefore it is trivially settled in CS at TU.

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Let us now consider an example in which we do not use an overt frame adverbial, and see what predictions we make. If it is analyzed as a futurate as in (134), (133) is interpreted as in (135):

(133)   John is fasting.

(134)

```
                              TP
                            /    \
                          T       ModP
                          |      /    \
                          N    /    \    vP
                             /    \  t₃  / \
                          PLAN  John   John  \
                                            /   \
                                           v     VP
                                        AGENT   fast
```

(134)

$$
\begin{array}{c}
\text{TP} \\
\begin{array}{cc}
\text{T} & \text{ModP} \\
| & \\
\text{N} &
\end{array}
\end{array}
$$
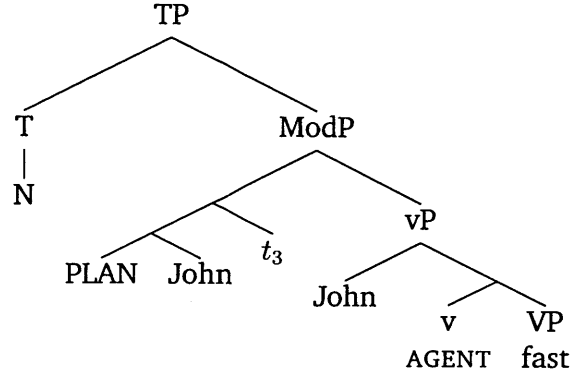
(135) $[\![\text{TP}]\!]^{M,w,c}$ is defined only if at TU in w, John has the ability to make
$\lambda w.\exists e[\tau(e) \subseteq g_c(t_3) \wedge [\![\text{vP}]\!]^{M,w,c})(w)(e)]$ true. If defined, $[\![\text{TP}]\!]^{M,w,c} = 1$ iff
$\forall w'[\mathcal{M}(w)(w')(TU) \wedge \mathcal{C}(\mathbf{I})(w)(w')(TU)] \rightarrow \exists e[\tau(e) \subseteq g_c(t_3) \wedge \text{AGENT}(e)(\mathbf{John})$
$\wedge \mathbf{fast}(w')(e)]]$

The sentence is felicitous only if $\lambda w.\exists e \ [\tau(e) \subseteq g_c(t_3) \wedge \text{AGENT}(e)(\mathbf{John}) \wedge$
$\mathbf{fast}(w)(e)]$ is not settled in CS at TU, i.e. only if $g_c(t_3)$ does not precede TU. In particular, the sentence is felicitous if $g_c(t_3)$ is in the future TU. The sentence is also predicted to be felicitous if TU is included in $g_c(t_3)$ but $g_c(t_3)$ extends in the future of TU. I'm not sure whether this is a desirable result or not. Presumably, in this context the sentence is indistinguishable from a simple progressive sentence.

Finally, we can account for the felicity conditions of present tense SCs. (136) is felicitous only if the proposition $\lambda w.\exists e[\tau(e) \subseteq g_c(t_3) \wedge \forall t'[\mathbf{Tuesday}(t') \wedge t' \subseteq \delta t[\mathbf{month}(t)] \rightarrow \exists e'[e' \leq_m e \wedge \mathbf{fast}(w)(e') \wedge \text{AGENT}(e')(\mathbf{I}) \wedge \tau(e') \subseteq t']]$ is not settled in CS at TU. There are three cases to consider. If all the Tuesdays in the month of utterance are in the past of TU and are included in $g_c(t_3)$, then the proposition is settled in CS at TU, no matter whether g_3 extends beyond TU or not. If all the Tuesdays in the month of utterance are included in $g_c(t_3)$ but at least one of these Tuesdays is not in the past of TU, then the proposition is not settled in CS at TU, since the issue whether the speaker fasts or not on that Tuesday is not settled then. Finally, if some Tuesday in the month of utterance is not included in $g_c(t_3)$, then the proposition is false in any world and therefore it is trivially settled in CS at TU. Hence, we predict that the sentence can be felicitously uttered until and including the last Tuesday of the month of utterance. This solves Sauerland's problem.

(136)   On every Tuesday this month, I fast.

(137)

```
                    TP
                 ╱      ╲
                T        ModP
                |      ╱      ╲
                N   ╱    ╲      vP₂
              PLAN  I   t₃   ╱      ╲
                  ╱  ╲      every Tuesday   2   vP₁
                         this month      ╱      ╲
                                        I      ╱    ╲
                                     AGENT        VP
                                              ╱      ╲
                                             V        PP
                                           fast      ╱  ╲
                                                    on   t₂
```
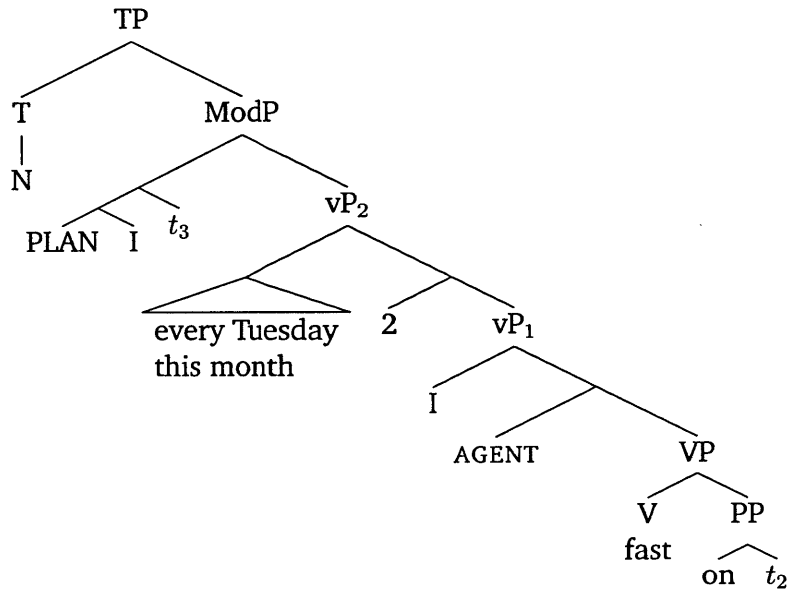
(138) $[\![\text{TP}]\!]^{M,w,c}$ is defined only if at TU in w, the speaker has the ability to make $\lambda w.\exists e[\tau(e) \subseteq g_c(t_3) \wedge [\![vP_2]\!]^{M,w,c}(w)(e)]$ true. If defined, $[\![\text{TP}]\!]^{M,w,c} = 1$ iff $\forall w'[\mathcal{M}(w)(w')(TU) \wedge \mathcal{C}(\mathbf{I})(w)(w')(TU)] \rightarrow \exists e[\tau(e) \subseteq g_c(t_3) \wedge \forall t[\mathbf{Tuesday}(t) \wedge t \subseteq \delta t'[\mathbf{month}(t')] \rightarrow \exists e'[e' \leq_m e \wedge \mathbf{fast}(w')(e') \wedge \text{AGENT}(e')(\mathbf{I}) \wedge \tau(e') \subseteq t]]$

Chapter 6

Overview of clausal tense in Mbyá

In this chapter, I give a short overview of aspects of Mbyá grammar that are relevant to this dissertation, and I describe the temporal interpretation of bare verbs (verbs without temporal morphology) and of the temporal morphemes -*kue* and -*rã* in their clausal uses, i.e. in the extended VP, as opposed to their uses in the extended NP. The focus of the chapter is descriptive. A detailed compositional analysis of clausal tense will be proposed in chapter 7.

6.1 A few aspects of Mbyá grammar

Agreement Mbyá verbs are inflected for person and number. The agreement morphology is prefixed to the verb root. Two paradigms are in use, which I will call A and B. Some prefixes have different forms depending on their nasal status; for instance, the oral 2nd person singular B prefix is *nde-*, and its nasal allomorph is *ne-*. This alternation is indicated by the symbol ∼ in the following table. In addition, the B paradigm is broken in two subparadigms that differ in the presence or absence of a thematic /r/ phoneme between the agreement prefix and the root, and also in the form of the third person prefix. Following Dooley (2006), I name these subparadigms ∅ and -r. The 3rd person suffixes of each B paradigm have different allomorphs, independently of their nasal status. This alternation is indicated by the symbol / in the table. The two paradigms mark a difference between first person plural inclusive (*incl.*) and exclusive (*excl.*).

(1) Paradigms of agreement prefixes:

	Class A	Class B, ∅	Class B, -r
1st sing.	a-	Che-	Che-r-
2nd sing.	(e)re-	nde- ∼ ne-	nde-r- ∼ ne-r-
1st pl. incl.	ja- ∼ ña-	ñande- ∼ ñane-	ñande-r- ∼ ñane-r-
1st pl. excl.	(o)ro-	ore-	ore-r-
2nd. pl.	pe-	pende- ∼ pene-	pende-r- ∼ pene-r-
3rd sing. or pl.	o-	i- / ij- ∼ iñ-	∅ / h-

Only one marker of agreement (class A or B) is realized on a verb. The choice of marker follows an active/inactive pattern. Intransitive verbs are specified A or B lexically: A for active, B for inactive verbs. Transitive verbs alternate between A or B marking using a person hierarchy: the A paradigm is used to mark agreement with subjects, the B paradigm is used to mark agreement with objects, and as a rule, the verb agrees with the highest of the subject or the object on the following person hierarchy: 1st person > 2nd person > 3rd person. For instance, a transitive verb with a 2nd person subject and a 1st person object agrees with its object, while a transitive verb with a 2nd person subject and a 3rd person object agrees with its subject. The portmanteaux prefix *ro-* is used for transitive verbs with a 1st person subject and a 2nd person object.

In the glosses, I will not indicate the difference between the two B subparadigms. Prefixes will be glossed by a letter A or B for their paradigm, followed by a number for their person and a code SG for singular and PL for plural, except for the third person where number is not marked.

Additional verb morphology The Mbyá verb has a rich system of prefixes and suffixes, as well as clitics. Apart from agreement markers, prefixes include morphemes that reflect valency changing operations (such as reflexivization and causativization), which are systematically ordered after person agreement, and markers of mood (imperative and optative). The system of suffixes and post-clitics is richer. It includes (the list is not exhaustive) adverbs, markers of aspect and modality, and operators that in English would be expressed as control verbs.

The scope relations between these suffixes/clitics is determined by their ordering, where a suffix/clitic that occurs to the right of another takes scope over it. This is easiest to see with negation, which is a circumfix, the position of its suffix part marking its scope. The following pair of examples from Dooley (2006)[1] illustrates this, where the adverb *ranhe* is interpreted as *still* out of the scope of negation, and *yet* in its scope:

(2) Nd-a'eve-i   ranhe.
     NEG-possible-NEG still
     'It is still impossible'   (Dooley 2006)

(3) Nd-a'eve   ranhe-i.
     NEG-possible still-NEG
     'It is not yet possible'   (Dooley 2006)

Relative clauses The particle *va'e* combines with a clause to form a DP that denotes some participant of the event described by the verb. I argue that these constructions are relative clauses.

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[1]The spelling of this example is the one adopted by Dooley, characteristic of Mbyá in Brazil.

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(4) A-echa   ava i-puku va'e.
     A1SG-see man B3-tall REL

     'I saw the tall man.'

There is evidence from differential object marking that the semantic 'head' of the relative clause can be external to it. In (5), the DP *peteĩ jurua* (a non indigenous person, lit. 'hairy mouth') is followed by the particle *pe*, which marks human objects as opposed to animal and inanimate objects. Since different object marking can only be controlled by the matrix verb in this example, this suggest that *jurua* is its complement and therefore an external head:

(5) A-ikuaa   peteĩ jurua pe i-puku va'e.
     A1SG-know one jurua OBJ B3-tall REL

     'I know one jurua who is tall.'

A second kind of evidence for an external head comes from N-word licensing. The N-word *mava'eve* ('nobody') is licensed by a negation on the verb of which it is an argument. The following pair of examples show that an N-word can be the head of a relative clause only if the matrix verb is negated, while negation inside the relative clause doesn't license it:

(6) Nd-a-echa-i   mava'eve (pe) i-puku va'e.
     NEG-A1SG-see-NEG nobody   OBJ B3-tall REL

     'I didn't see anybody who is tall.'

(7) *A-echa   mava'eve (pe) nda-i-puku-i   va'e.
     A1SG-see nobody   OBJ NEG-B3-tall-NEG REL

     'I didn't see anybody who is tall.'

Finally, relative clauses with *va'e* are subject to relative clause island constraints, as illustrated in the following example:

(8) *A-jogua ajaka Juan o-ayvu   kuña   pe o-japo   va'e-kue.
     A1SG-buy basket Juan A3-know woman OBJ A3-make REL-KUE

     '*I bought the basket that Juan knows the woman who made'

I conclude that *va'e* is used to mark the formation of head external relative clauses. It is less clear what the category of *va'e* itself is. It is not plausible that *va'e* is a relative pronoun: there is a paradigm of indefinite and interrogative pronoun that is morphologically distinct from *va'e*, and its position in the right periphery of the verb suggests that it is a functional head more than a lexical one (arguments never appear in the string of suffixes and clitics of the verb). Furthermore, the position of arguments in a sentence is to a great extent free in Mbyá, while the position of *va'e* is always at the end of the string of suffixes and clitics of the verb of the relative clause.

I propose that *va'e* is a functional head that tops the spinal clause of the relative clause, much like a C head, but that it has nominal categorial features. The motivation of this last claim is that the temporal morphemes *-kue* (past) and *-rã* (future) can occur on *va'e*. These morphemes are attested on NPs and on relative clauses but never on verbs, except with the intermediation of *va'e*, which can be used in matrix clauses as a support for *-kue* and *-rã* without relativization (see next section). Note that in this context, the use of *va'e* without *-kue* or *-rã* is ungrammatical:

(9) O-ky   va'e-kue.
     A3-rain REL-KUE
     'It rained.'

(10) O-ky   va'e-rã.
     A3-rain REL-RA
     'It will rain.'

(11) *O-ky   va'e.
     A3-rain REL

The impossibility to use *-kue* and *-rã* on verbs is explained if these suffixes are constrained to attach to an expression that has nominal features. The use of *va'e* in matrix clauses as a support for *-kue* and *-rã* without relativization appears to be a morphological 'rescue strategy', where an uninterpreted expression of the right category is inserted in the syntactic representation to support tense, not unlike *do*-support in English.

Complement clauses and nominalization   Clausal complements of verbs and of post-positions must be suffixed with *-a*. Following Dooley, I argue that *-a* is a nominalizer (glossed NLZ).

(12) Juan o-ikuaa oo   o-kai-a.
     Juan A3-know house A3-burn-NLZ
     'Juan knows that the house burned.'

(13) Ndee re-ke-a   jave a-mba'eapo.
     You B2SG-sleep-NLZ while A1SG-worked.
     'While you were sleeping, I was working.'   (Dooley 2006)

Dooley (2006) describes *-a* as a nominalizer for a variety of reasons. First, the same suffix is used to form oblique nominalizations, for instance locative nominalizations as in (14), and also agent nominalizations, as in (15).

(14) A-a-ta   che-ru   o-mano-a.
     A1SG-go-TA my-father A3-die-NLZ
     'I am going where my father died.'   (Dooley 2006)

(15) A-iko   porombo'ea escuela py.
     A1SG-be teacher   school in.
     'I am a teacher at school.'

Secondly, the suffixes *-kue* and *-rã* are only attested on complement clauses formed with *-a*, which suggests that *-a* is of category N.

6.2 On the temporal interpretation of matrix clauses

6.2.1 Default assumptions about tense

In describing the truth-conditions of sentences as they relate to tense, I adopt the null hypothesis that tense relates the evaluation time of the extended projection of a predicate to another time, which in matrix clauses usually is the time of utterance, TU. By 'extended projection of a predicate', I mean either the Aspect Phrase that extends a non-stative VP, or a stative predicate (which might be verbal or not) without grammatical aspect. I adopt, once again as a null hypothesis, Klein's (1994) analysis[2] of the division of labor between grammatical aspect and predicates (VPs and non-verbal predicates alike): a non-stative VP denotes a property of events, which aspect maps to a property of times. Tense relates a time that satisfies this property to TU or to some other time. Stative predicates (verbal or not) denote properties of times and relate to tense without the intermediation of grammatical aspect. In informal descriptions of the temporal interpretation of sentences, I will say that the reference time of a clause precedes, follows or is otherwise related to another time, usually TU. I must warn the reader that 'reference time' in this sense is not supposed to be interpreted as Reichenbach's (1947) Reference Time (with capital letters), but only as the evaluation time of the extended predicate of a clause, i.e. the evaluation time of an Aspect Phrase or of an aspect-less stative predicate. In particular, Reichenbach's Reference Time is a contextually specified salient time. By contrast, I make no claim that the 'reference time' of the sentences I describe is contextually specified or more generally referentially provided rather than quantified over. It is just the time of evaluation of the extended predicate of a clause. Whether it is a contextually salient time or not is an empirical question that has to be determined *a posteriori*.

6.2.2 Bare verbs in matrix clauses

The reference time of mono-clausal sentences with bare verbs is located in the past or in the present of TU. A first piece of evidence of this is that they can only be used to answer questions about a past or a present time:

(16) Q: Mba'e pa re-japo   kuee   ka'aru?
         what Q A2SG-do yesterday afternoon
         'What did you do yesterday afternoon?'

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[2]And its formalization by Kratzer (1998), which is implicit in this chapter.

A: A-mba'apo.
A1SG-work
'I worked.'

(17) Q: Mba'e pa re-japo   agỹi?
       what Q A2SG-do right.now
       'What are you doing right now?'

    A: A-mba'apo.
       A1SG-work
       'I am working.'

Questions about future times cannot be felicitously answered with bare verbs:

(18) Q: Mba'e pa re-japo-ta   ko'erã?
       what Q A2SG-do-PROS tomorrow
       'What are you going to do tomorrow?'

    A: *A-mba'apo.
       A1SG-work-TA
       Intended: 'I am going to work.'

That the reference time of bare verbs in mono-clausal sentences must not follow the time of utterance is confirmed by the fact that such sentences are only compatible with past or present frame adverbials:

(19) Juan i-ñembyayi agỹi/kuee/*ko'erã
      Juan B3-hungry now/yesterday/tomorrow
      'Juan is/was hungry now/yesterday/*tomorrow'

(20) Juan o-mba'apo agỹi/kuee/*ko'erã
      Juan A3-work   now/yesterday/*ko'erã
      'Juan is/was working now/yesterday/*tomorrow'

The reader will have noticed that sentences (19) and (20) were translated freely using perfective or imperfective aspect. There is no overt realization of perfective and imperfective aspects in Mbyá. Both aspectual interpretations of bare verbs are possible, as illustrated by the following examples:

(21) Q: Mba'e-pa re-japo   kuee   Maria o-vaẽ   ramo?
         what-Q   A2SG-do yesterday Maria A3-arrive DS
         'What where you doing yesterday when Maria arrived?'

      A: A-mba'apo.
         A1SG-work

         'I was working.' [True if the speaker was already working when Maria arrived]

(22) Q: Mba'ere tu ne-kane'õ?
      why   Q B2SG-tired
      'Why are you tired?'

      A: A-mba'apo vaipa kuee.
      A1SG-work a.lot yesterday
      '(Because) I worked a lot yesterday.'

We might wonder whether the reference time of bare verbs in matrix clauses has to be anaphorically supplied or not. In order to clarify this point, consider the difference between the German simple past and present perfect. Kratzer (1998) notes that the use of the past tense is infelicitous in (23), in a context where you are merely looking at a churches in Italy, and there is no previous discourse that provides a salient past time to which the past tense could be anchored. By contrast, the use of the present perfect in (24) is felicitous in this context:

(23) *Wer baute diese Kirche? Borromini baute diese Kirche.
       'Who built this church? Borromini built this church.'

(24) Wer hat diese Kirche gebaut? Borromini hat diese Kirche gebaut.
       'Who has this church built? Borromini has this church built.'

Kratzer remarks that this expected if the German simple past is anaphoric: the past tense is interpreted as a pronoun that refers to a contextually salient past time. In the absence of an appropriate antecedent, its reference cannot be determined. On the other hand, the present perfect in (24) can introduce a past time on its own.

Coming back to Mbyá, the following example shows that bare verbs in Mbyá can introduce a past reference time without a salient antecedent:

(25) Context: Germino is visiting Cirilo's village. Germino points to a house and asks Cirilo:

      Q: Mava'e pa o-japo   kova'e oo?
         Who   Q A3-make that   house
         'Who built that house?'

      A: Juan o-japo.
         Juan A3-make
         'Juan built it.'

There is no salient past time that could serve as an antecedent of the reference time in (25). Rather, the question and its answer each introduce their own reference time existentially. The following example makes the same point: there is no salient past time to serve as an antecedent for the topic time of A, yet the past tense interpretation of the bare verb is felicitous:

(26) Context: Aureliano arrives at Cirilo's house. Noticing that Cirilo is absent, he asks Cirilo's wife:

Q: Mamo pa Cirilo?
　 where Q Cirilo

'Where is Cirilo?'

A: O-o　Posadas py.
　 A3-go Posadas to

'He went to Posadas.'

6.2.3　Matrix uses of *va'ekue*

Although bare verbs are freely interpreted with respect to a past or a present reference time, the morphemes *-kue* and *-rã* can be used in matrix clauses to force a past or a future interpretation, respectively. However, these morphemes cannot be used in matrix clauses without the support of the relativizer *va'e*. Despite this fact, there is no evidence that *va'e* affects the syntactic or semantic interpretation of matrix clauses when it is used to support *-kue* and *-rã*. I will therefore assume that *va'e* is introduced as an uninterpreted morphological support for these morphemes, which may be compared to *do*-support of tenses in English, except that in Mybá the particle that supports tense is nominal (a relativizer) rather than verbal.

The following examples show that mono-clausal sentences whose verb is modified by *va'ekue* have a past reference time. These sentences cannot be used to answer questions about present or future times:

(27)　Q: Mba'e pa re-japo　kuee　　　ka'aru?
　　　　 what　Q　A2SG-do yesterday afternoon

'What did you do yesterday afternoon?'

A: A-mba'apo　va'e-kue.
　 A1SG-work REL-KUE

'I worked.'

(28)　Q: Mba'e pa re-japo　agỹ'i?
　　　　 what　Q　A2SG-do right.now

'What are you doing right now?'

A: *A-mba'apo va'e-kue.
　 A1SG-work REL-KUE

Intended: 'I am working.'

(29)　Q: Mba'e pa re-japo-ta　ko'erã?
　　　　 what　Q　A2SG-PROS tomorrow

'What are you going to do tomorrow?'

A: *A-mba'apo va'e-kue.
　 A1SG-work REL-KUE

Intended: 'I am going to work.'

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Moreover, a matrix verb modified by *va'ekue* cannot be modified by present of future frame adverbials:

(30)   Juan o-mba'apo va'e-kue kuee/*agỹi/*ko'erã
       Juan A3-work   REL-KUE yesterday/now/tomorrow
       'Juan was working/worked yesterday/*now/*tomorrow'

Like matrix bare verbs, verbs modified by *va'ekue* are also compatible with perfective or imperfective aspect, as the following examples illustrate:

(31)   Q: Mba'e-pa re-japo   kuee   Maria o-vaẽ   ramo?
          what-Q   A2SG-do yesterday Maria A3-arrive DS
          'What where you doing yesterday when Maria arrived?'

       A: A-mba'apo va'e-kue.
          A1SG-work REL-KUE

          'I was working.' [True if the speaker was already working when Maria arrived]

(32)   Q: Mba'ere tu ne-kane'õ?
          why   Q B2SG-tired
          'Why are you tired?'

       A: A-mba'apo va'e-kue vaipa kuee.
          A1SG-work REL-KUE a.lot yesterday
          '(Because) I worked a lot yesterday.'

The next example illustrates that the use of *va'ekue* does not entail that the eventuality described by the VP is over by the reference time:

(33)   Context: said in the afternoon:

       Juan o-mba'apo va'e-kue pyareve, ha'e o-mba'apo teri agỹi.
       Juan A3-work   REL-KUE morning and A3-work   still now.

       'Juan was working this morning, and he is still working now.'

Finally, the reference time of sentences with *va'ekue* does not have to be anaphoric to a contextually specified salient time, but can be existentially quantified:

(34)   Context: Germino is visiting Cirilo's village. Germino points to a house and asks Cirilo:

       Q: Mava'e pa o-japo   va'e-kue kova'e oo?
          Who   Q A3-make REL-RA that   house
          'Who built that house?'

       A: Juan o-japo   va'e-kue.
          Juan A3-make REL-RA
          'Juan built it.'

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(35) Context: Aureliano arrives at Cirilo's house. Noticing that Cirilo is absent, he asks Cirilo's wife:

    Q: Mamo pa Cirilo?
       where Q Cirilo

      'Where is Cirilo?'

    A: O-o   va'e-kue Posadas py.
       A3-go Posadas to

      'He went to Posadas.'

6.2.4 Matrix uses of *va'erã*

Let us now discuss matrix uses of *va'erã*. Mono-clausal sentences with *va'erã* can be used to answer questions about future times, but not questions about past times:

(36) Q: Mba'e pa re-japo-ta   ko'erã?
      what Q A2SG-PROS tomorrow

      'What are you going to do tomorrow?'

    A: A-mba'apo va'e-rã.
      A1SG-work REL-RA

      'I will work.'

(37) Q: Mba'e pa re-japo kuee   ka'aru?
      what Q A2SG-do yesterday afternoon

      'What did you do yesterday afternoon?'

    A: *A-mba'apo   va'e-rã.
      A1SG-work-TA REL-RA

      Intended: 'I worked.'

Whether sentences with *va'erã* can answer questions about present times is less clear. The use of *va'erã* is slightly degraded in (38). One informant made a relevant comment about (38)[3]: 'it is good, but with another meaning, it means that I have to work now'. This suggests that (38) is degraded because the answer does not address the question directly. While the question is a request to provide information about the activity that the speaker is actually engaged in at the time of utterance, the answer provides information about the activities that the speaker is obliged to engage in at that time.

(38) Q: Mba'e pa re-japo agỹ'i?
      what Q A2SG-do right.now

      'What are you doing right now?'

    A: ? A-mba'apo va'e-rã.
      A1SG-work REL-RA

      'I have to work.'

---

[3]The elicitation was done in Spanish, as were the informants' comments.

The paradigm in (36) to (38) suggests that while the use of *va'erã* with a future reference time is compatible with a non-modal interpretation, its use with a present reference time forces a deontic interpretation. This suspicion is confirmed by the use of frame adverbials. When asked to translate (39) with a future frame adverbial, informants provide a non-modal translation in Spanish. However, they provide a modal translation for the sentence with a present frame adverbial in (40):

(39) A: A-mba'apo va'e-rã ko'erã/*kuee.
   A1SG-work REL-RA tomorrow/yesterday
   'I will work tomorrow/*yesterday.'

(40) A: A-mba'apo va'e-rã agỹi.
   A1SG-work REL-RA right.now
   'Right now, I have to work.'

The following sentences from Mbyá narratives further illustrate deontic uses of *va'erã*:

(41) Guavira ña-moatachi   va'e-rã ja-'u   aguã.
   guavira A1.PL.INC-fumigate REL-RA A1.PL.INC-eat PURP
   'Guavira must be fumigated before they are eaten'   (Cadogan 1959)

(42) Ñande ru tenonde gua re ne-ma'endu'a va'e-rã.
   A1.PL.INCL father first NLZ RE A2.SG-obey REL-RA.

   'You must obey the commandments of our first father.'   (Cadogan 1959)

Note that *va'erã* cannot be interpreted epistemically in Mbyá. Sentence (43) is unacceptable to my informants in the proposed context:

(43) Context: I just asked you where Juan is. You look in the direction of his house, and you see the smoke of a fire. You conclude that Juan is at home.

   # Juan o-ĩ   ng-oo   py va'e-rã
   Juan A3-be REFL-house in REL-RA

   Intended: 'Juan must be at home.'

In conclusion, mono-clausal sentences with *va'erã* are compatible either with a present or a future reference time, but a present reference time forces the interpretation of *va'erã* as a deontic modal operator. With a future reference time, a seemingly non-modal interpretation is available.

6.2.5 Summary

We have seen that bare verbs in matrix clauses are interpreted with respect to a non-future reference time, and that *va'ekue* locates the reference time in the past of the time of utterance. It appears that *va'erã* can be used either as a future operator, which locates the reference time in the future of the time of utterance, or as a deontic modal operator with present reference time. In the next section, I describe the temporal interpretation of embedded clauses.

6.3 Temporal interpretation of embedded clauses

6.3.1 Clausal complements

Bare verbs When the embedded verb is bare, it describes an eventuality that is simultaneous to the eventuality described by the matrix verb. Consider first (44). If the matrix clause has a present reference time, the sentence is true only if Juan thinks that Maria is currently sick:

(44) Agỹ, Juan o-icha'ã Maria i-ñembyayi-a
Now Juan A3-think Maria B3-hungry-NLZ

'Now, Juan thinks that Maria is hungry.'

Simultaneous readings are also obligatory when the matrix clause has a past or a future reference time. The only available interpretation of the complement clause of (45) and (46) is that Juan is working at the time of his statement, which is in the past of TU in (45) and in its future in (46):

(45) Kuee ka'aru Juan h-e'i chevy pe o-mba'apo-a
yesterday afternoon Juan B3-say me to A3-work-NLZ

'Yesterday afternoon Juan said to me that he was working.'

(46) Ko'erã ka'aru pytũ Juan h-e'i-ta chevy pe o-mba'apo-a
tomorrow afternoon dark Juan B3-say-TA me to A3-work-NLZ

'Tomorrow evening, Juan will say to me that he is working.'

-gue Earlier than matrix readings are obtained by suffixing *-gue* (an allomorph of *-kue*) on the embedded verb. (47) and (48) can mean that Juan is currently thinking that Maria was hungry (resp. was working) at a previous time:

(47) Juan o-icha'ã Maria i-ñembyayi-a-gue
Juan A3-think Maria B3-hungry-NLZ-KUE

'Juan thinks that Maria was hungry'

(48) Juan o-icha'ã Maria o-mba'apo-a-gue
Juan A3-think Maria A3-work-NLZ-KUE

'Juan thinks that Maria was working.'

Note that under this reading, (47) and (48) do not entail that the eventuality described by the embedded verb is over before the event time of the matrix clause, i.e. before the time at which Juan holds his thought:

(49) Juan o-icha'ã Maria i-ñembyayi-a-gue ha'e i-ñembyayi-a teri.
Juan A3-think Maria B3-hungry-NLZ-KUE and B3-hungry-NLZ still

'Juan thinks that Maria was hungry and still is'

(50) Juan o-icha'ã Maria o-mba'apo-a-gue ha'e o-mba'apo-a teri.
Juan A3-think Maria A3-work-NLZ-KUE and A3-work-NLZ still

'Juan thinks that Maria was working and still is.'

In (49), the time that is located in the past of the matrix event time is a time at which Maria was hungry. In (50), it is a time that is included in an event of Maria working. In other words, it is the reference time of the embedded clause that -*gue* locates in the past of the matrix event time.

These facts are compatible with an analysis of -*gue* as an absolute past tense (i.e. a tense which locates a time in the past of the utterance time) or a relative one (which locates a time in the past of the local perspective time). However, embedding a nominalized clause modified by -*gue* under a future or past matrix verb shows that -*gue* is interpreted as a relative past tense. If the matrix verb describes a future event (in this case because of the prospective aspect marker -*ta*), the embedded reference time must precede the matrix time of situation, but may follow the time of utterance:

(51)   Ko'erã   ka'aru   pytũ, Juan o-mombe'u-ta o-mba'apo-a-gue
        tomorrow afternoon dark Juan A3-tell-TA   A3-work-NLZ-KUE
        (ko'erã)   pyareve
        (tomorrow) morning

        'Tomorrow in the evening, Juan will say that he worked (tomorrow) in the morning.'

Past under past embeddings confirm that -*gue* is interpreted as relative past. First, note that there is no sequence of tense (SOT) effects in Mbyá, as shown by the ungrammaticality of (53) with the past tense marker -*gue* on the embedded verb in context (52):

(52)   Context: Yesterday, there was a soccer game on TV starting at 10pm. At 10 pm sharp, I called Juan because I wanted to talk to him. He told me that he didn't want to talk to me because he was watching the soccer game.

(53)   Kuee   a-henoi   Juan jave, h-e'i   (va'e-kue) chevy pe
        yesterday A1.SG-call Juan when, B3-say (REL-KUE) me   to
        o-ma'ẽ-a(*-gue)   partido
        A3-watch(-*KUE) game

        'Yesterday when I called Juan, he told me that he was watching the game.'

The context in (52) rules out an interpretation of (53) according to which the embedded verb describes an event that occurs in the past of the matrix verb. Only a simultaneous interpretation is available. This interpretation is possible when the embedded verb is bare, but not when -*gue* is suffixed to it. If SOT was an option, -*kue* on the embedded verb would be interpretable as a null tense (a relative present tense) and the simultaneous interpretation of (53) would be available. The ungrammaticality of (53) therefore demonstrates the unavailability of SOT in Mbyá. It also shows that -*gue* in (53) is not interpreted as an independent absolute past tense, since this possibility would allow earlier than matrix, later than matrix and simultaneous interpretations of the embedded verb, and it would also predict the grammaticality of (53) with -*gue*.

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Embedded -rã The suffix -rã is attested in clausal complements, where it occurs before the nominalizing suffix -a and after a glottal stop suffix (written as an apostrophe). Following Dooley (2006), I assume that the glottal stop suffix is a suffixal allomorph of the 'relativizer' va'e.

(54) Juan o-icha'ã   Maria i-ñembyayi-'-rã-a
      Juan A3-think Maria B3-hungry-REL-RA-NLZ
      'Juan thinks that Maria will be hungry'

(55) Juan o-icha'ã   Maria o-mba'apo-'-rã-a
      Juan A3-think Maria A3-work-REL-RA-NLZ
      'Juan thinks that Maria will work.'

It is also possible to embed the non-reduced expression va'erã, which is however in complementary distribution with the nominalizer -a:

(56) Juan o-icha'ã   Maria i-ñembyayi(*-a)   va'e-rã
      Juan A3-think Maria B3-hungry(-NLZ) REL-RA
      'Juan thinks that Maria will be hungry'

(57) Juan o-icha'ã   Maria o-mba'apo(*-a) va'e-rã
      Juan A3-think Maria A3-work(-NLZ) va'e-rã
      'Juan thinks that Maria will work.'

The reference time of a complement clauses modified by -rã follows the matrix event time:

(58) Kuee   pyareve Juan h-e'i   va'e-kue chevy pe o-mba'apo-'-rã-a
      yesterday morning Juan B3-tell REL-KUE me   to A3-work-REL-RA-NLZ
      ka'aru
      afternoon
      'Yesterday morning, Juan told me that he would be working (yesterday) in the afternoon'

Here again, this does not entail that the whole eventuality is located in the future of the matrix event time:

(59) Juan o-icha'ã   Maria o-mba'apo-a agỹi   ha'e o-mba'apo-'-rã-a
      Juan A3-think Maria A3-work-NLZ right.now and A3-work-REL-RA-NLZ
      teri ka'aru.
      still afternoon
      'Juan thinks that Maria is working now and will still be working this afternoon.'

6.3.2 Relative clauses

The particle va'e is used to form relative clauses, and can be combined with the temporal suffixes -kue and -rã:

(60) Juan o-ipytyvõ ava re   Maria i-jayvu va'e pe
Juan A3-help   man OBL Maria B3-talk REL OBJ

'Juan is helping the man that Maria is talking/was talking/talked about'

(61) Juan o-ipytyvõ ava re   Maria i-jayvu va'e-kue pe
Juan A3-help   man OBL Maria B3-talk REL-KUE OBJ

'Juan is helping the man that Maria talked about'

(62) Juan o-ipytyvõ ava re   Maria i-jayvu va'e-rã pe
Juan A3-help   man OBL Maria B3-talk REL-RA OBJ

'Juan is helping the man that Maria will talk about'

The reference time of a relative clause formed with *va'e* is simultaneous with or precedes the time of utterance. In other words, the non-future tense of bare relativizers can be independent from the tense of the matrix verb. In (63), a relative clause formed with *va'e* is the complement of a past tense matrix verb. The event described by the embedded verb follows the event described by the matrix verb:

(63) Kuee   pyareve, Juan i-jayvu (va'e-kue) ava Maria o-jurupyte va'e
yesterday morning Juan B3-talk (REL-KUE) man Maria A3-kiss   REL
reve agỹi
with now

'Yesterday morning Juan talked to the man that Maria is kissing now.'

Examples (64) and (65) show that an independent interpretation of relative clauses is also possible with *va'ekue* and *va'erã*:

(64) Kuee   pyareve, Juan i-jayvu (va'e-kue) ava Maria o-jurupyte
yesterday morning Juan B3-talk (REL-KUE) man Maria A3-kiss
va'e-kue reve ka'aru   pytũ
REL-KUE with afternoon dark

'Yesterday morning Juan talked to the man that Maria kissed in the evening (yesterday).'

(65) Ko'erã   ka'aru   pytũ, Juan i-jayvu va'e-rã ava reve Maria re
tomorrow afternoon dark Juan B3-talk REL-RA man with Maria to
o-menda va'e-rã reve pyareve
A3-marry REL-RA with morning

'Tomorrow evening, Juan will talk to the man that Maria will marry in the morning (tomorrow).'

Interpretations of *va'ekue* that are dependent on the matrix event time are also attested. Consider the following scenario. Maria is a young girl who wants to marry a resourceful man when she grows up. Since she believes that someone who built his own house must be resourceful, she decides that her future husband will have built his house. In this context, (66) is true and does not entail that the man that she will marry built his house before the time of utterance.

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(66) Guaimi   vy, Maria o-menda va'e-rã peteĩ ava ng-oo   pe
     female.adult SS, Maria A3-marry REL-RA one   man REFL-house OBJ
     o-japo   va'e-kue reve.
     A3-make REL-KUE with

     'When she is an adult, Maria will marry a man who built his own house.'

Dependent readings of *va'erã* are not attested. The only reading of (67) is that
the man that Maria married will build his house at a time that follows TU.

(67) Maria o-menda va'e-kue peteĩ ava ng-oo   pe o-japo   va'e-RA
     Maria A3-marry REL-KUE one   man REFL-house OBJ A3-make REL-RA
     reve.
     with

     'Maria married a man who will build his own house.'

6.3.3 Adverbial clauses

In this subsection, I describe the temporal interpretation of three kinds of temporal
adverbial clauses: *when*-clauses, *before*-clauses and *after*-clauses. *When*-clauses and
because-clauses are formed with the switch reference markers *vy* (same subject) or
ramo (different subject). As the following examples illustrate, the switch-reference
marker only indicates that the clause in which it occurs is subordinated to the ma-
trix clause, and that its subject is the same as or different from the matrix subject.
The nature of the relation between the matrix and subordinated eventualities is de-
termined contextually. In (68), the subordinated clause is interpreted as a temporal
adverbial that constrains the location of the matrix reference time (a '*when*-clause'
interpretation). In (69A), it describes an eventuality that causes the matrix eventu-
ality:

(68) Kuee,   Juan o-vaẽ   vy, o-echa va'e-kue Maria pe.
     Yesterday, Juan A3-arrive SS, A3-see REL-KUE Maria OBJ

     'Yesterday, when Juan arrived, he saw Maria.'

(69) Q: Mba'ere tu Juan o-pyta   ng-oo   py kuee?
        why   Q Juan A3-stay REFL-house in yesterday

     'Why did Juan stay home yesterday?'

     A: O-pyta o-ky   ramo.
        A3-stay A3-rain DS

     'He stayed (home) because it was raining.'

In (68), the subordinated verb is bare, and describes an eventuality that occurs
in the past of the time of utterance. This is not surprising. But consider now (70):

(70) Ko'erã,   Juan o-vaẽ   vy, o-echa-ta Maria pe.
     Tomorrow, Juan A3-arrive SS, A3-see-ta Maria OBJ

     'Tomorrow, when Juan arrives, he will see Maria.'

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There, the bare verb of the subordinated clause describes a future eventuality. Similar facts are observed with *before* and *after*-clauses. In (71) and (72), the bare verb in the subordinated clause describes an event that occurs in the past of the time of utterance. But in (73) and (74), it describes an event that occurs after the time of utterance.

(71) Kuee, o-ky rire, Juan o-o ka'aguy re
 Yesterday, A3-rain after Juan A3-go forest to
 'Yesterday, after it rained, Juan went to the forest.'

(72) Kuee o-ky e'ỹre, Juan o-o ka'aguy re
 Yesterday A3-rain before Juan A3-go forest to
 'Yesterday, before it rained, Juan went to the forest.'

(73) Ko'erã, o-ky rire, Juan o-o-ta ka'aguy re
 Tomorrow A3-rain after Juan A3-go-TA forest to
 'Tomorrow, after it rains, Juan will go to the forest'

(74) Ko'erã, o-ky e'ỹre, Juan o-ota ka'aguy re
 Tomorrow, A3-rain before, Juan A3-go-TA forest re
 'Tomorrow, before it rains, Juan will go to the forest.'

The generalization that emerges from these examples is that the reference time of adverbial clauses with bare verbs is not necessarily identical to the matrix event time, and that its temporal location with respect to the matrix event time seems to be determined in great extent by the type of adverbial relation that holds between the matrix and subordinated clauses.

6.3.4 Future reference with bare verbs

In section 2, we have seen that bare verbs in matrix clauses cannot be used to describe future eventualities. Nevertheless, Tonhauser (2011b) noted that bare verbs in Paraguayan Guaraní can describe future events in matrix sentences that are part of a sequence of conjoined clauses, the first of which bears future morphology. As the following sentences illustrate, the same is true in Mbyá:

(75) Che-ru o-u-ta, ha'e rire a-chẽ che-ro gui.
 B1SG-father A3-come-TA, and after A1SG-leave B1SG-house from
 'My father will come, and then I will leave the house.'

(76) Ara mboae py, ja-japo-ta vy'a che-ramoĩ pe,
 time other in, A1PL.INC-do-TA happy B1SG-grand.father OBJ,
 ja-karu ja'ea ha'e ja-y'u reta.
 A1PL.INC-eat a.lot and A1PL.INC a.lot
 'In one year we will make a party for my grand father, we will eat a lot and drink a lot.'

Tonhauser (2011b) also remarks that in Paraguayan Guaraní, *after* and *before* adverbial clauses that are interpreted in the future do not license future interpretations of bare verbs in matrix clause. The same is true in Mbyá, as can be seen in (77) and (78):

(77) Ko'erã,   o-ky   rire, Juan o-o-*(ta) ka'aguy re
      Tomorrow A3-rain after Juan A3-go-TA forest   to

      'Tomorrow, after it rains, Juan will go to the forest'

(78) Ko'erã,   o-ky   e'ÿre, Juan o-o-*(ta) ka'aguy re
      Tomorrow, A3-rain before, Juan A3-go-TA forest   re

      'Tomorrow, before it rains, Juan will go to the forest.'

When-adverbials also fail to license future interpretations of bare verbs:

(79) Ko'erã,   Juan o-vaẽ   vy, o-echa-*(ta) Maria pe.
      Tomorrow, Juan A3-arrive SS, A3-see-ta   Maria OBJ

      'Tomorrow, when Juan arrives, he will see Maria.'

6.3.5 Summary

The analysis of complement and relative clauses reveals that *-kue* and *-rã* are interpreted as a relative past tense and a relative future oriented modal operator. In the next section, I propose a formalization of the temporal analysis of matrix, complement and relative clauses.

Chapter 7

An analysis of clausal tense

7.1 The past tense -*kue*

7.1.1 -*kue* as a relative past tense

Generalities I propose to analyze -*kue* as a relative past tense, similar to the English past tense as analyzed in the first part of this dissertation. More precisely, just as in English, the overt morpheme is uninterpreted but must agree with a silent past tense operator:

(1) $[\![\text{PAST}]\!]^{M,w,c} = \lambda t.\lambda t'.t < t'$

Non-stative verbs are analyzed as properties of events or relations between events and individuals, while stative predicates (verbs or not) are interpreted as properties of times or relations between times and individuals:

(2) $[\![\text{ña}]\!]^{M,w,c} = \lambda x.\lambda e.\text{run}(w)(e)(x)$

(3) $[\![\text{puku}]\!]^{M,w,c} = \lambda x.\lambda t.\text{tall}(w)(t)(x)$

As in English, the relation between tense and non-stative VPs is established by grammatical aspect, which is silent in Mbyá:

(4) $[\![\text{PFV}]\!]^{M,w,c} = \lambda P.\lambda t.\exists e[P(e) \wedge \tau(e) \subseteq t]$

(5) $[\![\text{PROG}]\!]^{M,w,c} = \lambda P.\lambda t.\exists e[P(e) \wedge t \subseteq \tau(e)]$

Matrix uses of -*kue* While *va'ekue* is pronounced in the string of suffixes and clitics of the verb, I assume that the abstract operator PAST is generated in a T head, so that the interpretation of a simple past tense sentence is just like in English:

(6) Maria i-ñembyayi va'e-kue.
    Maria B3-hungry REL-PAST
    'Maria was hungry.'

(7)

```
                        TP
                ┌───────────┴───────────┐
                T                        VP
          ┌─────┴─────┐           ┌──────┴──────┐
       ONCE     ┌─────┴─────┐   Maria           V
              PAST    N                    ┌─────┴─────┐
                                        iñembyayi va'ekue
```
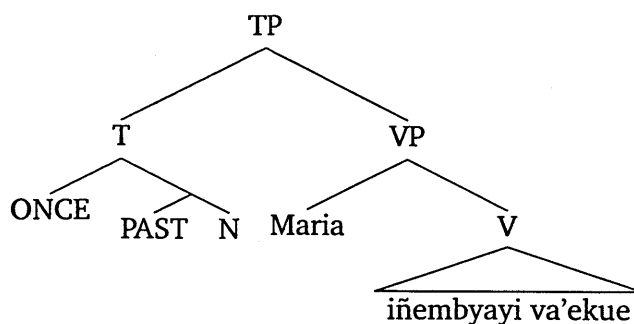
The difference between 'existential' and 'anaphoric' uses of tense is accounted for by assuming contextual domain restriction on the temporal quantifier, following Ogihara (1996).

Complement clauses I propose that the relative interpretation of tenses in clausal complements is due to the fact that embedding verbs such as *he'i* ('say') or *oicha'ã* ('think') select complements that denote properties of times rather than propositions, and introduce a quantifier that binds the internal argument of these properties. From this, it follows that the indexical pointer N cannot saturate the internal argument of tenses in clausal complements (otherwise the embedded clause would be interpreted as a proposition rather than as a property of times). In the LF in (9) we can see that the temporal argument t_1 of the embedded past tense is abstracted over by an operator 1 in the scope of the matrix verb *oicha'ã*. This guarantees that the complement of *oicha'ã* is interpreted as a property of times rather than as a proposition, and that the past tense of the embedded clause is interpreted relative to the time of occurrence of the matrix event. The interpretation of (8) is derived in (10). The function denoted by *oicha'ã* ('think') in a world w takes a property of times P, an individual x (the attitude holder), an event e as arguments, and outputs the truth value 1 iff P is true in all the pairs of times t' and worlds w' that are compatible with what x thinks in w in the thinking event e[1]. What is important here is that the time variable t' in these pairs of variables represents the subjective time at which x locates herself in e, and it is with respect to t' that the complement of *oicha'ã* is interpreted. Therefore the past tense in the complement of (9) locates Maria's being hungry at a time that precedes the interval at which Juan located himself when he held the thought described by the embedded clause. This analysis of tense in clausal complements goes back at least to von Stechow (1984), following Lewis (1979) on attitude verbs.

(8) Juan o-icha'ã va'ekue   Maria i-ñembyayi-a-gue
     Juan B3-think REL-PAST Maria B3-hungry-NLZ-PAST

     'Juan thought that Maria was hungry'

---

[1]We say that the pair (t', w') belongs to the doxastic alternatives of x in e in w, which is written $(t', w') \in \text{DOX}(w)(e)(x)$.

(9)

TP₂ tree:

- TP₂
  - T
    - ONCE
    - PAST N
  - AspP
    - PFV
    - VP
      - Juan
      - V′
        - V
          - oicha'ã va'ekue
        - CP
          - 1
          - C
          - TP₁

[$_T$ONCE [PAST t₁]] [$_{VP}$Maria iñembyiague]
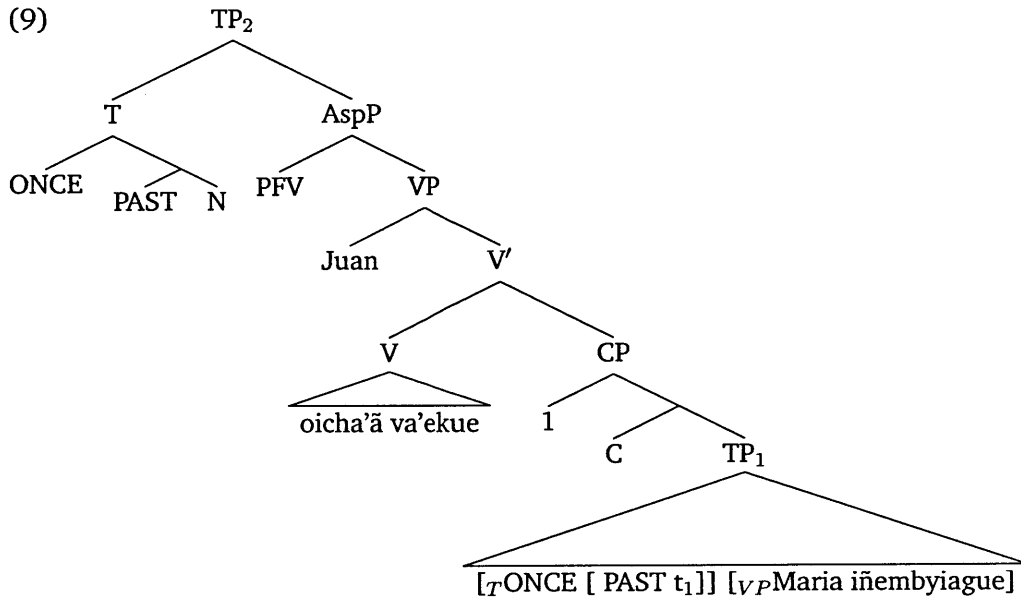
(10) $[\![\,[_{VP}\text{ Maria iñembyiague }]\,]\!]^{c,g,w} = \lambda t.\mathbf{hungry}(w)(t)(\mathbf{Maria})]$

$[\![\text{CP}]\!]^{c,g,w} = \lambda t'.\exists t[t < t' \wedge \mathbf{hungry}(w)(t)(\mathbf{Maria})]$

$[\![\text{oicha'ã}]\!]^{c,g,w} =$

$\lambda P_{\langle s,\langle i,t\rangle\rangle}.\lambda x.\lambda e.\forall(w',t')[((w',t') \in \text{DOX}(w)(e)(x)) \rightarrow (P(w')(t'))]$

$[\![\text{TP}_2]\!]^{c,g,w} = \exists t[t < TU \wedge \exists e[\tau(e) \subseteq t \wedge \forall(w',t')[((w',t') \in \text{DOX}(w)(e)(\mathbf{Juan})) \rightarrow$
$(\exists t''[t'' < t' \wedge C'(t'') \wedge \mathbf{hungry}(w')(t'')(\mathbf{Maria})])]]]$

Relative clauses The reference time of relative clauses with *va'ekue* can be located in the past of the time of utterance (independent reading) or in the past of the matrix event time (dependent reading). In order to derive the independent reading, the internal argument of the embedded tense is saturated by N, the indexical pointer to TU. This analysis is due to Kusumoto (1999). As in the previous chapters, the letter t is used for pronouns ranging over times, d for pronouns ranging over individuals and e for pronouns ranging over events:

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(11) Juan i-jayvu va'e-kue   ava Maria o-jurupyte va'e-kue   reve
      Juan B3-talk REL-PAST man Maria A3-kiss   REL-PAST with
      'Juan talked to the man that Maria kissed.'

(12)
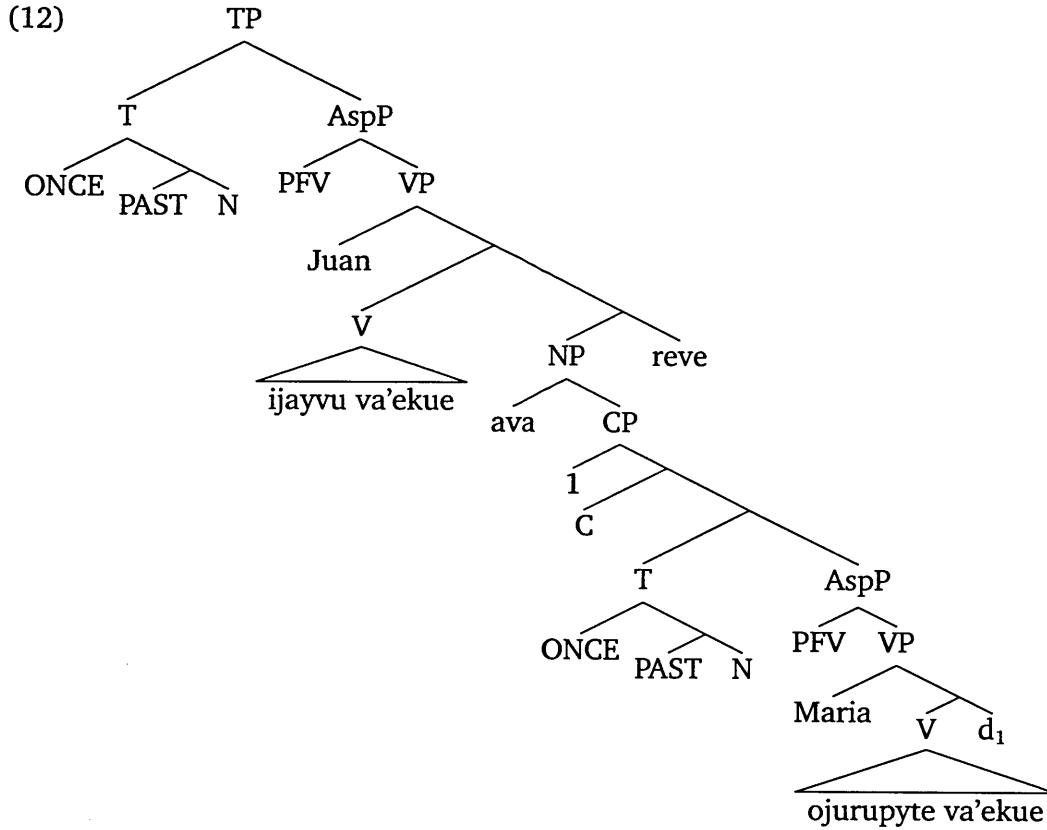
(13) $[\![(12)]\!]^{M,w,c} = \exists t[t < TU \wedge \exists e[\tau(e) \subseteq t \wedge \exists x[\textbf{talk}(w)(e)(x)(\textbf{Juan}) \wedge \textbf{man}(w)(x)$
      $\wedge \exists t'[t' < TU \wedge \exists e'[\tau(e') \subseteq t' \wedge \textbf{kiss}(w)(t')(x)(\textbf{Maria})]]]$

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Following von Stechow (2009), we may try to generate the dependent interpretation of tense in relative clauses by saturating the internal argument of the embedded tense with a temporal pronoun rather than N, and letting the matrix tense quantifier bind that tense. The interpretation that would be obtained for the dependent reading of (11) would be as follows:

(14)

```
                    TP
             ┌──────┴──────┐
             T             2
          ┌──┴──┐      ┌────┴────┐
       ONCE    ┌─┴─┐   t₂      AspP
             PAST  N        ┌───┴───┐
                           PFV      VP
                                 ┌───┴───┐
                               Juan      ┌──┴──┐
                                ┌──┴──┐  NP    reve
                           ijayvu va'ekue ┌─┴─┐
                                        ava  CP
                                          ┌───┴───┐
                                          1   ┌───┴───┐
                                             C┌───┴───────┐
                                              T          AspP
                                          ┌───┴───┐   ┌───┴───┐
                                        ONCE  ┌───┴─┐ PFV     VP
                                            PAST   t₂      ┌───┴───┐
                                                        Maria  ┌──┴──┐
                                                               V    d₁
                                                          ┌────┴────┐
                                                        ojurupyte va'ekue
```
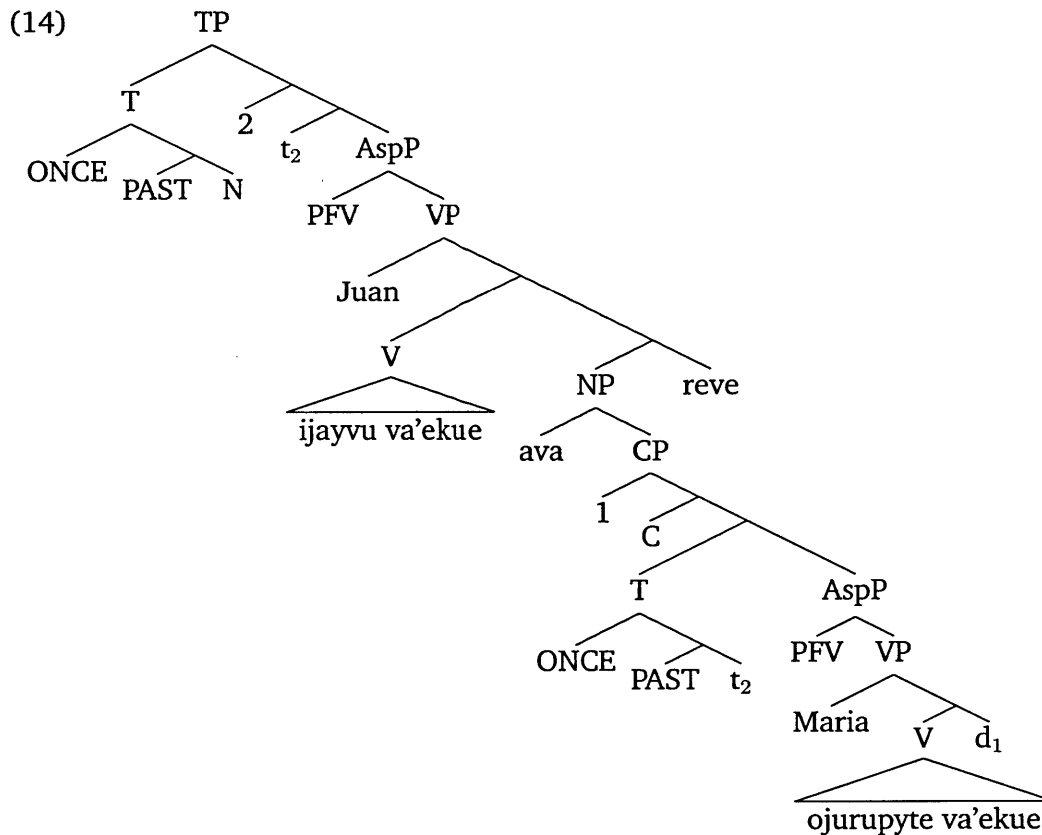
(15) $[(14)]^{M,w,c} = \exists t[t < TU \wedge \exists e[\tau(e) \subseteq t \wedge \exists x[\mathbf{talk}(w)(e)(x)(\mathbf{Juan}) \wedge \mathbf{man}(w)(x)$
$\wedge \exists t'[t' < t \wedge \exists e'[\tau(e') \subseteq t' \wedge \mathbf{kiss}(w)(t')(x)(\mathbf{Maria})]]$

However, according to this LF, the embedded past tense is not relative to the matrix event time but to the matrix reference time. In order to make the embedded past tense relative to the matrix event time, we must let the matrix aspect operator bind the internal argument of the embedded tense. If we assume with von Stechow (2002) that temporal relations may have events as well as times in their extension, we may account for this fact by letting the internal argument of the embedded tense be an event variable that is bound by the matrix aspect operator, as in the following LF:

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(16)

```
                        TP
              ┌──────────┴──────────┐
              T                     AspP
         ┌────┴────┐        ┌────────┴────────┐
       ONCE   ┌────┴───┐   PFV    2
             PAST      N        ┌──┴──┐
                                e₂   VP
                             ┌───┴────────┐
                           Juan   ┌───────┴───────┐
                                  V          NP      reve
                             ┌────┴────┐   ┌──┴──┐
                          ijayvu va'ekue  ava   CP
                                              ┌──┴──┐
                                              1    C
                                               ┌───┴────────┐
                                               T           AspP
                                          ┌────┴────┐   ┌────┴────┐
                                        ONCE  ┌─────┴──┐ PFV      VP
                                             PAST     e₂      ┌────┴────┐
                                                            Maria  ┌────┴──┐
                                                                   V      d₁
                                                              ┌────┴────┐
                                                            ojurupyte
                                                             va'ekue
```
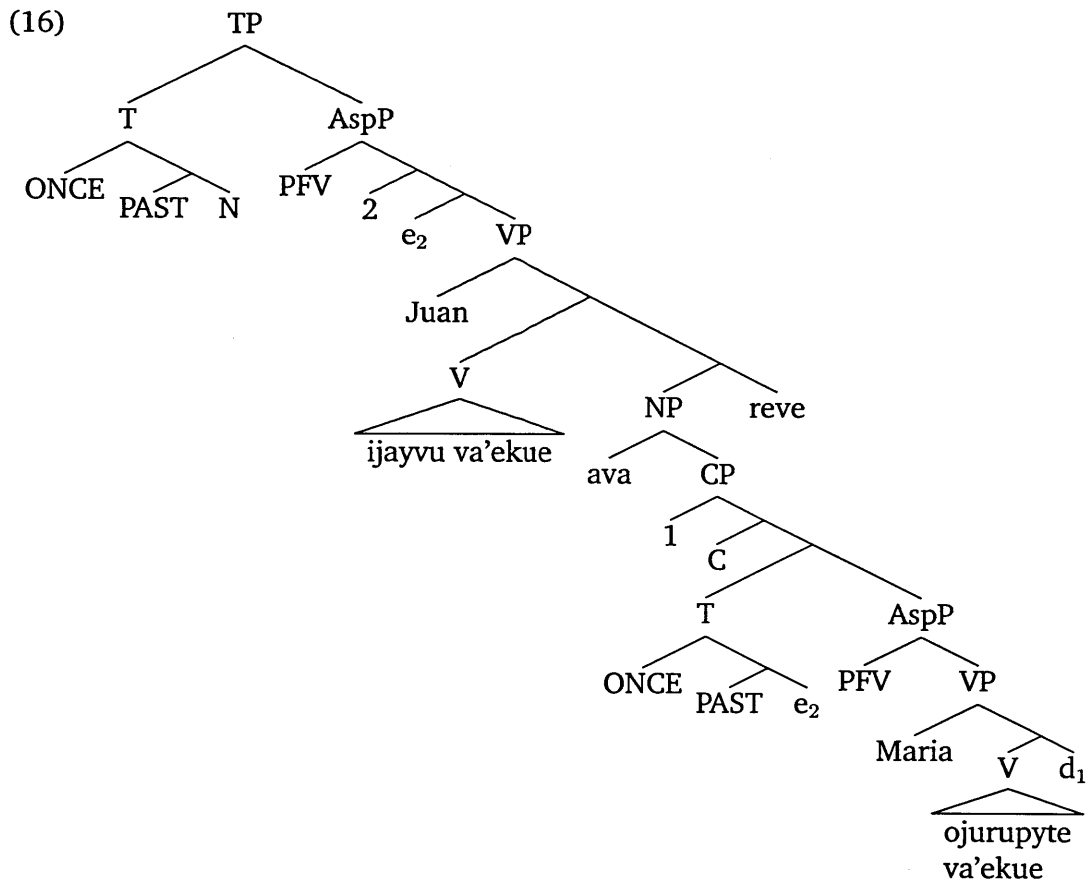
(17) $[\![(16)]\!]^{M,w,c} = \exists t[t < TU \wedge \exists e[\tau(e) \subseteq t \wedge \exists x[\textbf{talk}(w)(e)(x)(\textbf{Juan}) \wedge \textbf{man}(w)(x)$
$\wedge \exists t'[t' < \tau(e) \wedge \exists e'[\tau(e') \subseteq t' \wedge \textbf{kiss}(w)(t')(x)(\textit{Maria'})]]]$

7.1.2 Alternative analyses

Va'ekue is not an adverb

Tonhauser (2006) argues that *va'ekue* in matrix clauses in Paraguayan Guaraní is a temporal adverb rather than a tense, because it is only used to refer to the remote past. This is illustrated in the contrast between (18a) and (18b) below, in PG from Tonhauser (2006). An informant judges (18b) infelicitous because it conveys that the trip back home was taken a long time ago, contradicting the information available in the context:

(18) Context: Coming home from a quick shopping trip that turned out to be longer than planned.

    a. Che-rape puku kuri.
       B1sg-path long KURI

       'My path was long.'

    b. # Che-rape puku va'ekue.
         B1sg-path long VAEKUE

'My path was long.'   (Tonhauser 2006)

While there are some differences between PG and Mbyá in this respect, the facts are similar. In Mbyá, *kuri* is not an adverb of immediate past, but means *a short while*, either in the past or in the future. Furthermore, the notion of immediate past is preferentially expressed with the adverb *kue'i*, which is composed of the particle *kue* and the diminutive suffix *'i*. While *va'ekue* in matrix clauses is not limited to *remote* past, as shown by its compatibility with adverbials such as *kuee* ('yesterday'), it is not felicitous to describe immediate past ('just happened' sentences), where *kue'i* is used instead, although *kuri* is also acceptable. Note that *va'ekue* is in complementary distribution with both *kue'i* and *kuri*:

(19) Juan o-o   va'ekue   kuee.
      Juan A3-go REL-PAST yesterday.

      'Juan left yesterday.'

(20) Juan o-o   kue-'i/kuri.
      Juan A3-go ADV.

      'Juan just left.'

(21) Juan o-o   va'ekue   (*kue'i/*kuri).
      Juan A3-go REL-PAST ADV.

      (Intended) 'Juan just left.'

Tonhauser's analysis of matrix *va'ekue* as a remote past adverb explains both the impossibility to express immediate past with *va'ekue* and its complementary distribution with *kue'i* and *kuri*. However, there are a number of strong arguments against this analysis, in Mbyá at least. First of all, *va'ekue* does not have the same distribution as other adverbs, and in particular it doesn't have the same distribution as *kue'i* and *kuri*. These adverbs can occur in a variety of positions, including sentence initially as in (22). Matrix *va'ekue* is only acceptable post verbally.

(22) Kue'i o-o.
      ADV A3-go

      'He just left'

(23) *Va'e-kue o-o
      REL-PAST A3-go

      (Intended) 'He left'

Secondly, the complementary distribution of *va'ekue* and *kue'i* or *kuri* is only observed in matrix clauses. *Va'ekue* as a tensed relativizer can co-occur with *kue'i*, as illustrated in the following example from Dooley (2006). Therefore, Tonhauser's analysis implies that *va'ekue* in matrix clauses and in relative clauses doesn't have the same temporal value (remote vs. unmarked past tense), which is undesirable:

(24) Kue'i o-eja   va'e-kue.
      ADV A3-leave REL-PAST

      '(This is) what he just left.'

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Thirdly, *va'ekue* can combine with *va'erã* to express deontic modality with a past perspective time or what appears to be a future in the past with an added conterfactual meaning. *Kue'i* is ungrammatical in this construction, and *kuri* takes on a different meaning:

(25) O-o   va'e-rã va'e-kue.
      A3-go REL-RA REL-PAST
      'He had to go' or 'He should have gone'

(26) *O-o   va'e-rã kue'i.
      A3-go REL-RA
      (Intended) 'He had to go' or 'He should have gone'

(27) O-o   va'e-rã kuri.
      A3-go REL-RA
      'He will go soon' or 'He must go soon'

All these facts can be explained if we assume that *va'ekue* is a tense morpheme. Its difference of distribution from adverbs is explained by the assumption that the position of the T head is fixed in the spinal clause and that this is reflected in the order of suffixes and post-clitics of the verb: the abstract tense operator PAST is located in the T head, and agrees with the overt morpheme *va'ekue*, which occurs in a fixed position in the chain of suffixes and post-clitics of the verb. The position of *va'ekue* in this chain is determined by the height of the T head in the extended projection of the verb, the idea being that the order of functional projections that extend the VP is mirrored by the order of post verbal morphemes that mark and agree with the heads of these projections. This view of verbal morphology is not only common cross-linguistically, it also explains the relative positions of *va'ekue* and *va'erã*. Under the assumption that *va'erã* agrees with a modal operator and that root modals sit below tense (e.g. Brennan 1993), we expect that *va'erã* will occur to the left of *va'ekue* in the chain of post-verbal morphemes, as illustrated in (25). The analysis of *va'ekue* as a past tense also explains that it can combine with *va'erã*, since tense scopes over root modal operators. Last but not least, this analysis explains the relation between *va'ekue* in matrix clauses and in relative clauses, and *-gue* in complement clauses: in all cases, the morpheme *-kue* marks the presence of a past tense operator.

In conclusion, the analysis of matrix *va'ekue* as a past adverb does not stand up to scrutiny in Mbyá. Of course, there remains the question why *va'ekue* cannot be used to describe the immediate past in matrix sentences. Note that this is not the only restriction on the use of va'ekue in matrix sentences: more generally, it has been remarked that *va'ekue* is not frequently used to refer to the past tense in matrix sentences, where the use of bare verbs is more common, see Tonhauser (2006). While I will propose a pragmatic explanation for this latter phenomenon in section 7.1.3, I have no principled explanation for the ban on immediate past with *va'ekue*.

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-kue is not a Kleinian perfect

I define a Kleinian perfect as an operator that maps a property of time to another property of times an in (28). Klein (1994) actually defines a perfect as an operator that conveys that the event time of a predicate precedes the topic time (Klein's own version of Reichenbach's Reference Time). This operator has been formalized by Kratzer (1998) as in (29). The reason I define the Kleinian perfect in (28) as a function of type $\langle it, it \rangle$ rather than as a function of type $\langle vt, it \rangle$ is that I want to be able to combine it both with stative predicates (which I have assumed are properties of times) and with aspect phrases, so as to allow for combinations of perfect and imperfective or perfective aspect. The reason I call it a Kleinian perfect rather than simply a perfect is to indicate that I am not claiming that this the only form of perfect available in natural languages or that tense/aspect combinations like the English present perfect (for instance) should be formalized in this way.

(28) $\llbracket \text{PERF} \rrbracket^{M,w,c} = \lambda P_{\langle i,t \rangle}.\lambda t.\exists t'[t' < t \wedge P(t')]$

(29) $\llbracket \text{PERF} \rrbracket^{M,w,c} = \lambda P_{\langle v,t \rangle}.\lambda t.\exists e[\tau(e) < t \wedge P(t')]$

Most of the sentences that we analyzed using a relative past tense could be analyzed with a Kleinian perfect instead, and still retain plausible truth conditions. Consider the sentences in (30) to (32). If *-kue* is analyzed as a Kleinian perfect in (30) and (31), then these sentences are constructed with bare verbs (without temporal morphology). In order to generate the correct truth-conditions, we must ensure that the evaluation time of the perfect is the time of utterance (so that these sentences locate a state of Maria being hungry in the past of TU). To this end, let us assume that the reference time of sentences with bare verbs is provided by a silent temporal pronoun t_{rt}, which in the case of (30) and (31) will refer to the time of utterance TU [2]. The denotation of these sentences will be as in (37) and (38). For complement clauses, the analysis is even simpler, we just need to assume that there is no tense projection in the complement, as in (35), which is interpreted as in (39).

(30) Maria i-ñembyayi va'e-kue.
Maria B3-hungry REL-PAST

'Maria was hungry.'

(31) Juan i-jayvu va'e-kue   ava   Maria o-jurupyte va'e-kue   reve
Juan B3-talk REL-PAST man Maria A3-kiss   REL-PAST with

'Juan talked to the man that Maria kissed.'

(32) Juan o-icha'ã   va'ekue   Maria i-ñembyayi-a-gue
Juan B3-think REL-PAST Maria B3-hungry-NLZ-PAST

'Juan thought that Maria was hungry'

(33) $[_{TP} \; t_{rt} \; [_{AspP} \; \text{PERF} \; [_{VP} \; \text{Maria hungry} \;] \;] \;]$

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[2] An analysis of bare verbs along these lines will be advocated in section 7.3, see also Tonhauser (2011b)

(34) $[_{TP}$ [ONCE [PAST N]] $[_{AspP}$ PFV $[_{VP}$ Juan talk $[_{PP}$ $[_{NP}$ man $[_{CP}$ 1 [C $[_{TP}$ t_{rt} $[_{AspP}$ PERF $[_{VP}$ Maria kissed e_1]]]]]] to]]]]

(35) $[_{TP}$ [ONCE [PAST N]] $[_{AspP}$ PFV $[_{VP}$ Juan think $[_{CP}$ C $[_{AspP}$ PERF $[_{VP}$ Maria hungry]]]]]]

(36) $[\![t_{rt}]\!]^{M,w,c} = g_c(t_{rt}) = TU$

(37) $[\![(33)]\!]^{M,w,c} = \exists t[t = TU \wedge \exists t'[t' < t \wedge \textbf{hungry}(w)(t')(\textbf{Maria})]]$

(38) $[\![(34)]\!]^{M,w,c} = \exists t[t < TU \wedge \exists e[\tau(e) \subseteq t \wedge \forall(w',t')[((w',t') \in \textsc{dox}(w)(e)(\textbf{Juan}))$
$\rightarrow (\exists t''[t'' < t' \wedge \textbf{hungry}(w')(t'')(\textbf{Maria})])]]$

(39) $[\![(35)]\!]^{M,w,c} = \exists t[t < TU \wedge \exists e[\tau(e) \subseteq t \wedge \exists x[\textbf{talk}(w)(e)(x)(\textbf{Juan}) \wedge \textbf{man}(w)(x)$
$\wedge \exists t'[t' = TU \wedge \exists t''[t'' < t' \wedge \exists e'[\tau(e') \subseteq t'' \wedge \textbf{kiss}(w)(t')(x)(\textbf{Maria})]]]$

Is there then any reason to analyze these sentences with a relative past tense rather than a Kleinian aspect? One difference between the two analyses is that the perfect analysis (but not the relative past analysis) predicts that temporal adverbials should be able to specify a present reference time in sentences like (30). Under the assumption that temporal adverbial modifiers can be adjoined either to a verb phrase or to an aspect phrase, we predict that the use of a present frame adverbial such as *agỹ* ('now') should be grammatical in sentences with *-kue*, contrary to fact. Indeed, under a perfect analysis of *-kue*, we need to allow the reference time of sentences such as (30) to be the time of utterance in order to derive the correct truth conditions. Therefore, it should be possible to adjoin the adverb *agỹ* to the perfect aspect phrase as in (40), contrary to facts.

(40) Maria i-ñembyayi va'e-kue   (*agỹ).
      Maria B3-hungry REL-PAST now

      'Maria was hungry (*now).'

Note that this problem does not arise with the relative past analysis that I have adopted, since the indexical pointer to TU that is buried inside the T head is never accessible for modification, even if we allowed temporal adverbials to be adjoined to TP. A similar argument was made in Bohnemeyer (2002, 2003) to distinguish the terminative aspect *ts'o'k* in Yukatek Maya from a relative past tense. This aspect is actually more complex than a Kleinian perfect, but Bohnemeyer's argument is relevant to the current discussion nonetheless: it hinges on the claim that a terminative aspect should allow reference time modification, contrary to a relative past tense. This is just the property that we have discussed. Bohnemeyer argues using examples such as (41) and (42) that *ts'o'k* in Yukatek Maya is a terminative aspect rather than a relative past. (41) shows that a temporal adverbial (in this case, a *when*-clause) can be used to specify a reference time that follows the event time. (42) shows that an adverb cannot specify the event time of a clause with *ts'o'k*. Bohnemeyer argues that (42) can only mean *Were you yesterday in the state of having met my brother?* and that the question is infelicitous because asking such a question is pragmatically odd. The question *Did you meet my brother yesterday?*, where the adverb modifies the event time, can be formulated as (43), without *ts'o'k*:

(41) Káa=h-máan-en   t-uy=iknal Pedro
     CON=PRV-pass-B.1.SG LOC-A.3=at Pedro

     '(When) I went by Pedro's at seven ...

     ts'o'k u=hàan-al   leti'; chen ba'l=e'
     TERM A.3=eat-INC it   only thing=TOP

     'he had (already) eaten; only ...'

     mix   inw=ohel   ba'x òora hàan-ak-i.
     EMPH.NEG A.1=know(B.3.SG) what hour eat-SUBJ(B.3.SG)-D4

     'I have no idea at what time he had eaten.'

(42) ?? Ts'o'k aw=il–ik   in=suku'n   ho'lheak?
       TERM A.2=see–CMP(B.3.SG) A.1.SG=elder.brother yesterday

     (intended) 'Have you met my brother yesterday?'

(43) T–aw=il–ah   in=suku'n   ho'lheak, he'bix
     PRV–A.2=see–CMP(B.3.SG) A.1.SG=elder.brother yesterday like
     t–a=tukul–ah–e'?
     PRV–A.2=think–CMP(B.3.SG)–D3

     'Did you meet my brother yesterday, as you had planned?'

Coming back to Mbyá, we observe that temporal adverbs in matrix sentences with *va'ekue* cannot specify a reference time that follows the event time. The only interpretation of (44) is that Juan saw Maria at the moment or after he arrived, *i.e.* the adverbial clause does not modify a reference time that follows the time of seeing Maria. (44) is false if Juan saw Maria before he arrived and doesn't see her at or after his arrival. We can account for the truth-conditions of the sentence by assuming that the event time of the matrix clause is included in its reference time, and that the adverb modifies either the reference time (if it is adjoined to AspP) or the event time (if it is adjoined to VP). In sum, Bohnemeyer's test supports the analysis of *-kue* as a relative past tense rather than as a terminative/perfect aspect.

(44) Kuee,   Juan o-vaẽ   vy,   o-echa   va'e-kue Maria pe.
     Yesterday Juan A3-arrive A3-see REL-PAST Maria   OBJ

     'Yesterday, when Juan arrived, he saw Maria.'

-kue is not a post-state operator

Another property that Bohnemeyer (2002, 2003) associates with the terminative aspect is that it asserts the existence of a state that results from or follows the event described by the VP, which I will call a post-state for short. In particular, Bohnemeyer argues that the terminative aspect *ts'o'k* conveys that the reference time overlaps with a post-state of the event described by the VP. This resultative meaning does not follow from the simple analysis of the terminative aspect in (45), but see Bohnemeyer (2003) for a formalization of the terminative aspect as a post-state operator (also relevant is Kratzer 2005). Here, I will only consider informal

tests of a post-state/resultative meaning without addressing issues of formalization. As evidence that *ts'o'k* is a post-state operator, Bonhemeyer observes that the dialogue in (45) is infelicitous in Yukatek Maya. To explain these facts, Bohnemeyer argues that the post state of knowing/meeting the speaker's father ends with the death of the father. Bohnemeyer likens this fact to the famous example in (48), which has been analyzed similarly: the sentence is infelicitous because it conveys that the time of utterance overlaps the result state of Einstein visiting Princeton, but this result state ended with the death of Einstein[3]:

(45) Q: Did you get to known my father who died last year?
      A: I think I only met him once.

(46) Q: *T-a=k'ahóol-t-ah   in=tàatah   le=máax
          PRV-A.2=acquaintance-APP-CMP(B.3.SG) A.1.SG=father DET=who
          h-kim   te=ha'b   h-máan-o'?
          PRV-die(B.3.SG) LOC:DET=year PRV-pass(B.3.SG)-D2

      'Did you get to know my father who died last year?'

      A: *Míin chen hun-téen-ili' ts'o'k inw=il-ah.
          DUB   only one-time-ID TERM A.1.SG=see-CMP(B.3.SG)

      'I think I only met him once.'

(47) Q: Ts'o'k a=k'ahóol-t-ah   in=tàatah   le=máax
          TERM A.2=acquaintance-APP-CMP(B.3.SG) A.1.SG=father DET=who
          h-kim   te=ha'b   h-máan-o'?
          PRV-die(B.3.SG) LOC:DET=year PRV-pass(B.3.SG)-D2

      'Did you get to know my father who died last year?'

      A: Míin chen hun-téen-ili' t-inw=il-ah.
          DUB only one-time-ID PRV-A.1.SG=see-CMP(B.3.SG)

      'I think I only met him once.'

(48) #Einstein has visited Princeton.

It can be shown that the use of *-kue* in Mbyá does not convey that the reference time overlaps or is included in a result state of the event described by the VP. First of all, examples similar to (50) are felicitous and can be true with *-kue* in Mbyá, c.f. (50). Secondly, there are naturally occurring uses of *-kue* that are not plausibly analyzed as descriptions of a result state. One of them is the use of *va'ekue* to express the past tense on verbs of saying that indicate reported speech in narratives, as the naturally occurring (51). Note that the English present perfect would be infelicitous in this context. Therefore, this criterion also suggests that *-kue* should not be analyzed as a post-state operator in Mbyá.

(49) Context: the speaker's grand-father is dead. When he was young, he visited
      Buenos Aires.

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[3]It is not clear to me why the sentence should be infelicitous rather than false if it entails that this result state overlaps TU.

(50) Che-r-amoĩ   o-o   va'e-kue   Buenos Aires py.
     B1SG-R-grand.father A3-go REL-PAST Buenos Aires LOC

     'My grand father went to Buenos Aires.'

(51) "Ha'e rami eme   ke" he'i   va'e-kue.
     This like NEG.IMP IMP A3.say REL-KUE

     '"Do not do this!" he said.'

(52) #'Do not do this' he has said.

7.1.3   A remark on the use of va'ekue

It has been observed that *va'ekue* is not commonly used in matrix clauses (see Ton-
hauser 2006). This is not very surprising though. Given that bare-verbs are non-
future, matrix sentences with *va'ekue* are in competition with bare-verb alternatives.
Assuming that out of two synonymous sentences, speaker tend to prefer the syntac-
tically simpler one, we expect that the past tense in most matrix sentences will be
expressed using bare verbs. A possible reason to use *va'ekue* would be the desire to
avoid an ambiguity between a past and a present reading of a bare verb sentence,
when it is felt that this ambiguity cannot be resolved contextually. Note that in
complement clauses, the situation is different, since bare verbs yield a simultane-
ous reading while the use of *-gue* yields a backward shifted reading: there is no
competition between the two forms.

Let us take advantage of this discussion to address a last objection to the analysis
of *-kue* as a past tense. In the previous chapter, it was observed that bare verbs can
be used with past time reference. One might think therefore that if *-kue* is a past
tense, it does double duty with the past interpretation of bare verbs, which casts
doubt on this analysis. Since ambiguity is so prevalent in natural languages, I am
not sure that this is a convincing objection against the analysis of *-kue* as a past
tense, but in any case, it is irrelevant in Mbyá, for two reasons. First of all, while
it might seem that *-kue* does double duty with bare verbs in matrix clauses, this
cannot be true in complement clauses, where the reference time of clauses with
bare verbs is simultaneous with the matrix event time, while the reference time of
clauses with *-kue* precedes the matrix event time. Therefore, there is at least one
context in which *-kue* must be used to express the past tense, which shows that the
objection relies on a wrong premise. Secondly, it should be emphasized that even
in matrix clauses, sentences with bare verbs and sentences with *va'ekue* are not
synonymous. The former can have either a past or a present temporal reference,
while the latter can only have a past reference. Therefore, if the use of *va'ekue* as
a past tense ever needs a functional justification, it might be that it disambiguates
the temporal reference of matrix clauses.

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7.2 The future oriented modal -rã

In chapter 6, it was observed that -rã can be interpreted either as a future tense or as a deontic necessity modal. In this section, I argue that -rã should be uniformly analyzed as a future oriented modal which selects either a metaphysical or a deontic modal base. Its apparently non-modal future interpretation is obtained when -rã is interpreted with respect to a metaphysical modal base. I also discuss combinations of the modal -rã with the past tense -kue.

7.2.1 The two faces of -rã

That va'erã can be used to make claims about the future is not at issue. A speaker who utters (53) commits herself to there being rain on the following day. If it doesn't rain, she will be proven wrong in retrospect.

(53) O-ky   va'e-rã   ko'erã.
      A3-rain REL-FUT tomorrow

      'It will rain tomorrow.'

These truth-conditions can be derived in a modal as well as a non-modal analysis of va'erã. In keeping with previous assumptions, va'erã itself is uninterpreted, but agrees with a silent operator RA. In a non-modal analysis, RA simply shifts the reference time in the future, as illustrated in (54) and (55):

(54) $[\![RA]\!]^{M,w,c} = \lambda t.\lambda t'.t' > t$

(55) $[\![53]\!]^{M,w,c} = \exists t[t < t' \wedge \exists e[\tau(e) \subseteq t' \wedge \mathbf{rain}(w)(e) \wedge \tau(e) \subseteq \mathbf{tomorrow}]$

In a modal analysis, RA quantifies over worlds that are metaphysically accessible from the world of evaluation of the sentence. A world w' is metaphysically accessible from a world w at a time t iff the history of w and w' are identical up to t. After t, w and w' will differ if they are different worlds. To what extent will they differ? At least to an extent that is not limited by morality or human laws (the realm of deontic modality), nor by the knowledge and desire of an agent (bouletic and epistemic modality), and possibly by the laws of nature (otherwise, why call it *meta*-physical modality?). Metaphysical modality is a very permissive modality. It is this permissiveness that allows us to capture the meaning of the future with metaphysical modality: *it will rain tomorrow* can be understood as a claim that all possible continuations of the actual world are such that it rains on the day that follows the time of utterance, independently of limitations imposed by human laws, morality, and desires or knowledge of an agent. Given these assumptions, we may analyze RA as in (56), where $\mathcal{M}(w)(w')(t)$ is true iff w' is metaphysically accessible from w at t.

(56) $[\![RA]\!]^{M,w,c} = \lambda P_{\langle s,\langle i,t\rangle\rangle}.\lambda t.\forall w'[\mathcal{M}(w)(w')(t)] \rightarrow \exists t'[t' > t \wedge P(w')(t')]$

(57) $[\![53]\!]^{M,w,c} = \forall w'[\mathcal{M}(w)(w')(TU)] \rightarrow$
      $\exists t'[t' > TU \wedge \exists e[\tau(e) \subseteq t' \wedge \mathbf{rain}(w')(e) \wedge \tau(e) \subseteq \mathbf{tomorrow}]]$

There is an issue with the modal analysis of the future that should be addressed right away. Thomason (1970) pointed out that disjunctions like (58) are interpreted both as tautologies and as excluding the middle:

(58) Either it will rain tomorrow or it won't.

In other words, we feel both that (58) cannot be false, and also that it asserts that either there is rain tomorrow in all possible futures or there is rain tomorrow in no possible futures. But these two intuitions appear to be inconsistent. Indeed, in order to interpret the disjunction as a tautology, we need to give wide scope to the negation over the necessity modal. The issue is that $\Box p \lor \neg \Box p$ does not exclude the middle: it is consistent with $\Diamond p \land \Diamond \neg p$. If on the other hand negation has scope under the necessity modal, the disjunction is no longer a tautology. Thomason adopts a modal analysis of the future, and solves the problem by assuming that future sentences are undefined if the prejacent of the modal operator is true in some possible futures and false in others. The question is whether the same facts hold in Mbyá. This question is difficult to answer, because negation cannot scope over non-deontic *va'erã* in Mbyá, and one has to use the negative future *mo'ã* instead:

(59) O-ky   va'e-rã ko'erã,   tera nd-o-ky-mo'ã-i.
     A3-rain REL-RA tomorrow or   NEG-A3-rain-FUT-NEG

     'Either it will rain tomorrow, or it won't'

Nevertheless, there is evidence that the negation of a future sentence *va'erã p* is inconsistent with the assertion that *p* is a possible future. In the following dialog, a negative answer is interpreted as a negation of the sentence *Oky va'erã ko'erã* ('It will rain tomorrow'), and it is incompatible with the assertion that it may rain:

(60) Q: O-ky   pa va'e-rã ko'erã?
        A3-rain Q REL-RA tomorrow

        'Will it rain tomorrow?'

     A: Any. # Va'eri   ikatu   o-ky.
        No. But possible A3-rain

        'No. # But it may rain.'

To account for this fact, I will assume that metaphysical uses of RA trigger a presupposition that, following von Fintel (1997), I will call a Homogeneity Presupposition (see also Copley 2002)[4]:

(61) Homogeneity Presupposition of metaphysical RA ($RA_{\mathcal{M}}$):
    $[\![RA_{\mathcal{M}}]\!]^{M,w,c}(P)(t)$ is defined only if $\forall w'[\mathcal{M}(w)(w')(t)] \to \exists t'[t' \geq t \land P(w)(t')]$
    or $\forall w'[\mathcal{M}(w)(w')(t)] \to \neg \exists t'[t' \geq t \land P(w)(t')]$

---

[4]This is essentially what Thomason (1970) proposed, although he did not talk about presuppositions as such.

In order to unify the future and deontic interpretation of *-rã*, I will assume that its future interpretations are modal. (53) is analyzed as in (62). RA heads a modal projection that is embedded directly under TP. In its future uses, the T head that embeds RA is N, the indexical pointer to TU. This is similar to Abusch's (1997) analysis of *will* in English, according to which *will* is the spell out of a tenseless forward shifting operator WOLL combined with the present tense. Note that the current analysis requires that N can occur independently of a tense operator, and projects a TP.

(62)

```
                    TP
                   /  \
                  T    ModP
                  |   /   \
                  N  Mod   AspP
                     |    /   \
                     RA  Asp   VP
                         |    /  \
                        PFV  oky va'erã
```
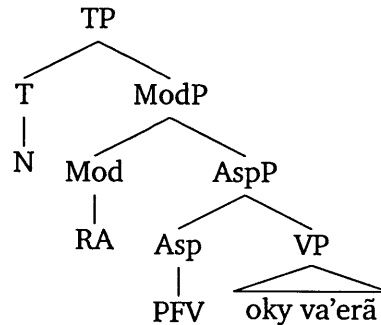
In chapter 6, I offered the following naturally occurring sentences as examples of a deontic modal interpretation:

(63) Guavira ña-moatachi   va'e-rã ja-'u   aguã.
      guavira A1.PL.INC-fumigate VAE-RA A1.PL.INC-eat PURP

      'Guavira must be fumigated before they are eaten.'   (Cadogan 1959)

(64) Ñande ru tenonde gua re ne-ma'endu'a va'e-rã.
      A1.PL.INCL father first NLZ RE A2.SG-obey VAE-RA.

      'You must obey the commandments of our first father.'   (Cadogan 1959)

The reader might wonder whether *va'erã* in these sentences is not better analyzed as a simple future operator, in which case the deontic flavor of the sentences would be obtained by some pragmatic mechanism. For instance, if the speaker has the necessary authority and desire to force the addressee to realize p, her assertion that p will happen may be interpreted as an order to the addressee to realize p. Kissine (2008) argues that apparent deontic uses of *will* in English should be analyzed along these lines. He points out (following Ziegeler 2006) that, contrary to true deontic claims, pseudo deontic claims made with *will* can be paraphrased with a factive predicate. For instance, while (65) cannot be paraphrased as (66), (67) can be paraphrased as (68)[5]:

(65) You must leave the town tomorrow morning with the first train.

(66) It is the case that you leave the town tomorrow morning with the first train.

(67) You will leave the town tomorrow morning with the first train.

---

[5]Examples (65) and (66) are not from Kissine (2008) but I think they make his point more clearly than the examples he quotes from Ziegeler (2006).

(68) It is the case that you leave the town tomorrow morning with the first train.

While I found it hard to reproduce Ziegeler's test in Mbyá due to differences between the two languages[6], I think that the following elicited sentences shows that deontic uses of *va'erã* cannot be reduced to future uses:

(69) Guavira ña-moatachi   va'e-rã ja-'u   aguã. Va'ekueri
      guavira A1.PL.INC-fumigate VAE-RA A1.PL.INC-eat PURP but
      ne-re-moatachi-moã-i,   ha'erami, re-'u   eme.
      NEG-A2.SG-fumigate-MOA-NEG therefore A2.SG-eat NEG.IMP

      'Guavira must be fumigated before they are eaten. But you are not going to fumigate them, so don't eat them'

(70) Ñande   ru   tenonde gua re ne-ma'endu'a va'e-rã. Va'ekueri
      A1.PL.INCL father first   NLZ RE A2.SG-obey   VAE-RA. but
      a-ikuaa   na-ne-ma'endu'a-mo'ã-i.
      A1.SG-know NEG-A2.SG-obey-MOA-NEG

      'You must obey the commandments of our first father. But I know you are not going to obey them.'

In (69) and (70), the first conjunct is a statement of the form *va'erã p*, and the second conjunct asserts that it is not the case that *p* will happen at a future time. Note that the future orientation of the second conjunct is expressed with *moã*, the negative form of the prospective aspect *-ta*, 'be going to' (see Tonhauser 2011a, for an analysis of *-ta* in PG). The point of this test is that if the first conjunct was a statement about the future, the two conjuncts should contradict each other. Indeed, (71) and (72) show that *must* passes this test in English, while *will* fails it. I conclude that *va'erã* has authentic deontic readings.

(71) You must leave the town tomorrow, but I know you are not going to.

(72) *You will leave the town tomorrow, but I know you are not going to.

If the only difference between the deontic and future uses of RA was the modal base with which the modal combines, we could use the same lexical entry for both uses[7]. However, in the lexical entry proposed in (56), a quantifier over future times has been built inside the denotation of RA. This will not do for the deontic interpretation of RA, which can have a present orientation and is compatible with present frame adverbials. In order to accommodate these facts, I propose the following lexical entry, where the modal base $\mathcal{MB}$ of RA can be either deontic or metaphysical, and RA introduces an existential quantifier over non-past times[8]:

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[6]There is no factive periphrasis comparable to 'It is the case that' in Mbyá, and it is not clear to me that there is an equivalent of the type of 'present' tense used in (66) and (68).

[7]It is common since the work of Kratzer (1981) to assume both that the modal base of a modal is contextually determined, and that some modals impose restrictions on the modal base they can combine with.

[8]For simplicity, I ignore the notion of ordering source.

(73) $[\![\text{RA}]\!]^{M,w,c} = \lambda P_{\langle s,\langle i,t\rangle\rangle}.\lambda t.\forall w'[\mathcal{MB}(w)(w')(t)] \rightarrow \exists t'[t' \geq t \wedge P(w')(t')]$

Given this modification, we must explain why metaphysical interpretations are not available with a present frame adverbials, i.e. why only deontic readings are available in examples like (74):

(74) A: A-mba'apo va'e-rã agỹi.
     A1SG-work REL-RA right.now
     'Right now, I have to work.'

The explanation will be the same as the one I proposed for the future orientation of futurates in chapter 5. Here, I will only give an informal account, and I refer the reader to chapter 5 for more details. Remember that a world w' is metaphysically accessible from a world w at a time t iff w and w' have the same history up to and including t, and differ only with respect to their future. As a consequence, the proposition $\lambda w.\text{MOD}(w)(t)(p)$ formed by combining a metaphysical modal MOD with a proposition p and a time of evaluation t, would be equivalent to the proposition $\lambda w.p(w)$ if the truth of p in w depends only on facts that happened in w before or at the time of evaluation t, i.e. if the truth of p is settled at t in w. Condoravdi (2002) proposes that the use of a metaphysical modal is infelicitous in such a case, a constraint which she calls the *diversity condition*. Condoravdi's reasoning explains why metaphysical readings of RA are impossible with present frame adverbial, or as answers to questions about the present time, because in that case the proposition with which RA combines is settled at TU, which is the reference time of the sentence. In (74) for instance, whether the speaker is working or not at TU is of course settled at TU. Only a deontic reading is available.

7.2.2 Embedding *-rã*

The suffix *-rã* is attested both in complement clauses and in relative clauses. Let us first examine its use in complement clauses. One possible interpretation of *-rã* in the complement of an attitude report or verb of saying is that of a future relative to the matrix event:

(75) Context: Yesterday morning, Juan said: "Amba'apo va'erã ka'aru." ('I will work this afternoon.')

a. Kuee   pyareve Juan he'i   va'e-kue chevy   pe
   yesterday morning Juan A3.say REL-PAST B1SG.OBL OBJ
   o-mba'apo-'-rã-a   ka'aru.
   A3-work-REL-RA-NLZ afternoon

   'Yesterday morning, Juan said to me that he would work in the afternoon.'

b. Kuee   pyareve Juan he'i   va'e-kue chevy   pe o-mba'apo
   yesterday morning Juan A3.say REL-PAST B1SG.OBL OBJ A3-work
   va'e-rã   ka'aru.
   REL-RA afternoon

'Yesterday afternoon, Juan said to me that he would work in the afternoon.'

These two sentences report an assertion that Juan made at a time that precedes TU. According to the analysis of complement clauses that was adopted in section 7.1 of this chapter, the verb of saying *he'i* in (75a/b) selects a relation between times and worlds as a complement, and asserts that this complement is true at the time that Juan located himself when he was performing his assertion, in all the worlds that are consistent with the content of his assertion. In both cases, the property that is embedded by *he'i* is analyzed as in (76), where the modal base of RA is metaphysical[9]. Once this property combines with *he'i*, RA quantifies over worlds that are metaphysically accessible from every world that is consistent with the content of Juan's assertion at the subjective time of his assertion. Since metaphysical RA must satisfy the diversity condition, the proposition that Juan works in the afternoon must not be settled in any of the evaluation worlds of RA[10] at its time of evaluation[11]. This is guaranteed in (76). Note that the proposition that Juan works in the afternoon of the day that precedes TU is settled at the TU of (76), but this does not violate the diversity condition, since the metaphysical modal is not evaluated with respect to the common ground and TU.

(76) $\lambda w.\lambda t.\forall w'[\mathcal{M}(w)(w')(t)] \rightarrow \exists t'[t' \geq t \land \exists e[\tau(e) \subseteq t' \land \textbf{work}(w')(e)(\textbf{Juan})$
$\land \tau(e) \subseteq \textbf{the-afternoon-before-TU}]]$

It is also predicted that *-rã* can have a deontic reading in complement clauses. This prediction is borne out, as indicated by the truth of sentences (77a) and (77b) in the context described in (77):

(77) Context: Yesterday morning, Juan said: "Amba'apo va'erã aỹ." ('I have to work now.')

    a. Kuee   pyareve Juan he'i   va'e-kue chevy   pe
       yesterday morning Juan A3.say REL-PAST B1SG.OBL OBJ
       o-mba'apo-'-rã-a.
       A3-work-REL-RA-NLZ

       'Yesterday afternoon, Juan said to me that he had to work.'

    b. Kuee   pyareve Juan he'i   va'e-kue chevy   pe o-mba'apo
       yesterday morning Juan A3.say REL-PAST B1SG.OBL OBJ A3-work
       va'e-rã.
       REL-RA

       'Yesterday afternoon, Juan said to me that he had to work.'

In relative clauses, *va'erã* is interpreted independently of the matrix event time. This reading is obtained by letting the relative TP be headed by the indexical N, as illustrated in (79):

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[9] I analyze *ka'aru* in (76a/b) as an indexical expression that refers to the day that precedes the time of utterance of (75a/b). This indexical expression is likely complex, but it is left unanalyzed in (76).

[10] i.e. the worlds that are consistent with the content of Juan's assertion.

[11] i.e. the subjective time of Juan's assertion.

(78) Maria o-menda va'e-kue peteĩ ava ng-oo   pe o-japo va'e-rã
     Maria A3-marry REL-KUE one man REFL-house OBJ A3-make REL-RA
     reve.
     with

     'Maria married a man who will build his own house.'

(79)
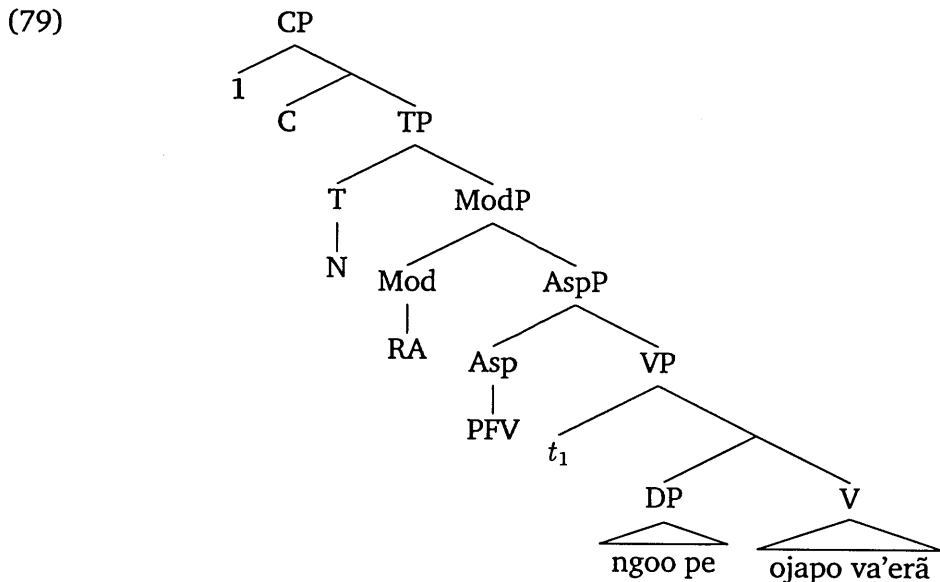
The lack of dependent reading of *va'erã* in relative clauses may be related to the lack of future-in-the-past reading with matrix *va'erã*. Indeed, remember that bare verbs in matrix clauses are non-future. This means that the reference time of matrix clauses with bare verbs can be a past time. Now, since we have argued that *va'erã* is not a tense but is a modal operator, *va'erã* should not be in complementary distribution with tense operators, and whatever mechanism is responsible for the non-future interpretation of matrix sentences with bare verbs should also apply to matrix sentences with *va'erã*. But if this were the case, it should be possible to interpret *va'erã* with respect to a past evaluation time in matrix clauses, contrary to fact: a sentence such as (80) cannot mean that there is a time in the future of some past reference time at which Juan leaves. It only means that Juan will leave, or has to leave.

(80) Juan o-o   va'e-rã.
     Juan A3-go REL-RA

     'Juan will leave.'

I leave this issue for further research.[12]

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[12]One may wonder if this phenomenon is related to the fact that *would* must be licensed by a higher past tense in English.

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7.2.3 Combinations of -rã and -kue

The modal -rã can occur in the scope of the past tense -kue, using the expression va'erã va'ekue, or its contractions va'erãgue and 'rãgue. In matrix clauses, va'erã va'ekue can express deontic necessity with a past perspective, as in the following example:

(81) Juan o-mba'apo va'e-rã va'e-kue   kuee,   ha'e   vy o-pyta
   Juan A3-work   REL-RA REL-PAST yesterday, PRON SS A3-stay

   ng-oo   py.
   REFL-house LOC

   'Juan had to work yesterday, this is why he stayed at home.'

(81) asserts that Juan had to work and carries no counterfactual implication: it can be uttered even if the speaker knows that Juan actually worked yesterday.

Va'erã va'ekue can also be used to express what appears to be a 'future in the past' without deontic import, but in this case it carries counterfactual implications. More precisely, va'erã va'ekue p in that sense is felicitous either if the speaker knows that p came to be false, or if the speaker doesn't know whether p came to be true, but it is infelicitous if she knows that p came to be true. In (82) for instance, only the continuations a and b are felicitous.

(82) O-ky   va'e-rã va'e-kue   kuee.
   A3-rain REL-RA REL-PAST yesterday

   'It should have rained yesterday.'

   a ... va'ekueri nd-oky-i.
        but   NEG-rain-NEG

   '...but it didn't rain.'

   b ... va'ekueri nd-a-ikuaa-i   o-ky   pa.
        but   NEG-A1SG-know-NEG A3-rain Q

   '...but I don't know if it rained.'

   c ... # ha'e o-ky.
        and A3-rain

   #'...and it rained.'

Informants suggest that (82) would be appropriate in a context where there was an accepted prediction of rain yesterday, and the speaker knows in retrospect that this prediction was wrong, or she doesn't know whether it was right or wrong.

Note that the weak-counterfactual ignorance of va'erã va'ekue does not follow from the combination of va'erã and va'ekue as I have analyzed them. Among several issues is the fact that I have analyzed va'erã as a pure metaphysical operator. Under this analysis (82) should actually entail that it rained yesterday, since it asserts that there is a past time t such that it rained on the day before TU in every world that

is metaphysically accessible from the evaluation world w at t, and w is one of these worlds. I will not address these issues in the dissertation, and I leave the analysis of *va'erã va'ekue* for further research.

7.3 Bare verbs

In chapter 6, I presented the following properties of bare verbs in Mbyá (see also Tonhauser 2011b, in Paraguayan Guaraní):

(83) Temporal Properties of Bare Verbs:

1. Non-future in matrix and relative clauses.

2. Simultaneous to matrix event time in complement clauses.

3. Dependent on matrix event time in adverbial clauses.

4. Future in conjoined-future-constructions.

In this section, I will consider three possible analyses of the temporal interpretation of bare verbs in Mbyá and I will argue that they are best analyzed as tenseless (Tonhauser 2011b), or as getting their evaluation time from a null underspecified temporal pronoun (see Matthewson 2003).

7.3.1 Bare verbs and underspecified tense

There are a number of possible analyses of bare verbs that capture their temporal interpretation in matrix clauses. I will consider three of them. First, one may assume the presence of a silent non-future tense operator NFUT, which I will represent as in (84):

(84) $[\![\text{NFUT}]\!]^{M,w,c} = \lambda t.\lambda t'.t' \leq t$

Let $t' \leq t$ iff either every subinterval of t' precedes any subinterval of t, or $t = t'$. Matthewson (2006) considers a similar analysis of null tense in St'át'imcets. In her analysis, tenses are pronouns that are related to the Time of Utterance by a presupposition, while (84) is a relative and non-presuppositional tense. Matthewson also argues that a non-future interval t can actually have a sub-interval that follows TU, as long as t overlaps TU. These differences won't matter in our discussion of bare verbs in Mbyá. Using the denotation in (84), the sentence in (85) would be interpreted as in (86). I assume imperfective aspect for simplicity, since it is not clear whether perfective aspect is available with a present interpretation of bare verbs (although see Matthewson 2006, in St'át'imcets). (84) is predicted to be true in a world w iff there is a time t that either precedes TU or is identical to TU and t is included in an event of raining.

(85) O-ky.
A3-rain
'It rained/was raining/it is raining'

(86) $[_{TP}$ $[_T$ ONCE $[$ NFUT N $]$ $]$ $[_{AspP}$ IMP $[_{VP}$ O-ky $]$ $]$ $]$
       $[\![(85)]\!]^{M,w,c} = \exists t[t \leq N \wedge \exists e[t \subseteq \tau(e) \wedge \mathbf{rain(w)}(e)]]$

A second analysis posits two null tenses, one past and one present. This analysis posits that a sentence like (85) is lexically ambiguous.

(87) $[\![\mathrm{PAST}]\!]^{M,w,c} = \lambda t.\lambda t'.t' < t$

(88) $[\![\mathrm{PRES}]\!]^{M,w,c} = \lambda t.\lambda t'.t' = t$

Finally, we may also argue that bare verbs have an underspecified tense argument in the sense of Matthewson (2003), i.e. a temporal pronoun that can in principle refer to a past, present or future interval, written t_i in the syntactic representation of sentences. The reference of this pronoun depends on the contextual assignment function g_c. In order to predict that bare verbs in matrix sentences cannot have a future reference time, we must also posit a principle like (90) that prevents the null tense from picking up a future referent. (85) is then analyzed as in (91)

(89) $[\![t_i]\!]^{M,w,c} = g_c(t_i)$

(90)   A free temporal pronoun can never refer to an interval that follows TU.

(91) $[_{TP}$ $[_T$ t_i $]$ $[_{AspP}$ IMP $[_{VP}$ O-ky $]$ $]$ $]$
       $[\![(85)]\!]^{M,w,c} = \exists e[g_c(i) \subseteq \tau(e) \wedge \mathbf{rain}(w)(e)]$

Tonhauser (2011b) proposes an analysis of bare verbs in Paraguayan Guaraní that is similar to Matthewson's (2003) underspecified tense analysis. However, she assumes that matrix sentences with bare verbs have no temporal argument at all, and do not project a TP. Translated in the framework that we have been using, her analysis states that matrix sentences with bare verbs denote properties of times[13], as in (92). An interpretation rule like (93) guarantees that sentences that denote properties of time are true iff the property holds of the contextually provided reference time t_{rt}.

(92) $[\![(85)]\!]^{M,w,c} = \lambda t.\exists e[t \subseteq \tau(e) \wedge \mathbf{rain}(w)(e)]$

(93)   Matrix clause rule:
     A matrix clause that denotes a property of times P is judged to be true iff $P(t_{rt})$ is true.

Furthermore, another rule guarantees that such reference times cannot be future times. This analysis is similar to the underspecified tense analysis, except that the evaluation time of matrix clauses is not syntactically represented. Note that, since there is at least one overt tense in Mbyá, namely the past tense *-kue*, and this tense occupies a T head, it is not uneconomical to assume that matrix sentences with bare verbs also project a TP. Things are different for Tonhauser, since she argues

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[13]The actual formalism of Tonhauser (2011b) is rather different from the one assumed here, but I think that the reinterpretation I propose captures the aspects of her analysis that actually matter to the debate in this section.

that -*kue* in Paraguayan Guaraní is a terminative aspect (which I have argued it is not, at least in Mbyá), and that PG is tenseless. As a consequence, she argues that it would be uneconomical to postulate a semantically 'tenseless' T head in the syntax in matrix clauses with bare verbs, as in (91).

Rather than make a lengthy comparison of these three analyses of bare verbs in matrix clauses, I will dispense with the first two analyses by arguing (following Tonhauser 2011b) that they cannot account for the interpretation of bare verbs in complement clauses. First, note that complements of verbs of saying and attitude are tensed environments, as shown by the possibility of using the past tense allomorph -*gue*. Since these complement clauses are tensed, any silent tense operator that can be used in matrix clauses should in principle be attested in complement clauses too. In particular, we would expect the silent non-future tense NFUT in (84) and the silent past tense in (87) to be attested in this environment. An observable consequence would be the possibility to assign an evaluation time to complement clauses that would be in the past of the matrix event time. This predicts that a sentence like (94) should be acceptable, contrary to facts:

(94) # Kuee,   Juan he'i   Maria o-mano-a   1990 py.
       Yesterday, Juan A3.say Maria A3-die-NLZ-PAST 1990 LOC
       'Yesterday, Juan said that Maria died in 1990.'   (Said in 2012)

On the underspecified tense analysis, the evaluation time of the embedded clause is a pronoun which can be bound by a lambda operator, in which case it will have no effect on the temporal interpretation of the clause. This predicts a 'simultaneous' interpretation of the complement clause, which explains the unacceptability of (94):

(95) Juan he'i [$_{CP}$ 1 [C [[$_{TP}$ [$_T$ t$_1$ [$_{AspP}$ PFV [$_{VP}$ Maria omanoa]]]]]
     [[(94)]]^{M,w,c} = $\exists t[t < TU \land \exists e[\tau(e) \subseteq t \land \tau(e) \subseteq$ **yesterday** $\land \forall(w',t')[(w',t') \in$
     SAY$(w)(e)($**Juan**$)] \rightarrow \exists e'[\tau(e') \subseteq t' \land \tau(e') \subseteq$ **1990** $\land$ **die**$(w')(e')($**Maria**$)]]]$

I conclude that the underspecified tense analysis (or the tenseless analysis) is superior to the other analyses of bare verbs.

Let us now discuss the interpretation of bare verbs in temporal adverbial clauses. Consider example (96) repeated from chapter 6:

(96) O-ky   rire, Juan o-o-ta   ka'aguy re
     A3-rain after Juan A3-go-TA forest   to
     'After it rains, Juan will go to the forest'

The observation we have to account for is that the event described in the *after*-clause follows TU, although there is no future operator in the clause (see Tonhauser 2011b, for similar data in PG). This should not surprise us, of course. Cross-linguistically, the temporal interpretation of temporal adverbial clauses is well known to be dependent to some greater or lesser extent on the temporal interpretation of matrix

clauses (see Ogihara 1996, Heim 1997, Kusumoto 1999, for a discussion of English and Japanese). Mbyá is actually very transparent in this respect. In order to account for the interpretation of temporal adverbial clauses, we only need to assume that these clauses are semantically tenseless (which is consistent with our analysis of bare verbs) and that the adverbial head (before/after/when) relates their evaluation time to the matrix event time. Since the temporal operators -*kue* (past tense), -*rã* (future oriented modal) and -*ta* (prospective aspect) are ungrammatical in adverbial clauses, no complications arise. Following von Stechow (2002), I analyze adverbial heads such as *rire* ('after') as relations between times or events (i.e. their arguments can be either times or events or both).

(97) $[\![\text{rire}]\!]^{M,w,c} = \lambda t.\lambda t'.t' > t$

The interpretation of the clausal complement of *rire* is more complex. There is a reading of (96) according to which Juan will go to the forest tomorrow after some specific event of raining. The context dependency of the adverbial clause can be captured by letting its reference time be a free variable (the underspecified tense). The reference time is related to the event time by a silent aspect, presumably a perfective aspect in (96). On the other hand, we also want the adverbial head *rire* to bind the subordinated event time to express that this event precedes the matrix event. I will again follow von Stechow (2002) and assume that what *rire* binds in this case is the internal argument of a silent preposition AT that modifies the subordinated VP. More precisely, I assume that the embedded CP denotes a property of times that is related to the adverbial *rire* by a silent description operator m-inf. $[\![\text{m-inf}]\!]^{M,w,c}$ maps a property of times to the maximally informative time that satisfies it[14]:

(98)
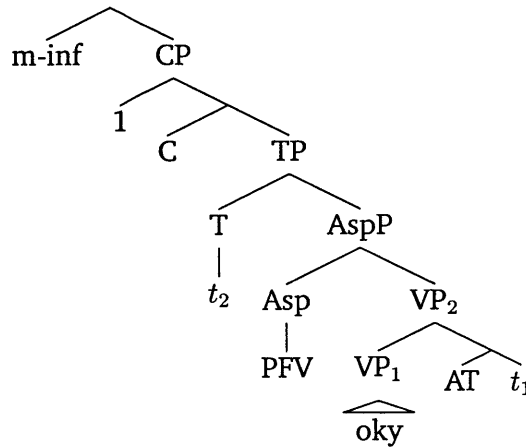
(99) $[\![\text{VP}_1]\!]^{M,w,c} = \lambda e.\textbf{rain}(w)(e)$
$[\![[_{PP}\text{ AT }t_1]]\!]^{M,w,c} = \lambda t.t = g_c(1)$
$[\![\text{VP}_2]\!]^{M,w,c} = \lambda e.\textbf{rain}(w)(e) \wedge \tau(e) = g_c(1)$
$[\![\text{AspP}]\!]^{M,w,c} = \lambda t.\exists e[\tau(e) \subseteq t \wedge \textbf{rain}(w)(e) \wedge \tau(e) = g_c(1)]$
$[\![\text{TP}]\!]^{M,w,c} = \exists e[\tau(e) \subseteq g_c(2) \wedge \textbf{rain}(w)(e) \wedge \tau(e) = g_c(1)]$

[14]See chapter 2 about *m-inf*.

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$[\![CP]\!]^{M,w,c} = \lambda t.\exists e[\tau(e) \subseteq g_c(2) \wedge \textbf{rain}(w)(e) \wedge \tau(e) = t]$

$[\![[\text{m-inf CP}]]\!]^{M,w,c} = \mu(\lambda w.\lambda t.\exists e[\tau(e) \subseteq g_c(2) \wedge \textbf{rain}(w)(e) \wedge \tau(e) = t])(w)$

$[\![[\text{m-inf CP}]\ \text{rire}]\!]^{M,w,c} = \lambda t.t > \mu(\lambda w.\lambda t.\exists e[\tau(e) \subseteq g_c(2) \wedge \textbf{rain}(w)(e) \wedge \tau(e) = t])(w)$

In the matrix clause, the temporal adverbial modifies the VP. The future operator *-ta* is analyzed as a prospective aspect, c.f. Tonhauser (2011a)[15]. (96) is analyzed as follows:

(100)
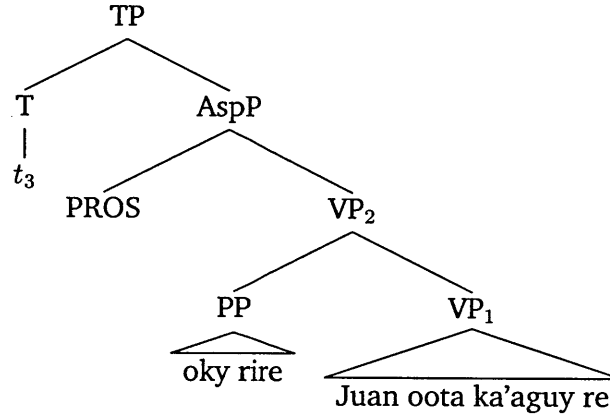
(101) $[\![PROS]\!]^{M,w,c} = \lambda P.\lambda t.\exists e[\tau(e) > t \wedge P(e)]$

$[\![VP_1]\!]^{M,w,c} = \lambda e.\textbf{go}(w)(e)(\textbf{the-forest})(\textbf{Juan})$

$[\![(96)]\!]^{M,w,c} = \exists e[\tau(e) > g_c(t_3) \wedge \textbf{go}(w)(e)(\textbf{the-forest})(\textbf{Juan})$
$\wedge\tau(e) > \mu(\lambda w'.\lambda t'.\exists e'[\tau(e') \subseteq g_c(t_2) \wedge \textbf{rain}(w')(e') \wedge \tau(e') = t'])(w)]]$

7.3.2 Exceptional futures

Tonhauser (2011b) noted that in PG, clauses with bare verbs may have a future reference time in conjoined sentences, when a previous conjunct has some future oriented morphology, such as the prospective aspect *-ta*. We saw in chapter 6 that the same phenomenon obtains in Mbyá. Tonhauser argues that this indicates that clauses with bare verbs are really tenseless since they can have a future as well as a past or present reference time. In order to account for this reading, Tonhauser posits the following rule that lets tenseless sentences be interpreted with respect to a future reference time in these constructions:

(102) **Temporal reference in Guaraní coordination constructions**
If an utterance U consists of conjoined sentences S_1 to S_n (for $1 < $ n) and the eventuality time of $S_i (1 \leq i < n)$ is temporally located in the future of the utterance time, then the reference time for S_{i+1} is a time shortly after the eventuality time of S_i. (Tonhauser 2011b)

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[15]Tonhauser proposes a modal analysis of *-ta*. I assume that the morpheme *-ta* must agree with a silent prospective aspect PROS. Here, I stick to a simpler non modal analysis which suffices in the current discussion.

I am not sure that the possibility of future reference with bare verbs in these constructions is such a good argument in favor of a tenseless analysis of bare verbs, since we still have to account for the non-future interpretation of bare verbs in matrix and relative clauses, and their simultaneous interpretation in complement clauses. Indeed, (101) is clearly a specific constructional rule that overrides a more general pragmatic rule of interpretation of tenseless sentences. In other words, it stipulates that the temporal interpretation of sentences with bare verbs in conjoined future constructions must be treated differently from their interpretation in other environments. Stipulation for stipulation, an analysis that posits a non-future tense operator in matrix clauses would not be more arbitrary if it assumed a future operator in conjoined future constructions. This being said, I still believe that the interpretation of bare verbs in complement clauses motivates an underspecified tense analysis of clauses with bare verbs. As for coordination constructions, (101) is consistent with the underspecified tense analysis I have adopted, and I will adopt it without further discussion.

7.3.3   Objections to the indeterminate tense analysis

I would like to close this chapter with a discussion of possible objections to the underspecified tense analysis of bare verbs in Mbyá. More specifically, I will answer the following questions:

1. Why would speakers use an underspecified tense if it has no semantic content? Is it not more economical to assume a tenseless analysis?

2. Why would learners posit a silent T head when there is no independent and overt evidence of the syntactic realization of tense in the language?

Let us begin with the first question. The underspecified tense analysis that I have proposed has a syntactic component and a semantic component. Whether the analysis is less economical than a tenseless analysis must be asked for each component. Let us begin with the semantic one. As we have seen, bare verbs are generally non-future, and their future interpretation is available only in very particular contexts, which are poorly identified in our current understanding of these languages. As a consequence, one must posit rules of temporal interpretation that prevents future reference with bare verbs, such rules being over-ridden with more specific rules in the so-called 'conjoined future construction.' The tenseless analysis proposed by Tonhauser and the indeterminate tense analysis that I proposed are identical in this respect. On the syntactic side, the question is whether there is any reason to posit a silent T head when sentences with bare verbs might as well be interpreted without one. One such reason is the desire to preserve syntactic uniformity in a language where there is independent evidence of overtly realized tense.

This brings us to the second question: while I recognize that it is worth asking, I think that it is not relevant in Mbyá. Indeed, we have seen that -*kue* is interpreted as a relative past tense in this language. I have considered and rejected alternative

analyses as a perfect aspect, a terminative aspect and a past time adverb. Therefore, there is at least one overt tense that learners can use to infer the presence of a T head in sentences with bare verbs.

In sum, it seems to me that the indeterminate tense analysis that I adopted is at least as motivated as the tenseless analysis.

Chapter 8

Nominal tense

8.1 Nominal tense

8.1.1 Tonhauser on *-kue* and *-rã* inside Noun Phrases

NPs such as *opygua* ('priest') or *kyrĩngue* ('children') denote properties of individuals. As a consequence, their interpretation is sensitive to time in at least two respects. Firstly, we may inquire about the time of existence of its individual argument. Secondly, one may ask at what time the predication is true of that individual. Musan (1995) called these two times the *time of existence* of the NP, and its *predication time*, respectively. It has been known since at least Enç (1981) that the predication time of NPs is to some extent independent from the tense of the verb. Enç (1981) points out for instance that the default interpretation of (1) is that the individuals who were fugitives at a previous time are now (back) in jail.

(1) The fugitives are now in jail.

Similar facts are observed in Mbyá, where the predication time of the subject NP *chera'ychy* ('my wife') in (2) is the time of utterance, even though the verb is interpreted in the past tense:

(2) Context: the speaker is currently married and is talking about his wife.

Che-ra'ychy pytã'i va'e-kue 1984 py
B1.SG-wife born VAE-KUE 1984 in

'My wife was born in 1984.'

Tonhauser (2007) uses three different notions to describe the temporal interpretation of NPs modified by *-kue* and *-rã* in Paraguayan Guaraní[1]. The *nominal time* of an NP is the time at which the property that it describes is asserted to hold of its argument. It corresponds to Musan's predication time. The *possessive time* is the time at which the argument of a possessive NP is asserted to be possessed. Finally, the *NP-time* is the evaluation time of the NP and is determined contextually. It is

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[1] In this chapter, I illustrate Tonhauser's proposal with data from Mbyá Guaraní elicited in Misiones, Argentina.

assumed that the NP-time is identical to the reference time of the clause unless the context provides clues to the contrary. In NPs without -*kue* or -*rã*, the NP-time and nominal/possessive time coincide. In (2) for instance, the NP-time is contextually located at the time of utterance –it can't be located at the reference time, since it would mean that the speaker was married to his wife at the time of her birth; since the speaker is currently married, it is safe to assume that the NP time is TU. Furthermore, the NP-time is identical to the possessive-time. The basic function of -*kue* and -*rã* is to indicate that the nominal/possessive time precedes or follows (respectively) the NP-time. Tonhauser (2007) calls this the *precedence* property of -*kue* and -*rã*. Let us illustrate this idea with data from Mbyá. Consider (3) to (5) in a context that favors a present interpretation of the verb. This means that the reference time of the clauses is TU and by default the NP time is TU as well. Whereas (3) is true iff Juan knows an individual who is a priest[2] at the time of utterance, (4) is true only if the individual that Juan knows was a priest at a time that precedes the time of utterance, and (5) is true only if that individual will be a priest at a time that follows it.

(3) Juan o-ikuaa   peteĩ opygua
     Juan A3-know one   opygua

     'Juan knows an opygua'

(4) Juan o-ikuaa   peteĩ opygua-kue
     Juan A3-know one   opygua-KUE

     'Juan knows an ex-opygua'

(5) Juan o-ikuaa   peteĩ opygua-rã
     Juan A3-know one   opygua-RA

     'Juan knows a future-opygua'

Just as with unmodified DPs, the NP-time of a DP with -*kue* or -*rã* need not coincide with the reference time of the clause. Consider for instance (6), uttered in a context where the speaker was only married once and is divorced at TU. The most plausible interpretation of (6) is that there is a time before TU and included in 1975 when the unique x who was the speaker's wife before TU was born. In other words, the NP-time is fixed at TU and the function of -*kue* in the DP is to shift the time at which that x is the speaker's wife before the NP-time. The reference time of the clause on the other hand is some time in 1975.

(6) Che-ra'ychy-kue pytã'i va'e-kue 1975 py
     B1.SG-wife-KUE born VAE-KUE 1975 in

     'My ex-wife was born in 1975.'

As we will see in more detail in section 2, the precedence property is captured by the assumption that -*kue* conveys that the nominal or possessive time of the NP

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[2]The *opy* is the house where religious ceremonies are performed. The *opygua* is the person who is in charge of the *opy*, hence a priest of sorts.

it modifies precedes the NP-time, and that *-rã* conveys that it follows the NP-time.

Tonhauser (2007) identifies three additional properties of *-kue* and *-rã*. I will illustrate these properties with *-kue* first. Modification of an NP by *-kue* indicates not only that the nominal/possessive time precedes the NP-time, but also that the individual argument of the NP ceased to have the property (or be in the possessive relation) described by the NP before the NP-time. This point is illustrated in the following example (adapted from Tonhauser 2007, p. 838). The first sentence of (7) entails that Juan was a leader at a time that precedes the NP-time, which Tonhauser takes to be the time of utterance. The fact that the use of *teri* ('still') renders the second sentence unacceptable shows that the first sentence entails that this person stopped being a leader before the NP-time. On the other hand, according to Tonhauser, the fact that it is possible to use *ju* ('again') shows that there is no entailment that this person is not a leader at the NP-time. Tonhauser (2007) calls this the *change of state property*:

(7)   Juan mburuvicha-kue, ha'e agỹ mburuvicha ju/#teri.
      Juan leader-KUE,   and now leader   again/# still

      'Juan is an ex-leader, and now he is a leader again/#and now he is still a leader'

I think that the change of state property is stronger than what Tonhauser suggests. Note that the following minimal variation on (7) is completely unacceptable in Mbyá:

(8)   # Agỹ, Juan mburuvicha-kue ha'e mburuvicha ju.
        Now, Juan leader-kue   and leader   again

      #'Now, Juan is an ex-leader and he is a leader again'

My suspicion is that (8) is unacceptable because preposing the adverbial *agỹ* forces it to modify the first predicate (and possibly the second too), which must then be evaluated with respect to a topic time that is a sub-interval of the day of utterance. Consequently, the sentence is interpreted as an assertion that Juan is an ex-leader at TU, and that he is a leader again at TU. This interpretation is predicted to be contradictory, provided the use of *-kue* on *mburuvicha* triggers the obligatory inference that the individual argument of the NP is not a leader at the evaluation time of the NP *mburuvichakue* – in this case, TU. On the contrary, no frame adverbial constrains the interpretation of the first predicate in (7), and given that bare verbs can be interpreted either as past or as present, a past interpretation of the first conjunct is available, an interpretation which is not contradictory. A better translation of (7) is therefore 'Juan was an ex-leader, and now he is a leader again'. In order to check this hypothesis, we can use an overt future tense in place of the null past/present tense, and utter the sentence in a context which makes it clear that the evaluation time of the two predicates is the same. The following examples shows that in this context, the use of *-kue* is unacceptable. Sentence (10) contrasts with the perfectly acceptable (11):

(9) Context: Juan was a professor from 2005 to 2010. Then he stopped being a professor. Now, in January 2012, he doesn't have a job. But next year, in 2013, he plans to be a professor again. He plans to start on January 1st 2013, and to stay a professor until he is old enough to retire, in 2025.

(10) # Año 2013 py, Juan o-iko-ta ñombo'ea-kue, ha'e o-iko-ta ñombo'ea ju.
Year 2013 in, Juan A3-be-TA professor-KUE and A3-be-TA professor again
#'In 2013, Juan will be an ex-professor and he will be a professor again'

(11) Año 2013 py, Juan o-iko-ta ñombo'ea ju
Year 2013 in, Juan A3-be-TA professor again
'In 2013, Juan will be a professor again'

The second property of nominal *-kue* is that it conveys that the lifetime of the individual argument of the NP was not over at the NP-time. In (12), it is understood that the individual who died yesterday was no longer a priest at the time of his death: the transition from being a priest to not being one must have occurred during the lifetime of the individual. Tonhauser (2007) calls this the *existence property* of *-kue*.[3]

(12) Opygua-kue o-mano kuee
opygua-KUE A3-die kuee
'The ex-priest died yesterday'

Finally, *-kue* only occurs with a limited range of noun classes. In particular, *-kue* is not attested with nouns that denote food artifacts (e.g. *chipa* 'corn bread'), natural kinds (e.g. *oky,* 'rain') or permanent/stage final relations (e.g. *ava,* 'man', or *ru,* 'father').

Tonhauser (2007) argues that the precedence property, the change of state property and the existence property are all directly encoded in the denotation of *-kue*. (14) is a reformulation of the proposed denotation in the framework adopted here[4]. It is assumed that NPs have a state argument. State variables are represented with the letter s:

(13) $[\![\text{mburuvicha}]\!]^{c,g,w} = \lambda x.\lambda t.\lambda s.\textbf{leader}(w)(s)(t)(x)$

(14) $[\![\text{-kue}]\!]^{c,g,w} = \lambda P_{\langle e,\langle i,vt\rangle\rangle}.\lambda x.\lambda t.\lambda s.\exists t'[t' < t \wedge P(x)(t')(s) \wedge$
$$\tau(s) = t' \wedge t \subseteq \tau(x) \wedge \neg\exists s'\exists t''[P(x)(t'')(s') \wedge t' \subset t'']]$$

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[3]With some possessive nouns, this property may be satisfied if the transition occurred during the lifetime of the possessor instead. More on this in section 3.

[4]Here is her original formulation (Tonhauser 2007, p. 848). The denotation of the NP *mburuvicha* ('leader') is given in (13).

> The meaning of *-kue* for properties P:
> $\forall P \forall x(\text{KUE}(P)(x) = 1 \text{ iff } \exists t_{nom}(t_{nom} < t_{np} \wedge \tau(P(x)) = t_{nom} \text{ in } w \wedge t_{np} \subseteq \tau(x)))$
> (For all properties P and entities x, the property $\text{KUE}(P)$ is true of x at the noun-phrase time t_{np} in a world w if and only if there is a time t that precedes t_{np} and t is the situation time of $P(x)$ in world w and t_{np} is included in the lifetime of x).

$[\![\text{-kue}]\!]^{c,g,w}$ maps an NP meaning P of type $\langle e, \langle i, vt \rangle \rangle$ to a relation of the same type which holds of an individual x in a state s at a time t if and only if there is a time t' such that (i) t' is before t, (ii) s is a state of x being P at t', (iii) the temporal extension of s (noted $\tau(s)$) is included in t', (iv) t is included in the lifetime of x (noted $\tau(x)$) and (v) s is a maximal state of x being P at t, i.e. there is no state s' and time t'' such that s' is a state of x being P at t'', and t'' properly includes t'. Note that the variable t is the evaluation time of the NP. Therefore, the change of state property should guarantee that there is a maximal state of x being P that ends before t. This is guaranteed by the conjunction of statements (i), (ii), (iii) and (iv). The existence property is guaranteed by statement (iv), that the evaluation time of the NP is included in the lifetime of its individual argument.

Similar facts can be observed with *-rã*. As the following sentence illustrates, *-rã* conveys not only that the nominal/possessive time of the modified NP follows the NP-time, but also that the individual argument of the NP did not have that property at the NP-time (*change of state property*):

(15)   # Agỹ, Juan mburuvicha-rã ha'e mburuvicha teri.
       Now, Juan leader-RA   and leader   still

       #'Now, Juan is a future-leader and he is still a leader.'

Tonhauser (2007) argues that the *existence property* with *-rã* is weaker than it is with *-kue*. She proposes that a noun phrase modified by *-rã* must denote an entity whose lifetime is included in the NP-time and that has a spatiotemporal continuation whose lifetime is included in the nominal time. This difference is meant to explain the following contrast observed between *-kue* and *-rã* in Paraguayan Guaraní:

(16)   Umi yso   panambi-rã.
       these caterpillar butterfly-RA

       'These caterpillars are future butterflies.'   (Tonhauser 2006)

(17)   *Umi panambi yso-kue.
       these butterfly caterpillar-KUE

       (Intended) 'These butterflies are ex-caterpillars.'   (Tonhauser 2006)

Tonhauser argues that *-kue* is infelicitous in (17) because (i) the NPs *yso* ('caterpillar') and *panambi* ('butterfly') denote permanent properties and (ii) the existence property of *-kue* requires that the individuals that are asserted to be butterflies were alive at some past time at which they were caterpillars. Therefore, (17) entails that the same individuals were caterpillars and butterflies are different times, which contradict the requirement that these NPs denote permanent properties. Relaxing the existence property for *-rã* allows Tonhauser to account for the acceptability of (16): what is required there is not that the same individuals are caterpillars at some time and butterflies at some other time, but rather that the caterpillars have 'spatiotemporal continuations' that are butterflies, where the 'spatiotemporal' continuation of

an individual x might be another individual y.

As it happens, I have not observed any contrast like that between (16) and (17) in Mbyá. Both (18) and (19) are acceptable according to my consultants (other examples are discussed in section 8.4):

(18) Kova'e ycho tanambi-rã.
This caterpillar butterfly-RA

'This caterpillar is a future butterfly.'

(19) Kova'e tanambi ycho-kue.
This butterfly caterpillar-KUE

'This butterfly is an ex-caterpillar.'

Tonhauser also argues that reference to spatiotemporal continuations of individuals in the existence property of -rã allows us to account for the unacceptability of the following example:

(20) #Che-ra'y tanambi-rã
B1.SG-son butterfly-RA

'My son is a future butterfly.'

I don't think that it is necessary to invoke the existence property to account for the putative unacceptability of (20). I propose that (20) is false rather than infelicitous. In other words, given common knowledge about human beings and butterflies, (20) is expected to be false for the same reason that 'My son will be a butterfly' is false in English. In sum, it is not clear at this point that one needs to posit a weaker version of the existence property for -rã in Mbyá.

This is not to say that there is no evidence of the existence property with -rã. This property manifests itself in the following example:

(21) Ñombo'ea-rã kuery i-ñarandu-ta.
professor-RA PLURAL B3-knowledgeable-TA

'The future professors will be knowledgeable.'

(21) is acceptable and true in context (22), but it is infelicitous in context (23).

(22) The ministry of education is currently training a group of students to become professors in bi-lingual schools. They are trained very well, they will make good professors.

(23) I think that in a hundred years, school teachers will be more knowledgeable than they are now. Of course, none of the people who will be professors in a hundred years are born yet.

Context (22) describes a set of individuals who are alive at TU but are not professors yet. It is also asserted that these individuals will become good professors.

Context (23) describes a situation in which there will be good professors in the future, but none of them has been born yet at TU. (21) cannot be used to describe this situation. In other words, (21) cannot be interpreted as 'The professors of the future will be knowledgeable', i.e. the NP *ñombo'eará* cannot be used to refer to individuals that do not exist at the evaluation time of the NP (by default the time of utterance) and who will be professors once they come into existence. This is expected if the use of *-rã* on an NP requires that the individual argument of the NP exists at the time of evaluation of the NP and asserts that this individual is in a maximal state of being in the property described by the NP at a time that follows its evaluation time.

On a related note, *-rã* cannot be used on NPs like *ava* ('men') or *kuña* ('women') to mean 'the men/women of the future'. Suffixing *-rã* on these nouns just result in ungrammaticality:

(24) *Ava-rã kuery i-ñarandu-ta.
      Men-RA PLURAL B3-knowledgeable-TA

      (Intended) 'The men of the future will be knowledgeable.'

(25) *Kuña-rã kuery i-ñarandu-ta.
      Women-RA PLURAL B3-knowledgeable-TA

      (Intended) 'The women of the future will be knowledgeable.'

Once again, this is expected under the aforementioned assumptions, provided that *ava* and *kuña* are individual level predicates.

In (26), I propose a reformulation of Tonhauser's analysis of *-rã*, using a version of the existence property similar to the one of *-kue*[5].

(26) $[\![\text{-rã}]\!]^{c,g,w} = \lambda P_{\langle e, \langle i, \langle l, st \rangle \rangle \rangle}.\lambda x.\lambda t.\lambda s.\forall w'[R(w)(w') \rightarrow \exists t'[t' > t \wedge P(x)(t')(s)(w') \wedge$
      $\tau(s) = t' \wedge t \subseteq \tau(x) \wedge \neg\exists s'\exists t''[P(x)(t'')(s')(w') \wedge t' \subset t'']]]$

In (26), it is assumed that individuals can exist in several worlds. Since *-rã* is a modal operator, its NP argument must be shifted to a type $\langle e, \langle i, \langle l, st \rangle \rangle \rangle$, which I assume is done by a rule of Intensional Functional Application (see Heim & Kratzer 1998). $[\![\text{-rã}]\!]^{c,g,w}$ takes an NP meaning P of type $\langle e, \langle i, \langle l, st \rangle \rangle \rangle$ and outputs a relation

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[5]Tonhauser (2007) proposes the following denotation for *-rã*:

The meaning of *-rã* for properties P:
$\forall P \forall x (\text{RA}(P)(x) = 1$ at t_{np} in w iff $\forall w' \in Best(Circ, NOcc, P)\exists t_{nom}\exists x'(t_{np} < t_{nom} \wedge t_{nom} = \tau(P(x'))$ in $w' \wedge cont(x, x')$ in $w' \wedge t_{np} \subseteq \tau(x))$
(For all properties P and individuals x, the property RA(P) is true of x at the noun-phrase time t_{np} in the actual world w if and only if for all worlds w' that are in the set of worlds given by $Best(Circ, NOcc, P)$ there is a time t and an individual x' such that t follows t_{np}, t is the situation time of $P(x')$ in w', x' is a spatiotemporal continuation of x in w', and t_{np} is included in the time of existence of x.)

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of the same type which holds of an individual x in a state s at a time t if and only if for every world w' accessible from w, there is a time t' such that (i) t' is after t, (ii) s is a state of x being P at t', (iii) the temporal extension of s (noted $\tau(s)$) is included in t', (iv) t is included in the lifetime of x (noted $\tau(x)$) and (v) s is a maximal state of x being P at t, i.e. there is no state s' and time t'' such that s' is a state of x being P at t'', and t'' properly includes t'. Here again, the change of state property follows from the conjunction of statements (i), (ii), (iii) and (iv). The existence property is guaranteed by statement (iv), that the evaluation time of the NP is included in the lifetime of its individual argument.

Note that this definition can easily be transformed to incorporate Tonhauser's weaker existence condition, by using counterpart functions (see Lewis 1968) in the denotation of $r\tilde{a}$. According to the definition in (27), $[\![\text{-}r\tilde{a}]\!]^{c,g,w}(P)(x)(t)(s)$ is true iff the lifetime of x includes t, and in every world w' that is accessible from w, there is a time t' in the future of t at which the counterpart $f(x)(w')$ of x in w' is in a state s of having property P. Tonhauser's reference to spatiotemporal continuations can then be understood as the claim that $\text{-}r\tilde{a}$ uses counterpart functions that map an individual x in an evaluation world w to a possibly different individual $f(x)(w')$ that is a 'spatiotemporal continuation' of x.

(27) $[\![\text{-}r\tilde{a}]\!]^{c,g,w} = \lambda P_{\langle e,\langle i,\langle l,st\rangle\rangle\rangle}.\lambda x.\lambda t.\lambda s.\forall w'[R(w)(w') \to \exists t'[t' > t$
     $\wedge\, P(f(x))(t')(s)(w') \wedge \tau(s) = t' \wedge t \subseteq \tau(x)$
     $\wedge\, \neg\exists s'\exists t''[P(f(x))(t'')(s')(w') \wedge t' \subset t'']]]$

The difference between Paraguayan Guaraní and Mbyá might then boil down to a minor variation in the use of such counterpart functions.

8.1.2 Tense and modality inside DPs

In Tonhauser's proposal, -kue and -rã encode not only the precedence property but also the change of state property and the existence property. This possibility is not available to me, since I have described -kue and -rã as temporal/modal operators that only encode a precedence relation between their temporal arguments. In this subsection, I propose a first analysis of the syntax and semantics of DPs modified by -kue or -rã. I show that my analysis captures the precedence property directly. More work is needed to capture the change of state and existence properties, which will be the topic of sections 2 and 3.

Non-possessive DPs

If we make the hypothesis that the structure of DPs parallels that of clauses, it is natural to assume that the evaluation time of DPs heads a TP. Let us illustrate this first with a DP in argument position. Without nominal tense, the T head is occupied by a silent pronoun ranging over intervals, t_{np}, whose reference is determined by the contextual assignment function g_c. The evaluation time of the DP, $g_c(t_{np})$, may

or may not be identical to the reference time of the clause (in that case $g_c(t_{rt})$), depending on the context of utterance:

(28) A-ikuaa   peteĩ opygua.
      A1SG-know one   priest

      'I know/knew a priest.'

(29)
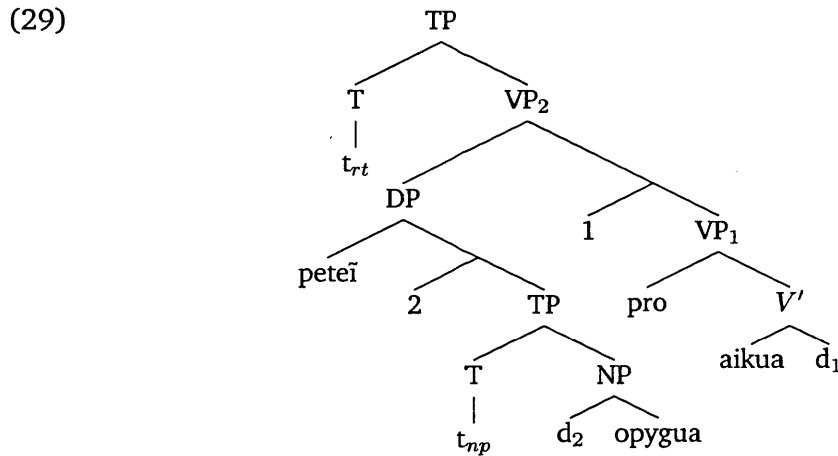
(30) $[\![(29)]\!]^{M,w,c} = \exists x[\mathbf{priest}(w)(g_c(t_{np}))(x) \wedge \mathbf{know}(w)(g_c(t_{rt}))(x)(\mathbf{I})]$

The function of nominal tense is to shift the time of predication of the NP in the past of its evaluation time t_{np}, which means that the latter is the internal argument of the tense operator PAST:

(31) A-ikuaa   peteĩ opygua-kue.
      A1SG-know one   priest-KUE

      'I know/knew an ex-priest.'

(32)

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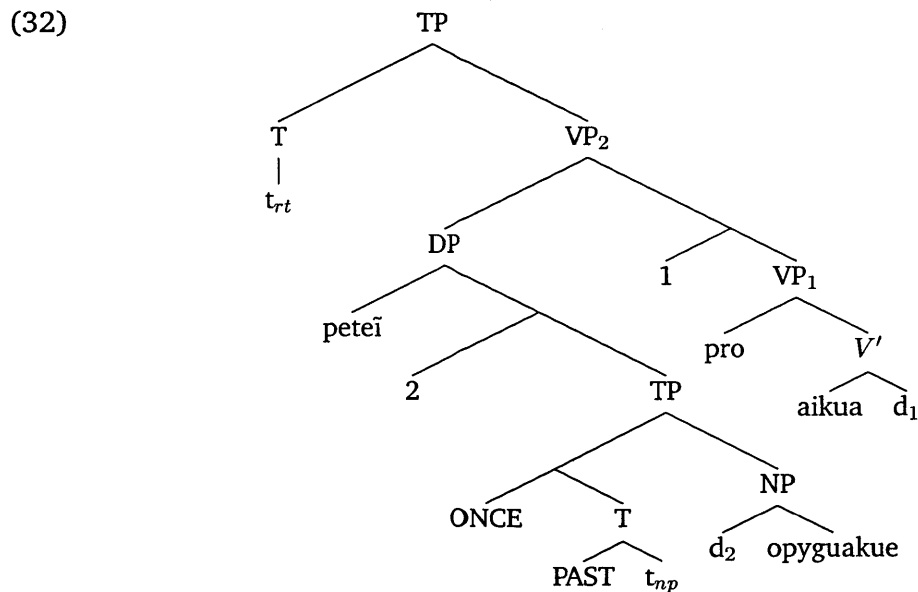
(33) $[\![(32)]\!]^{M,w,c} = \exists x[\exists t[t < g_c(t_{np}) \wedge \mathbf{priest}(w)(t)(x)] \wedge \mathbf{know}(w)(g_c(t_{rt}))(x)(\mathbf{I})]$

According to (33), (32) is true iff there is an individual x who was a priest at some time before $g_c(t_{np})$ and the speaker knows x at $g_c(t_{rt})$. By default, $g_c(t_{np}) = g_c(t_{rt})$, therefore (33) asserts that at $g_c(t_{rt})$ the speaker knows an individual who was a priest before $g_c(t_{rt})$. These truth-conditions capture the precedence property of -*kue*, but not the change of state and existence properties.

I argued that -*rã* is a modal operator that is realized in the scope of tense in the extended projection of VPs, and the null hypothesis is that the extended projection of NPs has a similar structure:

(34) A-ikuaa   peteĩ opygua-rã.
      A1SG-know one   priest-RA

      'I know/knew a future-priest.'

(35)
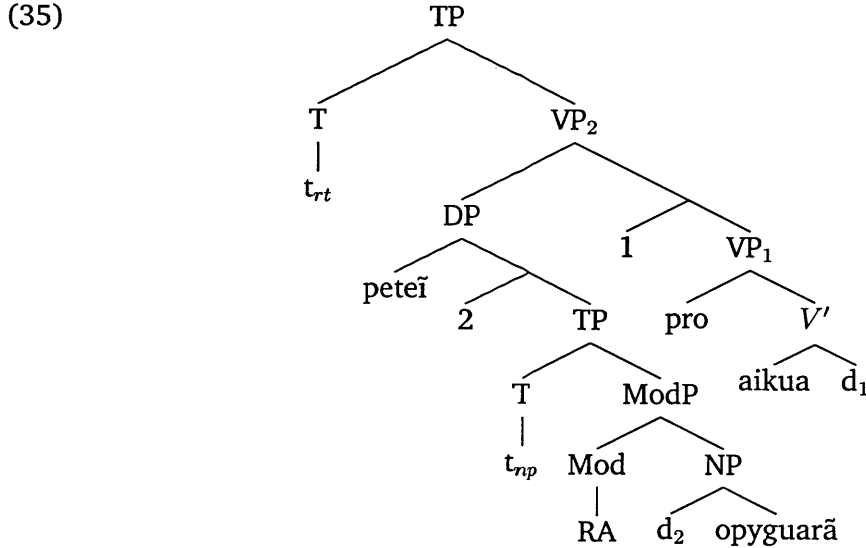
(36) $[\![(35)]\!]^{M,w,c} = \exists x[\forall w'[\mathcal{M}(w)(w')(g_c(t_{np}))] \to \exists t[t > g_c(t_{np}) \wedge \mathbf{priest}(w')(t)(x)]]$
      $\wedge \mathbf{know}(w)(g_c(t_{rt}))(x)(\mathbf{I})]$

(35) is true in w iff there is an x that the speaker knows in w at $g_c(t_{rt})$ and in every world $\mathcal{M}$-accessible from w at $g_c(t_{np})$, there is a time after $g_c(t_{np})$ at which x is a priest. Once again, $g_c(t_{np}) = g_c(t_{rt})$ by default. Provided $\mathcal{M}$ is a metaphysical accessibility relation, these truth-conditions capture the precedence property of -*rã*, but not the change of state and existence properties.

With predicative DPs, the evaluation time of the DP must be identical to the reference time of the clause. This is expected for type-theoretical reasons: the T head in the spinal clause selects a property of times, which means that the evaluation time of the predicate DP must be unsaturated or abstracted over. In the following structure, I assume that a silent copula BE relates the DP to the subject of the clause.

(37) Juan opygua
      Juan priest
      'Juan is/was an opygua'

(38)

```
                        TP
                      /    \
                    T       PrP
                    |      /   \
                   t_rt  Juan   Pr'
                              /    \
                            Pr     NP
                            |       |
                            BE    opygua
```
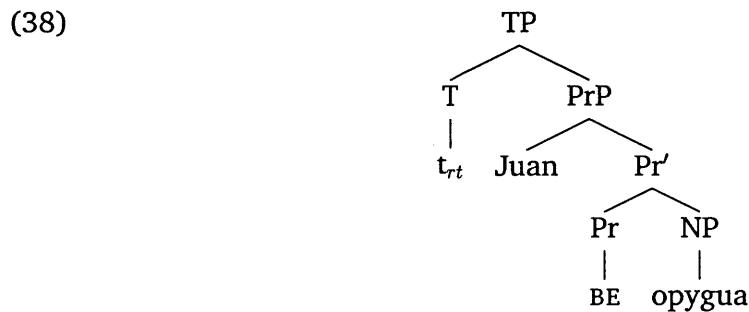
(39) $[\![(38)]\!]^{M,w,c} = \mathbf{priest}(w)(g_c(t_{rt}))(\mathbf{Juan})$

With the nominal tense -*kue*, it must be assumed that the internal argument of the tense operator is bound by the reference time of the clause (or more properly, that it is bound by a lambda that is sister to the clausal T head):

(40) Juan opygua-kue
      Juan priest-PAST
      'Juan is/was an ex-opygua'

(41)

```
              TP
            /    \
          T       \
          |    1    PrP
         t_rt       /   \
                 Juan    \
                    2      Pr'
                          /    \
                        BE      TP
                              /    \
                            /       NP
                         ONCE   T   /  \
                              /   \ d_2  opyguakue
                           PAST  t_1
```
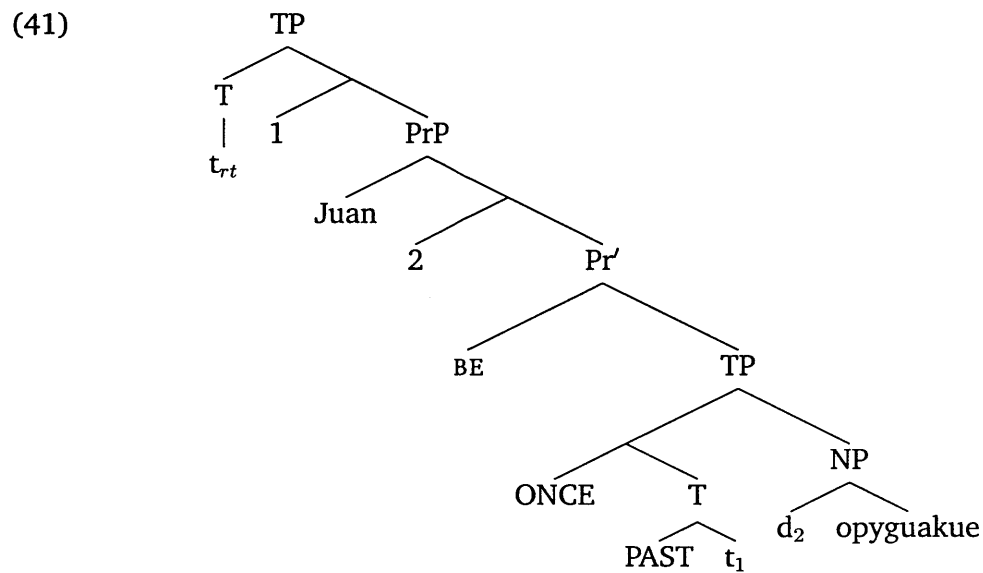
(42) $[\![(41)]\!]^{M,w,c} = \exists t [t < g_c(t_{rt}) \wedge \mathbf{priest}(w)(g_c(t))(\mathbf{Juan})]$

Likewise, the evaluation time of nominal -*rã* is bound by the reference time of the clause:

(43) Juan opygua-rã
      Juan priest-RA
      'Juan is/was a future-opygua'

(44)

TP
├─ T
│ └─ t_{rt}
└─ 1 — PrP
   ├─ Juan
   └─ 2 — Pr′
      ├─ BE
      └─ TP
         ├─ T
         │ └─ t_1
         └─ ModP
            ├─ Mod
            │ └─ RA
            └─ NP
               ├─ d_2
               └─ opyguarã
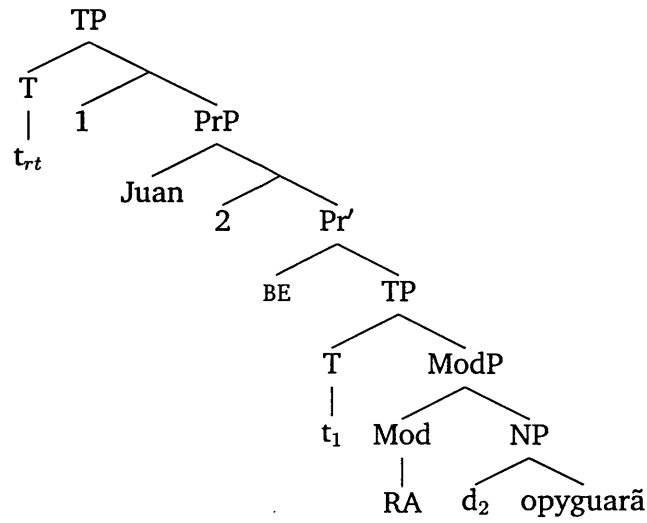
(45) $[\![(41)]\!]^{M,w,c} = \forall w'[\mathcal{M}(w)(w')(g_c(t_{rt}))] \rightarrow \exists t[t > g_c(t_{rt}) \wedge \mathbf{priest}(w')(t)(\mathbf{Juan})]$

Possessive NPs

I assume that the possessive relation is denoted by an operator heading a PossP projection (c.f. Larson & Cho 1999, Alexiadou et al. 2007, for related proposals), and that the possessor is in Spec,PossP, as shown in (47) where the possessor is the first person silent pronoun *pro*.

(46) Che-o   tuvicha.
      B1.SG-house big

      'My house is big.'

(47)

TP
├─ T
│ └─ t_{rt}
└─ VP
   ├─ DP
   │ ├─ D
   │ │ └─ THE
   │ └─ TP
   │   ├─ T
   │   │ └─ t_{np}
   │   └─ PossP
   │   ├─ pro
   │   └─ Poss′
   │   ├─ Poss
   │   │ └─ POSS
   │   └─ NP
   │   └─ chero
   └─ V
      └─ tuvicha

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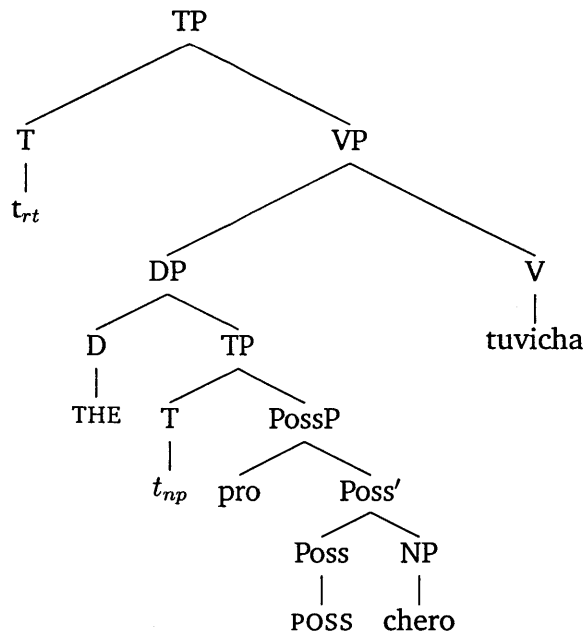
The possessive operator POSS maps an NP denotation (of type $\langle e, it \rangle$) to a function from individuals (the possessors) to a function of type $\langle i, et \rangle$. As can be seen in (48), I assume that POSS identifies the time of the possession and the evaluation time of its argument of type $\langle e, it \rangle$. As we will see, this decision makes correct predictions with nominal tense. Finally, the external argument of POSS, i.e. the 'possessed' individual, is bound by a silent definite determiner in D. With these assumptions, (47) is predicted to be true iff the unique individual that is a house at $g_c(t_{np})$ and that is possessed by the speaker at $g_c(t_{np})$ is big at $g_c(t_{rt})$.

(48) $[\![POSS]\!]^{M,w,c} = \lambda P_{\langle e,it \rangle}.\lambda y.\lambda t.\lambda x.[POSS(w)(t)(x)(y) \wedge P(x)(t)]$

(49) $[\![(47)]\!]^{M,w,c} = \mathbf{big}(w)(g_c(t_{rt}))(\iota x[\mathbf{house}(w)(g_c(t_{np}))(x)$
$$\wedge POSS(w)(g_c(t_{np}))(x)(\mathbf{I})])$$

This analysis correctly predicts scope ambiguities in the interpretation of possessive DPs with *-kue* or *-rã*. I will illustrate these ambiguities with the past tense operator. Consider (50). This sentence is true both in (50A) and in (50B).[6]

(50) Che-ro-gue tuvicha.
      B1.SG-PAST big

      'My former house is big'

      Context A: The speaker owns a building that used to be his house, but he recently turned it into a barn. That building is big.

      Context B: There is a house that the speaker used to own but recently sold to his brother. That house is big.

The availability of these two readings can be captured as a scope ambiguity, as illustrated in (51) and (53) (see next page).

PAST may scope below POSS, as in (51). This generates the reading attested in context A, namely that the possession relation holds at the evaluation time $g_c(t_{np})$ of the DP, but the predication time of the NP precedes $g_c(t_{np})$. Under this reading, (50) asserts that there is a unique x that was a house (before $g_c(t_{np})$) and that the speaker possesses (at $g_c(t_{np})$) and that is big (at $g_c(t_{rt})$):

---

[6]For simplicity, I consider only contexts in which the reference time of the clause is fixed at TU. But since the predicate of (50) is a bare verb, its reference time can in principle be a past time in an appropriate context.

(51)

```
                                TP
                        ┌───────┴───────┐
                        T              VP
                        │        ┌──────┴──────┐
                      t_rt      DP             V
                            ┌────┴────┐        │
                            D        TP     tuvicha
                            │    ┌────┴────┐
                          THE   T        PossP
                                │    ┌─────┴─────┐
                              t_np  pro        Poss′
                                          ┌─────┴─────┐
                                         Poss      1  2  TP
                                          │         ┌────┴────┐
                                        POSS        T        NP
                                                 ┌──┴──┐    ┌──┴──┐
                                               ONCE  PAST  d₁  chero
                                                      t₂
```
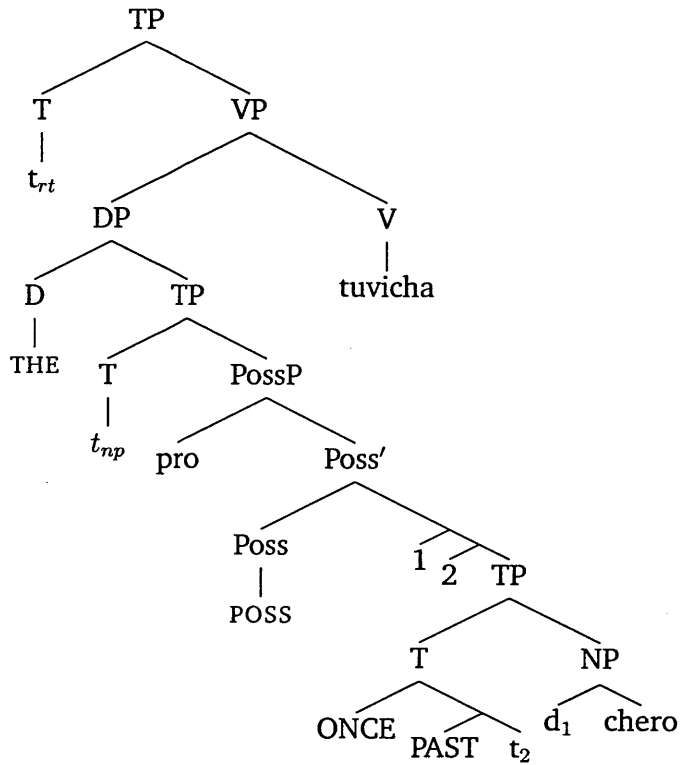
(52) $[\![(51)]\!]^{M,w,c} = \mathbf{big}(w)(g_c(t_{rt}))(\iota x[\exists t[t < g_c(t_{np})$
$\wedge \mathbf{house}(w)(t)(x)] \wedge \mathrm{POSS}(w)(g_c(t_{np}))(x)(\mathbf{I})])$

PAST may also scope above POSS, as in (53), interpreted in (54). Under this reading, which is attested in context B, (50) asserts that there is a unique x that was a house (before $g_c(t_{np})$) that the speaker possessed (before $g_c(t_{np})$) and that is big (at $g_c(t_{rt})$). Note that PossP is not of the right type to combine with the T head by functional application. Indeed, PossP denotes a function of type $\langle i, et \rangle$, while the T head denotes a quantifier of type $\langle it, t \rangle$. This problem is solved by adopting the compositional rule in (55):

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(53)

```
                              TP
                    ┌─────────┴─────────┐
                    T                   VP
                    │          ┌────────┴────────┐
                   t_rt        DP                V
                         ┌─────┴─────┐           │
                         D           TP       tuvicha
                         │      ┌─────┴─────┐
                        THE     T          PossP
                            ┌───┴───┐   ┌───┴───┐
                          ONCE    ┌─┴─┐ pro    Poss'
                                PAST  t_np    ┌──┴──┐
                                            Poss   NP
                                             │      │
                                            POSS  chero
```
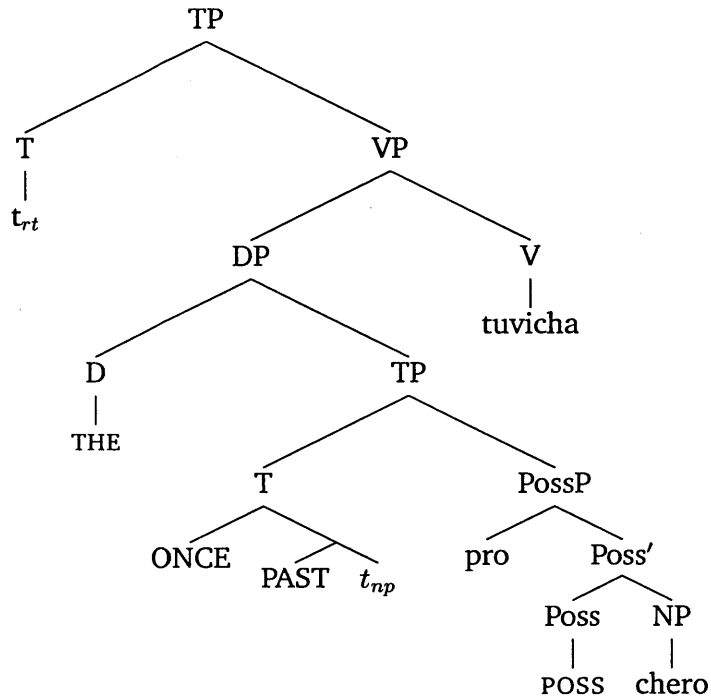
(54) $[\![(53)]\!]^{M,w,c} = \mathbf{big}(w)(g_c(t_{rt}))(\iota x[\exists t[t < g_c(t_{np})$
$\wedge \mathbf{house}(w)(t)(x) \wedge \mathrm{POSS}(w)(t)(x)(\mathbf{I})]])$

(55) If α is a branching node with daughters β of type $\langle \sigma_1, t \rangle$ and γ of type $\langle \sigma_1, \langle \sigma_2, t \rangle \rangle$, then α denotes the function $\lambda x_{\sigma_2}.[\![\beta]\!](\lambda y_{\sigma_1}.[\![\gamma]\!](y)(x))$

A reading that is not available according to this analysis is one in which PAST modifies the possessive relation but does not modify the NP. Larson & Cho (1999) make the same claim about *former* in English possessive DPs. They mention an argument from Heim (p.c.) that *former* cannot modify just the possessive relation without modifying the evaluation time of the NP. Consider (56). If *former* could modify only the possessive relation without modifying the time of predication of the NP *coffee shop*, then the sentence should be true in context C, contrary to facts:

(56) John's former coffee shop is located on Mass Ave.

Context A: John used to own a coffee shop on Mass Ave. He sold it years ago.

Context B: John used to own a coffee shop on Mass Ave. Recently, he turned it into a barber shop.

#Context C: John used to own a barber shop on Mass Ave. He sold it years ago, and the new owner turned it into a coffee shop.

The same point can be made in Mbyá. (50) is infelicitous in context C:

(50) Che-ro-gue tuvicha.
B1.SG-PAST big
'My former house is big.'

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#Context C: The speaker used to own a barn. He sold it to his brother, who turned it into a house. That building is big.

The analysis of *-rã* in possessive DPs is similar to that of *-kue*. (57) is ambiguous between a reading in which RA takes scope below the possessive operator (context A) and a reading in which RA takes scope above it (context B). However, a reading in which RA modifies only the possessive relation is impossible:

(57)   Che-ro-rã tuvicha.
       B1.SG-RA big

'My future house is/was big'

Context A: The speaker owns a barn that he is going to turn into a house. That building is big.

Context B: The speaker's brother recently built a house, which the speaker is going to buy. That house is big.

#Context C: The speaker's brother owns a house, which he is turning into a barn that the speaker will buy. That building is big.

8.2   Deriving the temporal implicatures of *-kue* and *-rã*

8.2.1   Reformulating the problem

First of all, note that both nominal and clausal uses of *-kue* trigger an inference that the property described by the predicate does not hold of its subject at the evaluation time:

(58)   Juan o-iko va'e-kue mburuvicha.
       Juan A3-be VAE-KUE leader

'Juan was a leader'

(59)   Agỹ, Juan mburuvicha-kue
       Now Juan leader-KUE

'Now, Juan is an ex-leader'

In (58), *-kue* modifies the copula *oiko*. Overt copulas are generally avoided in Mbyá, and are used only to support verbal morphology, such as *va'ekue* in (58). By contrast, there is no overt copula in (59), and *-kue* modifies the predicative NP directly. Both (58) and (59) trigger the inference that Juan is no longer a leader at the time of utterance when they are uttered out of the blue. However, while this inference can be canceled in (58), it appears to be mandatory in (59)[7]:

---

[7]The fact that the adverb *agỹ* is used in different positions in (60) and (61) is crucial: in (60), the past tense in the first clause means that the reference time of the clause is in the past, hence that clause would be incompatible with *agỹ*. In the second clause, the use of *agỹ* guarantees a present interpretation. In (61), we want the reference time of both clauses to be the time of utterance, hence *agỹ* is preposed to the sentence. If *agỹ* was used in the second clause, (61) would be consistent, but

(60) Juan o-iko va'e-kue mburuvicha, ha'e agỹ mburuvicha teri
Juan A3-be VAE-KUE leader   and now leader   still

'Juan was a leader, and he is still a leader now'

(61) #Agỹ, Juan mburuvicha-kue ha'e mburuvicha (teri/ju)
Now Juan leader-KUE   and leader   still/again

'Now, Juan is an ex-leader and he is a leader/still a leader/a leader again'

Similar facts are observed with -rã:

(62) Juan mburuvicha agỹ'i,   ha'e o-iko va'e-rã mburuvicha amboe ara
Juan leader   right.now and A3-be VAE-RA leader   other year
avei
also

'Juan is a leader right now, and he will also be a leader next year'

(63) #Agỹ, Juan mburuvicha ha'e mburuvicha-rã
Now Juan leader   and leader-RA

'Now, Juan is a leader and a future-leader'

The problem can therefore be reformulated as follows: can we analyze the temporal implicature triggered by -kue and -rã in such a way that it is obligatory in their nominal uses but can be blocked in their clausal uses?

8.2.2 Temporal Implicatures in clauses

In this subsection, I present evidence that -kue and -rã trigger temporal implicatures, and I analyze these implicatures following the theory proposed in the first part of the dissertation. Remember that obligatory quantity implicatures are generated by exhaustivity operators adjoined at scope sites in the syntactic representation of sentences. I call the complement of an exhaustivity operator its prejacent.

That -kue and -rã trigger TIs is shown by the existence of lifetime effects with individual level predicates, as in (64) and (65). Out of the blue, native speakers infer from (64) that Juan is dead. The sentence is infelicitous if it is known that Juan is alive, barring implausible scenarios where the color of his eyes changed. Similar facts are observed with (65). This sentence could be felicitously uttered for instance by a parent who makes a prediction about the color of the eyes of his yet unborn child. It is infelicitous if it is known that Juan is alive.

(64) Juan recha hovy va'e-kue
Juan eyes blue REL-PAST

'Juan had blue eyes'

the sentence would become irrelevant for the current argument: It would mean 'Juan was an ex-leader, and he is now a leader again', and this data point is compatible both with the assumption that the temporal implicature of nominal -kue is obligatory and with the assumption that it can be canceled. Therefore, we don't want (60) and (61) to form a minimal pair. C.f. the discussion of example (8) in section 1.

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(65) Juan recha hovy va'e-rã
     Juan eyes blue REL-RA
   'Juan will have blue eyes'

As we saw in chapter 3, these facts can be explained if the use of *va'ekue* or *va'erã* in a sentence triggers a TI that its present alternative is false. While there is no present in Mbyá, sentences with bare verbs are non-future, and we have argued in chapter 7 that when the reference time of such a sentence is the time of utterance, it can be analyzed either with a null pronominal reference time t_{rt} in T or with the indexical pointer to the time of utterance N in T. Therefore, a sentence such as (66) admits both (68) and (69) as alternatives, both of which are possible parses of (70).

(66) Juan o-vy'a   va'e-kue
     Juan A3-happy REL-PAST
     'Juan was happy'

(67)
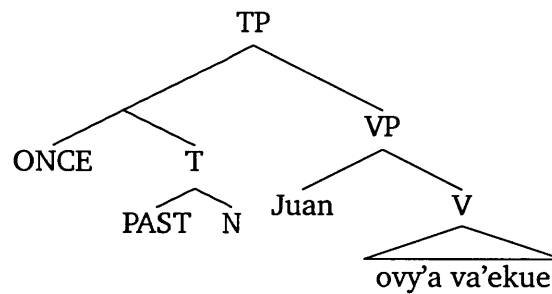
(68)
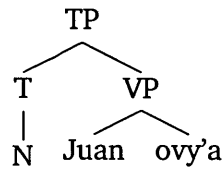
(69)
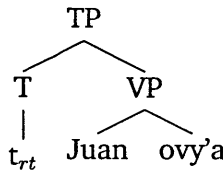
(70) Juan o-vy'a
     Juan A3-happy
     'Juan is/was happy'

Both alternatives are of course structurally simpler than the prejacent, but are they excludable? (68) clearly is, since the two LFs denote logically independent propositions. While the prejacent asserts that Juan was happy at some time before TU, (68) asserts that he is happy at TU. Therefore, (66) will be strengthened as (73), provided (68) is relevant.

(71) $[\![(67)]\!]^{M,w,c} = \exists t[t < TU \land \textbf{happy}(w)(t)(\textbf{Juan})]$

(72) $[\![(68)]\!]^{M,w,c} = \textbf{happy}(w)(TU)(\textbf{Juan})$

(73) $\lambda w.\exists t[t < TU \wedge \mathbf{happy}(w)(t)(\mathbf{Juan})] \wedge \neg\mathbf{happy}(w)(TU)(\mathbf{Juan})$

Whether (70) is excludable depends on the value of $g_c(t_{rt})$ in (74). This is turn depends on contextual information. Now, if the context provides a specific topic time for the prejacent (66) –for instance through a question such as *How did Juan feel yesterday?*– it is reasonable to assume that t_{rt} in the alternative (74) refers to that time as well. In that case, we predict that (74) is not excludable, which is fine since this is a context in which no implicature is expected anyway, due the the lack of relevance of the present tense answer. If on the other hand the context does not provide a specific topic time for the prejacent, it probably does not provide a referent for t_{rt} either; in that case, we may assume either that (74) is infelicitous and discarded, or that t_{rt} is fixed to TU by default. In both cases, if an implicature is generated, it is the same as the one that results from negating (72).

(74) $[\![(70)]\!]^{M,w,c} = \mathbf{happy}(w)(g_c(t_{rt}))(\mathbf{Juan})$

As expected, the TIs triggered by *va'ekue* will be blocked whenever the 'bare verb' alternatives are not relevant. This discussion shows that the computation of TIs with *va'ekue* is not significantly different from the computation of TIs with the past tense in English. I will not discuss how TIs are triggered by the use of *va'erã*, since the process is essentially the same. In the next subsection, I discuss the computation of TIs in DPs, and propose an explanation of their obligatory nature.

8.2.3 Temporal Implicatures in DPs

The goal of this subsection is to show how to capture the so-called 'change of state' property of *-kue* and *-rã* as an implicature. Note that this implicature cannot be global. Rather, it must be an embedded implicature. Consider the example in (75). The correct interpretation of this sentence is (76):

(75) A-ikuaa   peteĩ opygua-kue.
     A1SG-know one   priest-KUE

     'I know/knew an ex-priest.'

(76) $\exists x \exists t[priest'(w)(t)(x) \wedge t < t_{np} \wedge know'(w)(t_{rt})(x)(sp_c)] \wedge$
$\neg\exists x[priest'(w)(t_{rt})(x) \wedge know'(w)(t_{np})(x)(sp_c)]$

Taking $g_c(t_{np}) = g_c(t_{rt})$ by default, and assuming that $g_c(t_{rt}) = TU$ this sentence is true iff there is an x who was a priest at some time before TU and who is not a priest at TU, and the speaker knows x at TU. The implicature, namely that x is not a priest at $g_c(t_{np}) = TU$, is embedded inside the object DP. If the temporal implicature of nominal *-kue* was global, the sentence would be interpreted as (77), contrary to facts. Under this reading (and making the same assumptions about $g_c(t_{np})$ and $g_c(t_{rt})$), the sentence is true iff there is an x who was a priest at some time before TU and such that the speaker knows x at TU, and it is not the case that there is an x who is a priest at TU and such that the speaker knows x at TU. This interpretation is too strong: (77) entails (76), but it also entails that the speaker doesn't know any

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individual who is a priest at the reference time. This is not correct, since (75) does not preclude that the speaker knows both a priest and an ex-priest.

(77) $\exists x \exists t [priest'(w)(t)(x) \wedge t < t_{np} \wedge \neg priest'(w)(t_{np})(x) \wedge know'(w)(t_{rt})(x)(sp_c)]$

In order to generate embedded temporal implicatures as in (76), I assume that exhaustivity operators can be embedded inside DPs. Of course, this already follows from my earlier adoption of Magri's (2009) theory, according to which exhaustivity operators are adjoined at every scope site (i.e. at every node of type t in an LF). I will now discuss the computation of temporal implicatures, first in non-possessive DPs and then in possessive DPs.

Non-possessive DPs

Let us first look at DPs in argument position, as in the preceding example, repeated in (78). Assuming that exhaustivity operators are inserted at every scope site, this sentence may be parsed as in (79):[8]

(78) A-ikuaa   peteĩ opygua-kue.
    A1SG-know one   priest-KUE

    'I know/knew an ex-priest.'

(79)
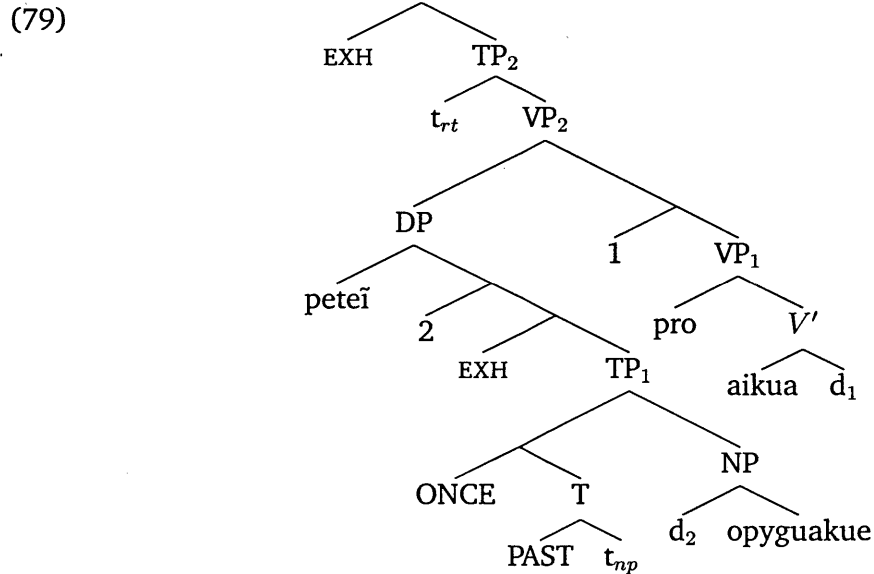
What matters to us is the lower EXH, inside the DP. Its complement is a TP that is interpreted as in (80). From this LF, we can generate the alternative in (81) by a series of deletions and contractions.

(80) $[\![TP_1]\!]^{M,w,c} = \exists t [t < g_c(t_{np}) \wedge \mathbf{priest}(w)(t)(g_c(d_2))]$

---

[8]One additional exhaustivity operator should actually have been adjoined to VP_1, which is a node of type t. Since there is nothing to exhaustifiy at that node, we can safely ignore it.

(81)

$$\begin{array}{c}\text{TP}\\ \diagdown\\ t_{np}\quad \text{N}\\ \diagdown\\ d_2\quad \text{opygua}\end{array}$$
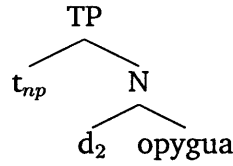
(82) $[\![(81)]\!]^{M,w,c} = \textbf{priest}(w)(g_c(t_{np}))(g_c(d_2))$

The denotation of the alternative in (82) is logically independent from the denotation of the prejacent, and so we can assume that it is excludable. Its exclusion by EXH results in the following strengthened meaning:

(83) $[\![[\text{EXH TP}_1]]\!]^{M,w,c} =$
$\exists t[t < g_c(t_{np}) \wedge \textbf{priest}(w)(t)(g_c(d_2))] \wedge \neg\textbf{priest}(w)(g_c(t_{np}))(g_c(d_2))$

Since there is no alternative in the domain of the upper **exh**, this predicts the correct truth-conditions. (78) is true iff there is an x who was a priest at some time before $g_c(t_{np})$ and who is not a priest at $g_c(t_{np})$, and the speaker knows x at $g_c(t_{rt})$:

(84) $[\![(79)]\!]^{M,c,w} = \exists x[\exists t[t < g_c(t_{np}) \wedge \textbf{priest}(w)(t)(x)] \wedge \neg\textbf{priest}(w)(g_c(t_{np}))(x) \wedge$
$\textbf{know}(w)(g_c(t_{rt}))(x)(sp_c)]$

The analysis of temporal implicatures of predicative DPs is essentially the same. Consider (85), parsed as (86). The prejacent of the embedded EXH is just as in (79), except for the fact that the internal argument of the nominal tense PAST is bound by clausal tense.

(85) Juan opygua-kue.
Juan priest-PAST
'Juan is an ex-priest.'

(86)
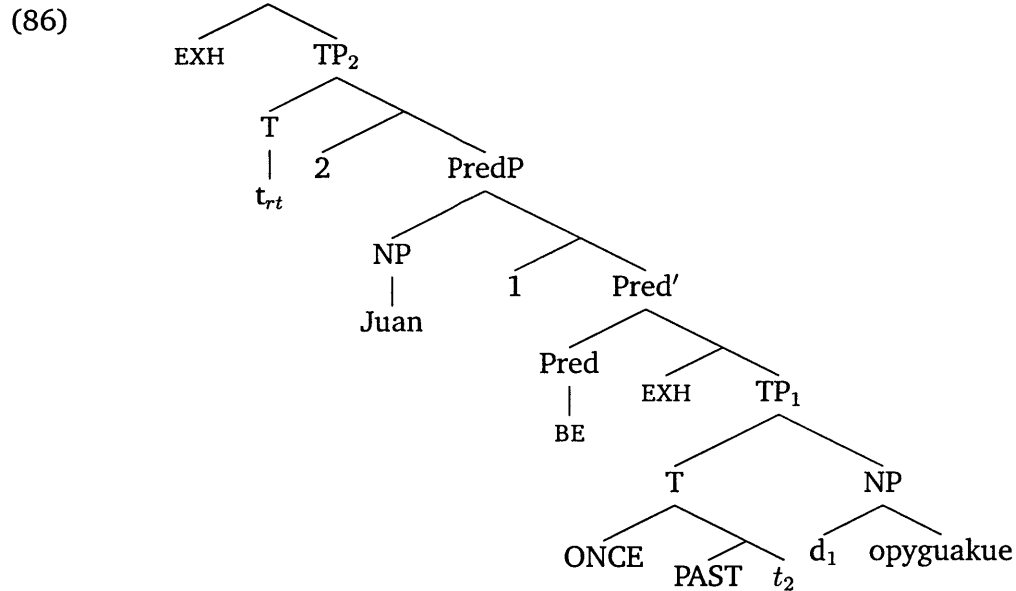
From the prejacent TP$_1$ of the embedded EXH operator, we generate the following alternative, by a series of deletion and contractions:

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(87)

```
           TP
          /  \
        t₂    N
             / \
           d₂  opygua
```
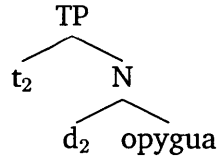
(88) $[\![(87)]\!]^{M,w,c} = \textbf{priest}(w)(g_c(t_2))(g_c(d_2))$

The predicative NP is then exhaustified as in (89), and the sentence is interpreted as in (90): true iff Juan was a priest before $g_c(t_{rt})$ and is not a priest at $g_c(t_{rt})$:

(89) $[\![[\text{EXH } \text{TP}_1]]\!]^{M,w,c} = \exists t[t < g_c(t_2) \wedge \textbf{priest}(w)(t)(g_c(d_1))]$
$\wedge \neg\textbf{priest}(w)(g_c(t_2))(g_c(d_1))$

(90) $[\![(89)]\!]^{M,w,c} = \exists t[t < g_c(t_{rt}) \wedge \textbf{priest}(w)(t)(\text{Juan})] \wedge \neg\textbf{priest}(w)(g_c(t_{rt}))(\text{Juan})$

Possessive DPs

Let us now discuss the computation of temporal implicatures in possessive DPs. We have seen that a nominal tense or modal may scope above or below the possessive operator. The LF of (91) with a narrow scope of the past nominal tense is (92). Remember that the internal argument of the PAST tense operator and the individual argument of the NP must be saturated so that the whole TP_1 is of type t and EXH can be adjoined to it. These arguments must be abstracted over before the extended NP can combine with POSS. The pronominal possessor argument *poss* is then introduced in Spec,PossP, and the evaluation time of the DP is introduced in the head of TP_2.

(91)   Che-ro-kue   tuvicha.
       B1.SG-house-PAST big
       'My ex-house is big.'

(92)

```
        EXH        TP₃
              T           VP
              |
             t_rt    DP           V
                  D      TP₂      |
                  |            tuvicha
                 THE   T      PossP
                       |
                      t_np  pro      Poss'
                            Poss          1
                            |              2
                           POSS        EXH    TP₁
                                          T        NP
                                     ONCE            d₁  chero
                                        PAST   t₂
```
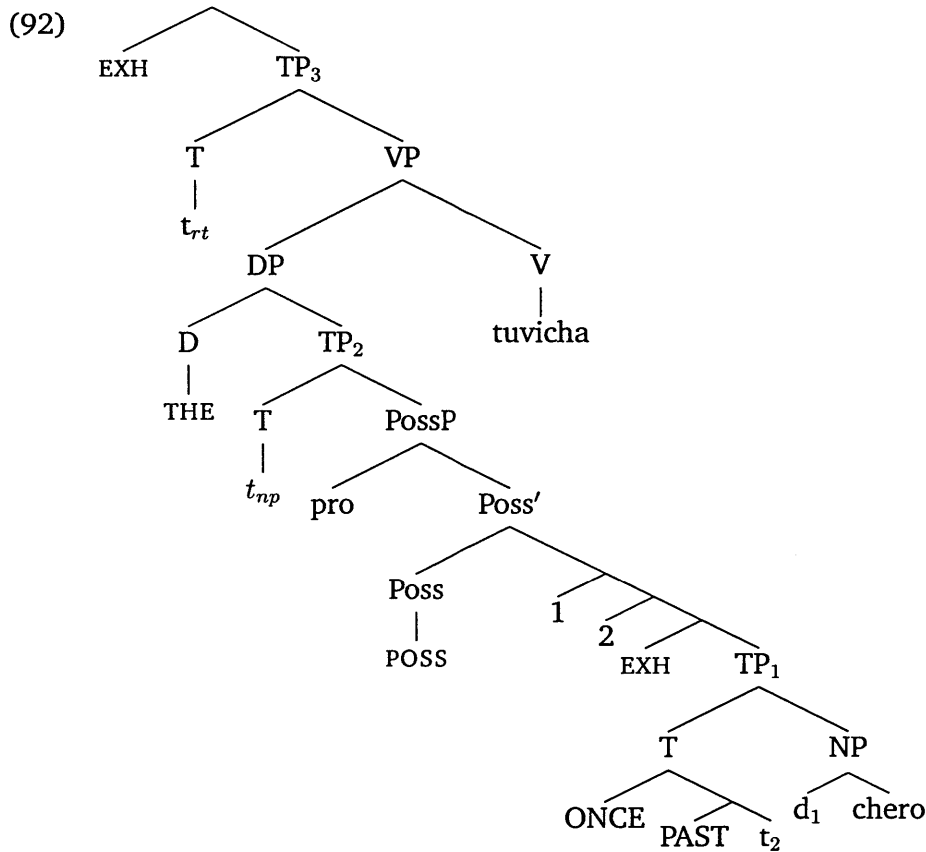
The following alternative to TP*₁* is generated by a series of deletions and contractions:

(93)

```
        TP
     T       NP
     |
    t₂    d₁  chero
```

TP*₁* can then be exhaustified as in (94), and the sentence ends up being interpreted as in (95). Under this reading, (91) is true iff α is big at $g_c(t_{rt})$, where α is the unique x that was a house before $g_c(t_{np})$, that is no longer a house at $g_c(t_{np})$ and that the speaker possesses at $g_c(t_{np})$.

(94) $[\![\text{EXH } \text{TP}_1]\!]^{M,w,c} =$
$\exists t[t < g_c(t_2) \wedge \textbf{house}(w)(t)(g_c(d_1)) \wedge \neg\textbf{house}(w)(g_c(t_2))(g_c(d_1))]$

(95) $[\![(92)]\!]^{M,w,c} = \textbf{big}(w)(g_c(t_{rt}))(\iota x[\exists t[t < g_c(t_{np}) \wedge \textbf{house}(w)(t)(x)$
$\wedge \neg\textbf{house}(w)(g_c(t_{np}))(x)] \wedge \text{POSS}(w)(g_c(t_{np}))(x)(\textbf{I})])$

Nominal tense/modality may also scope above POSS, as in the following LF of (91):

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(96)
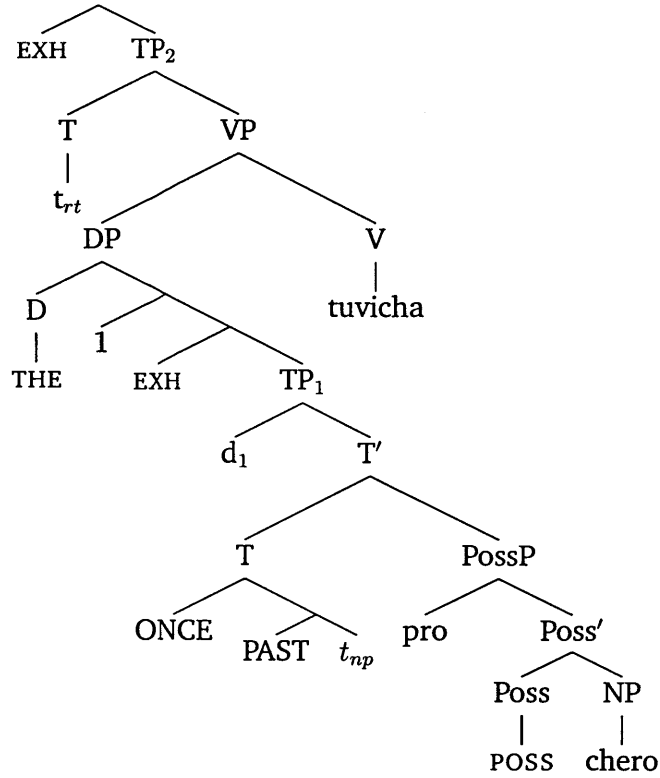
The alternative to TP$_1$ that interests us is once again obtained by deleting PAST and ONCE and contracting the superfluous nodes:

(97)
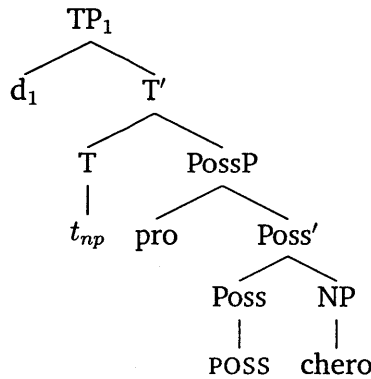
Given the exhaustified TP$_1$ in (98), (96) is interpreted as in (99). Under this reading, (91) is true iff α is big at $g_c(t_{rt})$, where α is the only x that was both a house and possessed by the speaker at some time before $g_c(t_{np})$, and such that x is no longer a house or is no longer possessed by the speaker at $g_c(t_{np})$.

(98) $[\![[\text{EXH TP}_1]]\!]^{M,w,c} =$
$\exists t[t < g_c(t_{np}) \wedge \textbf{house}(w)(t)(g_c(d_1)) \wedge \text{POSS}(w)(t)(g_c(d_1))(\textbf{I})]$
$\wedge \neg\textbf{house}(w)(g_c(t_{np}))(g_c(d_1)) \wedge \text{POSS}(w)(g_c(t_{np}))(g_c(d_1))(\textbf{I})$

(99) $[\![(96)]\!]^{M,w,c} = \textbf{big}(w)(g_c(t_{rt}))(\iota x[\exists t[t < g_c(t_{np}) \wedge \textbf{house}(w)(t)(x)$
$\wedge \text{POSS}(w)(t)(x)(\textbf{I})] \wedge \neg(\textbf{house}(w)(g_c(t_{np}))(x) \wedge \text{POSS}(w)(g_c(t_{np}))(x)(\textbf{I}))])$

8.2.4 How to keep the temporal implicature in place?

In the preceding subsection, it was shown that the change of state property of *-kue* and *-rã* can be analyzed as an embedded temporal implicature. However, temporal implicatures can generally be blocked, as in the following example:

(100) Q: Mba'e pa Juan o-japo 1996 py?
      What Q Juan A3-do 1996 in

      'What was Juan doing in 1996?'

     A: O-iko va'e-kue opygua.
      A3-be REL-PAST priest

      'He was a priest.'

In this dialog, the answer does not convey that Juan is no longer a priest. Following Magri (2009), we have assumed that an implicature that $\neg\phi$ is blocked whenever ϕ is not relevant. In (100), assuming that the set of relevant propositions is identical to the extension of the question, it is expected that the proposition that Juan is a priest at TU is not relevant, and therefore that the corresponding implicature will be blocked.

That TIs of clausal uses of *-kue* or *-rã* can be blocked is shown by the felicity of sentences such as (101):

(101) A-vy'a   va'e-kue kuee,   ha'e a-vy'a   teri agỹ.
      A1.SG-happy REL-PAST yesterday and A1.SG-happy still now

      'I was happy yesterday and I am still happy today.'

By the same device, we can show that TIs of nominal uses of *-kue* or *-rã* cannot be blocked:

(102) * Agỹ Juan opygua-kue, ha'e opygua teri.
      Now Juan priest-PAST and priest still

      *'Now, Juan is an ex-priest, and he is still a priest.'

Given what we have said about implicatures so far, this is surprising. (103) is parsed as in (104), and the implicature that Juan is not a priest at TU is generated by negating the alternative in (105) to the prejacent of EXH_1.

(103) Juan opygua-kue
      Juan priest-PAST

      'Juan is an ex-priest.'

(104) [EXH_2 [$_{TP}$t$_{rt}$ [$_{PredP}$Juan [BE [1 [2 [EXH_1 [[ONCE [PAST t$_2$]] [d$_1$ opyguakue]]]]]]]]]

(105) [t$_2$ [d$_1$ opyguakue]]

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This implicature should be blocked whenever the proposition denoted by (105) is not in the set of propositions that are relevant for the purposes of exhaustification with EXH_1. Let us call (105) the 'bare' alternative of the prejacent of EXH_1, which is the alternative that is obtained by deleting nominal tense and modality from the prejacent. In order to explain the obligatory nature of the implicatures triggered by uses of *-kue* or *-ra* inside (extended) NPs, we must convince ourselves that the bare alternatives of such NPs are obligatorily relevant to the local exhaustivity operator.

Note that these alternatives don't need to be globally relevant. In other words, they don't have to denote possible answers to the Question under Discussion that is addressed by the sentence as a whole. What matters is that they are members of the set of relevant propositions that restricts the exhaustivity operator embedded inside the extended NP. Crucially, that set needs not be the same as the one that restricts the exhaustivity operator adjoined to the matrix clause, which by assumption is (a super set of) the extension of the global Question Under Discussion. Indeed, we will explore the hypothesis that exhaustivity operators embedded inside extended NPs and matrix exhaustivity operators relate to different sets of propositions.

Intuitively, the function of an NP is to identify a set of individuals by ascribing to them a property at an evaluation time t_{np}. One may refine this intuition by adopting the following principle:

(106)   The function of an NP is to answer the question *Who is P at t?*, where P is the property denoted by the NP and *t* is the evaluation time of the NP.

More formally, this question may be formed by abstracting over the individual argument of the head noun. I propose that it is this question that restricts the local exhaustivity operator. For instance, the lower exhaustivity operator in (107) is restricted by the question *Who is a priest at t_{np}?* I will call this question the local Question Under Discussion.

(107)   Juan opygua
        Juan priest
        'Juan is a priest.'

(108)   [EXH_2 [$_{TP}$t$_{rt}$ [$_{PredP}$Juan [BE [1 [2 [EXH_1 [t$_2$ [d$_1$ opyguakue]]]]]]]]]

(109)   Set of relevant propositions with respect to EXH_1:
        $\{p : \exists x[p = \lambda w.\textbf{priest}(w)(t_{np})(x)]\}$

The effect of nominal tense is to shift the evaluation time of the nominal predicate in the past or the future of t_{np}. This has an effect on the set of locally relevant propositions. In (110), the local QUD becomes *Who was a priest before t_{np}?*

(110)   Juan opygua-kue
        Juan priest-PAST
        'Juan is an ex-priest.'

(111) [EXH$_2$ [$_{TP}$t$_{rt}$ [$_{PredP}$Juan [BE [1 [2 [EXH$_1$ [[ONCE [PAST t$_2$]] [d$_1$ opyguakue]]]]]]]]]]

(112) Set of relevant propositions with respect to EXH$_1$:
$\{p : \exists x[p = \lambda w.\exists t[t < t_{np} \wedge \mathbf{priest}(w)(t)(x)]]\}$

(113) Juan opygua-rã
Juan priest-RA
'Juan is a future-priest.'

In (114) with a future nominal tense, the local QUD is *Who will be a priest after t$_{np}$?*

(114) [EXH$_2$ [$_{TP}$t$_{rt}$ [$_{PredP}$Juan [BE [1 [2 [EXH$_1$ [t$_2$ [RA [d$_1$ opyguakue]]]]]]]]]]]]

(115) Set of relevant propositions with respect to EXH$_1$:
$\{p : \exists x[p = \lambda w.\forall w'[\mathcal{M}(w)(w')(t_{np})] \rightarrow \exists t[t > t_{np} \wedge \mathbf{priest}(w')(t)(x)]]\}$

Note that neither (115) nor (112) license a 'bare' answer, i.e. the proposition that x is a priest at t_{np}, for some x, is not in the extension of the question. But it is precisely the relevance of this proposition that we must account for. I propose that the answer lies in the fact that unrestricted questions about the present or the past license present tense answers. Indeed, consider the contrast between (116) and (117). In (116), although the question is about the past it is not about a particular past time. A present tense answer is acceptable. In (117), where the question is about a particular past interval, the present tense answer is infelicitous.

(116) Q: Which ones of your friend was ever married?
       A: John is married.

(117) Q: Which ones of your friends was married in the 1990s?
       A: #John is married.

Therefore, a present tense answer is relevant with respect to an unrestricted question about the past. I don't know how to explain this fact, but it well attested, included in Mbyá as illustrated in the following example:

(118) Q: Re-iko va'e-kue   pa opygua?
          A2.SG REL-PAST Q priest

          'Were you a priest?'

       A: Ta, a-iko   opygua agỹ.
          Yes, A1.SG-be priest   now

          'Yes, I am a priest now.'

Even if we accept that the present alternative is relevant by default, there is still a possibility that the past tense in the prejacent is contextually restricted to a salient set of times, in which case the set of propositions that are relevant for the local exhaustivity operator has the form of a question about this particular set of times, and we don't expect the present alternative to be relevant. Consider the LF of

(119) in (120), where the nominal past tense is restricted by a contextual variable C_3. The local QUD for EXH$_1$ is (121), which does not license a present tense answer. This should block the temporal implicature of (119).

(119) Juan opygua-kue
Juan priest-PAST
'Juan is an ex-priest.'

(120) [EXH$_2$ [$_{TP}$t$_{rt}$ [$_{PredP}$Juan [BE [1 [2 [EXH$_1$ [[ONCE [[PAST t$_2$] C$_3$]] [d$_1$ opy-guakue]]]]]]]]]

(121) Set of relevant propositions with respect to EXH$_1$:
$\{p : \exists x[p = \lambda w.\exists t[t < t_{np} \land t \in g_c(C_3) \land \mathbf{priest}(w)(t)(x)]]\}$

However, this issue never arises because, as a matter of fact, nominal tense can never be restricted to a contextually salient time, contrary to clausal tense. This is illustrated in the following pair of examples. In both cases, the question determines a topic time for the answer, but the past tense can only be restricted to this time if it is used in the clausal spine, and not in the predicative NP:

(122) Q: Mba'e pa re-japo raka'e años 90 py?
What Q A2-do before year 90 in
'What were you doing in the 90s?'

A: A-iko va'e-kue poromboea (ha'e a-iko porombo'ea teri)
A1-be VAE-KUE teacher   and A1-be teacher   still
'I was a teacher (and I am still one).'

(123) Q: Mba'e pa re-japo raka'e años 90 py?
What Q A2-do before year 90 in
'What were you doing in the 90s?'

A: A-iko poromboea-kue
A1-be teacher-kue

'I was an ex-teacher.'
* 'I was a teacher.'

Since nominal tense/modality can never be contextually restricted, nothing blocks the relevance of present alternatives to a past or future NP.

8.3 Deriving the existence property

8.3.1 Existence presuppositions with NPs

The existence property of *-kue* and *-rã* is the fact that the evaluation time of the modified DP is a subset of the lifetime of its individual argument. In (124) for instance, it is understood that the ex-priest was still alive when he stopped being a priest. Note that this individual needs not be alive at the time of the remembering, which shows that the existence property is not due to a constraint that the verb would impose on the lifetime of its arguments.

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(124) Che-ma'endu'a   petei opygua-kue.
       B1.SG-remember one priest-PAST
       'I remember one ex-priest.'

The existence property is reminiscent of the lifetime presupposition discussed by Musan (1997). Musan noted that (125) presupposes that Gregory is alive at TU. The sentence is infelicitous if Gregory is dead. (126) and (127) show that the same point can be made with predicative NPs: given the knowledge that James McCawley is dead, both sentences are infelicitous.

(125)   Gregory is happy.

(126)   #James McCawley is a linguist.

(127)   #James McCawley is not a linguist.

Additional evidence that we are really dealing with a presupposition is given in (128), which shows that the presupposition can be filtered in the usual way:

(128)   Either James McCawley is dead, or he is happy/a linguist.

Musan argued that this presupposition of existence is part of the meaning of predicates like *happy* or *linguist*. A predicate like *linguist* denotes a function from individuals to times to truth-values that is defined only for individuals who are alive at the evaluation time. From now on I will represent presuppositions in the semantic metalanguage as subscripts on predicates, as in (129). The function τ in the presupposition maps individuals to their lifetime. The presupposition states that the lifetime of the individual argument x overlaps the evaluation time t. The sentence *Jim is a linguist* must then be interpreted as in (130).

(129) $[\![\text{linguist}]\!]^{M,w,g} = \lambda x.\lambda t.\mathbf{linguist}(w)(t)(x)_{\tau(x) \circ t}$

(130) $[\![\text{Jim is a linguist}]\!]^{M,w,g} = \mathbf{linguist}(w)(TU)(\mathbf{Jim})_{\tau(\mathrm{Jim}) \circ TU}$

In the rest of this section, I will argue that the existence property of *-kue* and *-rã* is an epiphenomenon that results from the interaction of lifetime presuppositions with temporal implicatures.

8.3.2   The existence property in tensed NPs

Consider (131), with *-kue* in a predicative DP. In section 2, this sentence was interpreted as in (132). (133) adds the lifetime presupposition of *opygua* ('priest') to the representation of its truth-conditions. What is important is not the presupposition of the first conjunct, but that of the second: that the lifetime of Juan overlaps the reference time of the clause, $g_c(t_{rt})$. Since presuppositions project over negation, the sentence as a whole inherits this presupposition. Therefore, (133) asserts that Juan was a priest at some time t before $g_c(t_{rt})$ and is no longer a priest at $g_c(t_{rt})$, and it presupposes that his lifetime overlaps both t and $g_c(t_{rt})$.[9]

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[9]This presupposition and those of the following examples include a variable bound by an existential quantifier, which gives rise to the so-called binding problem, see Karttunen & Peters (1979) and

(131) Juan opygua-kue.
Juan priest-PAST
'Juan is an ex-priest.'

(132) $[\![(89)]\!]^{M,w,c} = \exists t[t < g_c(t_{rt}) \wedge \mathbf{priest}(w)(t)(\mathbf{Juan})] \wedge \neg\mathbf{priest}(w)(g_c(t_{rt}))(\mathbf{Juan})$

(133) $[\![(89)]\!]^{M,w,c} = \exists t[t < g_c(t_{rt}) \wedge \mathbf{priest}(w)(t)(\mathbf{Juan})_{\tau(Juan)\circ t}]$
$\qquad\qquad \wedge \neg\mathbf{priest}(w)(g_c(t_{rt}))(\mathbf{Juan})_{\tau(Juan)\circ g_c(t_{rt})}$

The existence property of *-kue* in (131) is thus derived as a projection of the life-time presupposition of *opygua* from inside the temporal implicature triggered by nominal tense. How is that possible? In the grammatical analysis of implicatures that we have adopted, implicatures are just entailments of sentences. Indeed, given an LF [EXH ϕ], if ψ is an excludable alternative to ϕ that is relevant with respect to EXH, then [EXH ϕ] will denote the proposition that $[\![\phi]\!] \wedge \neg[\![\psi]\!]$. In particular, $\neg[\![\psi]\!]$ is entailed by $[\![[$EXH $\phi]]\!]$. So, if ψ triggers a presupposition p, it is predicted that p will project from below the negation in $\neg[\![\psi]\!]$, just as it would if $\neg[\![\psi]\!]$ was directly asserted rather than implicated.

The existence property is also correctly derived with arguments DPs, and with possessive DPs. (134) asserts that at $g_c(t_{rt})$ the speaker knows some individual was a priest at some t before $g_c(t_{np})$ and is not a priest at $g_c(t_{np})$, and it presupposes that this individual is alive at t and at $g_c(t_{np})$.

(134) A-ikuaa   peteĩ opygua-kue.
A1SG-know one priest-KUE

'I know/knew an ex-priest.'

(135) $[\![(134)]\!]^{M,c,w} = \exists x[\exists t[t < g_c(t_{np}) \wedge \mathbf{priest}(w)(t)(x)_{\tau(x)\circ t}]$
$\qquad\qquad \wedge \neg\mathbf{priest}(w)(g_c(t_{np}))(x)_{\tau(x)\circ g_c(t_{np})} \wedge \mathbf{know}(w)(g_c(t_{rt}))(x)(sp_c)]$

Possessive DPs with nominal tense/modality are ambiguous, as we know. In (137), *-kue* scopes below the possessive operator. The sentence asserts that the unique x that was a house at some t before $g_c(t_{np})$, that is not a house at $g_c(t_{np})$ and that the speaker possesses at $g_c(t_{np})$ is big at $g_c(t_{rt})$. It presupposes that the 'lifetime' of that x overlaps both t and $g_c(t_{np})$, i.e. that at these times x was not destroyed. In (138), *-kue* scopes above the possessive operator. The sentence asserts that that the unique x that was a house at some t before $g_c(t_{np})$, that the speaker possessed at t, and that is not both a house and possessed by the speaker at $g_c(t_{np})$, is big at $g_c(t_{rt})$. It presupposes that the lifetime of x overlaps both t and $g_c(t_{np})$.

(136) Che-ro-kue   tuvicha.
B1.SG-house-PAST big

Beaver (2001). Several theories of presuppositions that are compatible with the present analysis address this problem. See e.g. Beaver & Krahmer (2001) for a solution using trivalent logic. I favor the analysis of Sudo (2012), which predicts exactly the presuppositions described in this section. Sudo's analysis is laid out in Dynamic Predicate Logic –this is not an issue, since the analysis I propose can be reformulated using translation of Mbyá into DPL.

'My ex-house is big.'

(137) $[[(136)]]^{M,w,c} = \textbf{big}(w)(g_c(t_{rt}))(\iota x[\exists t[t < g_c(t_{np}) \land \textbf{house}(w)(t)(x)_{\tau(x)\circ t}$
$\quad \land \neg\textbf{house}(w)(g_c(t_{np}))(x)_{\tau(x)\circ g_c(t_{np})}] \land \text{POSS}(w)(g_c(t_{np}))(x)(\textbf{I})])$

(138) $[[(136)']]^{M,w,c} = \textbf{big}(w)(g_c(t_{rt}))(\iota x[\exists t[t < g_c(t_{np}) \land \textbf{house}(w)(t)(x)_{\tau(x)\circ t} \land$
$\quad \text{POSS}(w)(t)(x)(\textbf{I})]$
$\quad \land \neg(\textbf{house}(w)(g_c(t_{np}))(x)_{\tau(x)\circ g_c(t_{np})} \land \text{POSS}(w)(g_c(t_{np}))(x)(\textbf{I}))])$

There is one reading of nominal tense/modality in possessive DP that we have not derived yet. Tonhauser (2007) notes that in possessive DPs, the existence property can be satisfied by the possessor rather than by the possessed individual. For instance, (139) can be felicitously uttered in a context in which Juan is alive and his wife died in 1995, while they were still married.

(139)   Juan ra'ychy-kue o-mano 1995 py.
        Juan wife-PAST   A3-die   1995 in

        'Juan's ex-wife died in 1995.'

I found that not all speakers accept this reading of modified possessive DPs. Out of three native speakers that were consulted about (139), two judge the sentence true in a context in which Juan and his wife were still married when she died. The last consultant judges the sentence false in that context, and emphasized in the discussion of his judgment that one infers from (139) that Juan and his ex-wife had already divorced when the latter died.

Moreover, even for the first two speakers, such examples are not available with all possessive DPs, but seem limited to possessive DPs built with functional nouns or nouns that can be interpreted functionally. A noun has a functional reading when it maps a possessor to a unique possessed object (of course, the relation of possessor is to be understood quite flexibly). The noun *wife* for instance, maps an individual x to the unique y who is a woman and his married to x. Of course, it is a cultural fact that this noun is interpreted functionally, but English and Mbyá are similar in this respect.

Let us consider more examples. Tonhauser (2007) notes that the noun *pa'i* (priest) in Paraguayan Guaraní allows satisfaction of the existence property by the possessor in possessive constructions. She points out that (140) can be used by the inhabitant of a community to refer to a man who was the priest of the community and died as a priest. (141) is a similar example from Mbyá: this sentence can be felicitously used to express that the speaker remembers the individual who was the priest of his community, even if this individual died as a priest.

(140)   Ore-pa'i-kue   José.
        B1.SG.EXCL-priest-PAST José

        'Our ex-priest Jose'   (Tonhauser 2007)

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(141) Che-ma'endu'a   ore   opygua-kue.
      B1.SG-remember B1.SG.EXCL priest-PAST
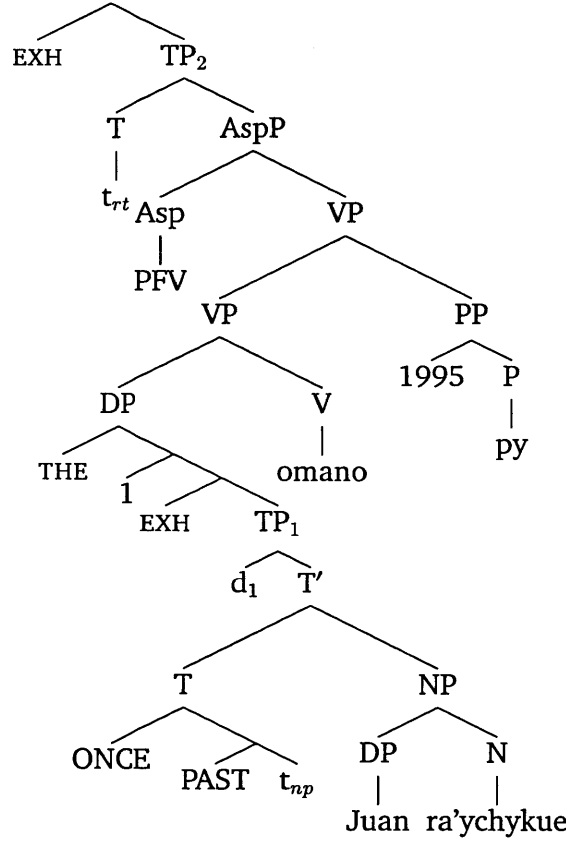   'I remember our ex-priest.'

In both example, the noun *priest* is contextually understood as a functional noun: the relevant fact is not that at some time in the past there was an individual who just happened to be the unique priest in the village; rather, it is that the community has an appointed and unique priest responsible for its spiritual guidance. When a possessive DP is built with a noun that does not readily license a functional reading, the effect disappears: from (142), consultants infer that Marcus stopped being Juan's friend during his lifetime. The sentence is infelicitous if it is known that Marcus was one of Juan's friend when he died.

(142) Che-ma'endu'a   Juan iru-kue,   Marcus.
      B1.SG-remember Juan friend-PAST Marcus

      'I remember Juan's ex-friend, Marcus.'

I propose that the speakers for whom the existence property can be satisfied by the possessor allow the denotation of functional nouns to be built around a function from individual to individuals, without involving a possessive operator. *Ra'ychy* ('wife') may then be represented as in (143). Crucially, the lifetime presupposition of a functional noun is that its individual argument, i.e. the 'possessor', is alive at the time of evaluation of the noun, but there is no presupposition that the 'possessed' individual is. As a result, the presupposition that projects from inside the temporal implicature of (139), analyzed in (144)-(146), is that Juan is alive at $g_c(t_{np})$, but there is no presupposition that his ex-wife is alive at that time.

(143) $[\![\text{ra'ychy}]\!]^{M,c,w} = \lambda x.\lambda t.\lambda y.y = \textbf{wife}(w)(t)(x)_{\tau(x)\text{o}t}$
      where $\textbf{wife}(w)(t)(x)$ is the unique wife of x at t in w.

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(144)

```
            EXH    TP₂
                   /\
                  T   AspP
                  |   /\
                t_rt Asp  VP
                     |    /\
                    PFV  VP    PP
                        /\    /\
                      DP  V  1995  P
                     /\   |      |
                   THE 1 omano   py
                      /\
                    EXH  TP₁
                        /\
                       d₁  T'
                          /\
                         T    NP
                        /\   /\
                    ONCE /\  DP  N
                     PAST t_np |   |
                           Juan ra'ychykue
```

(145) $[[\text{EXH } TP_1]]^{M,w,c} = \exists t[t < g_c(t_{np}) \wedge g_c(d_1) = \textbf{wife}(w)(t)(\textbf{Juan})_{\tau(\text{Juan})\circ t}]$
$\wedge \neg(g_c(d_1) = \textbf{wife}(w)(g_c(t_{np}))(\textbf{Juan})_{\tau(\text{Juan})\circ g_c(t_{np})}$

(146) $[[\text{EXH } TP_2]]^{M,w,c} =$
$\exists e[\textbf{die}(w)(e)(\iota x(\exists t[t < g_c(t_{np}) \wedge x = \textbf{wife}(w)(t)(\textbf{Juan})_{\tau(\text{Juan})\circ t}] \wedge \neg(x = \textbf{wife}(w)(g_c(t_{np}))(\textbf{Juan})_{\tau(\text{Juan})\circ g_c(t_{np})}))) \wedge \tau(e) \subseteq g_c(t_{rt}) \wedge \tau(e) \subseteq \textbf{1995}$

Nouns like *priest* which license functional readings will be ambiguous between non functional and functional denotations, see (147) vs. (148). When used with a functional denotation with nominal tense or modality, they trigger the presupposition that the 'possessor' is alive at the time of evaluation of the DP, and (141) is interpreted as in (149).

(147) $[[\text{opygua}]]^{M,w,c} = \lambda x.\lambda t.\textbf{priest}(w)(t)(x)_{\tau(x)\circ t}$

(148) $[[\text{opygua}_f]]^{M,w,c} = \lambda x.\lambda t.\lambda y.y = \textbf{priest}_f(w)(t)(x)_{\tau(x)\circ t}$

(149) $[[(141)]]^{M,c,w} =$
$\textbf{remember}(w)(TU)(\iota x(\exists t[t < g_c(t_{np}) \wedge x = \textbf{priest}(w)(t)(\textbf{us})_{\langle\tau(\text{us})\circ t\rangle}] \wedge \neg(x = \textbf{priest}(w)(g_c(t_{np}))(\textbf{us})_{\tau(\text{us})\circ g_c(t_{np})})))$

For speakers for whom the existence property must be satisfied by the possessed individual, functional nouns are logically decomposed using a possessor relation. The noun *ra'ychy* ('wife') should then be analyzed as follows:

(150) $[[\text{ra'ychy}]]^{M,w,c} = \lambda x.\lambda t.\lambda y.\textbf{woman}(y)_{\tau(y)\circ t} \wedge \textbf{married}(w)(t)(y)(x)$

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8.4 Lexical restrictions on nominal uses of -*kue* and -*rã*

Tonhauser (2007) noted that -*kue* cannot occur with certain classes of nouns, such as most natural kinds (e.g. *ita* 'stone') or permanent and final stage human properties (e.g. *ra'y* 'son'). As Tonhauser remarks, this falls out from the interaction of the change of state and existence properties, together with constraints on the use of nouns that denote persistent properties. Consider for instance (151), interpreted as in (152). This sentence asserts that Juan was a man at some t before $g_c(t_{rt})$ and implicates that he is not a man at $g_c(t_{rt})$, but it presupposes that he is alive at both times. Since the sentence contradicts the common knowledge that being a man is a persistent property, it is infelicitous.

(151) *Juan peteĩ ava-kue.

   Juan one man-PAST

   *'Juan is/was an ex-man.'

(152) $[\![(151)]\!]^{M,w,c,} = \exists t[t < g_c(t_{rt}) \wedge \mathbf{man}(w)(t)(\mathbf{Juan})_{\tau(\mathrm{Juan})\circ t}]$
   $\wedge \neg(\mathbf{man}(w)(g_c(t_{rt}))(\mathbf{Juan})_{\tau(\mathrm{Juan})\circ g_c(t_{rt})})$

Similar facts are expected when -*rã* combines with a noun that denotes a permanent property, and indeed we find that (153) is ungrammatical in Mbyá:

(153) *Juan peteĩ ava-rã.

   Juan one man-RA

   *'Juan is/was a future-man.'

(154) $[\![(153)]\!]^{M,w,c,} = \forall w'[\mathcal{M}(w)(w')(g_c(t_{rt}))] \rightarrow \exists t[t > g_c(t_{rt})$
   $\wedge \mathbf{man}(w')(t)(\mathbf{Juan})_{\tau(\mathrm{Juan})\circ t}] \wedge \neg(\mathbf{man}(w)(g_c(t_{rt}))(\mathbf{Juan})_{\tau(\mathrm{Juan})\circ g_c(t_{rt})})$

Tonhauser (2006, 2007) also observes some differences between the distribution of -*kue* and -*rã* in Paraguayan Guaraní. In a study of forty-six nouns from six different semantic classes, Tonhauser (2007) notes that -*kue* is ungrammatical on nouns from three of these classes, and compatible only with a possessive reading on nouns of yet another class, while -*rã* is compatible with all but two classes, and even for these two classes it can be used with a possessive reading. These results are summarized in the following table from Tonhauser (2007):

(155) The acceptability of -*kue* and -*rã* across semantic classes (Tonhauser 2007):

	professions	nonfood artifacts	food artifacts	natural kinds (except human relations)	temporary human relations	permanent/ final-stage human relations
-*kue*	✓	✓	*	*	✓ $_{poss}$	*
-*rã*	✓	✓	✓	✓	✓ $_{poss}$	✓ $_{poss}$

Although Tonhauser (2006) gives numerous examples from this study, the complete results haven't been published, and I haven't realized a similar study in Mbyá.

Therefore a careful comparison of the two languages in this respect will have to wait for another occasion. However, I would like to make a few comments based on selected examples from Tonhauser (2006, 2007) and from my own fieldwork.

First of all, I suspect that there is variation between Paraguayan Guaraní and Mbyá in the distribution of -kue and -rã across these lexical classes. Consider for instance the Paraguayan Guaraní example (156) from Tonhauser (2006):

(156)   Ko   kamby kesu-rã
        this milk   cheese-RA

        'This milk is for cheese.'   (Tonhauser 2006)

This example illustrates the use of -rã with a food artifact noun. The same example is grammatical in Mbyá:

(157)   Kova'e kamby keso-rã
        this   milk   cheese-RA

        'This milk is for cheese.'

Since *milk* is presumably categorized as a natural kind or maybe as a food artifact, we expect from the results reported in the table that the following example should be ungrammatical. However, my consultants report that it is acceptable in Mbyá:

(158)   Kova'e keso   kamby-kue
        this   cheese milk-kue

        'This cheese is for milk.'

In order to assess the variation between Paraguayan Guaraní and Mbyá, one would need to know whether (158) is grammatical in Paraguayan Guaraní, and one would need to repeat this comparison for all the words tested in Tonhauser's study. But let us assume that (158) is indeed ungrammatical in Paraguayan Guaraní, as the table from Tonhauser (2007) suggests. Can we make sense of this variation in our theory?

To account for the grammaticality of the Mbyá examples (157) and (158), all that is needed is the assumption that speakers of Mbyá conceptualize a portion of milk and the cheese that is obtained from it as different stages of the same entity. The putative ungrammaticality of the translation of (158) in Paraguayan Guaraní would then be due to the fact that speakers of this language conceptualize the milk and the cheese that is obtained from it as different entities.

How is it possible that (156) is a grammatical sentence in Paraguayan Guaraní then? Earlier in this chapter, I suggested that since -rã quantifies over worlds, it might license the use of counterpart functions to handle relations between individuals across different possible worlds. Remember the denotation that I have assigned to -rã:

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(159) $[\![\text{RA}]\!]^{M,w,c} = \lambda P_{\langle s,\langle i,t\rangle\rangle}.\lambda t.\forall w'[\mathcal{M}(w)(w')(t)] \to \exists t'[t' > t \land P(w')(t')]$

The Paraguayan Guaraní example (156) may then be analyzed as follows. A silent expression $\mathcal{F}$ that denotes a counterpart function f is inserted in the syntactic representation of the NP. The sentence is interpreted as in (161): it is true iff in every world w' that is metaphysically accessible from the evaluation world w at the reference time t_{rt}, there is a time t after t_{rt} at which the counterpart of 'this milk' in w' is some cheese.

(160)

```
                    TP
              ┌──────┴──────┐
              T         ┌───┴────┐
              │         2       PredP
             t_rt            ┌────┴──────┐
                            DP          ┌─┴──────┐
                         ┌──┴──┐        1   ┌────┴────┐
                        Ko kamby        Pred'       Pred
                                              ┌──────┴──────┐
                                             BE            TP
                                                      ┌─────┴─────┐
                                                     t_2         ModP
                                                            ┌─────┴─────┐
                                                           Mod         NP
                                                            │      ┌────┴────┐
                                                           RA     F   d_1   kesu
```
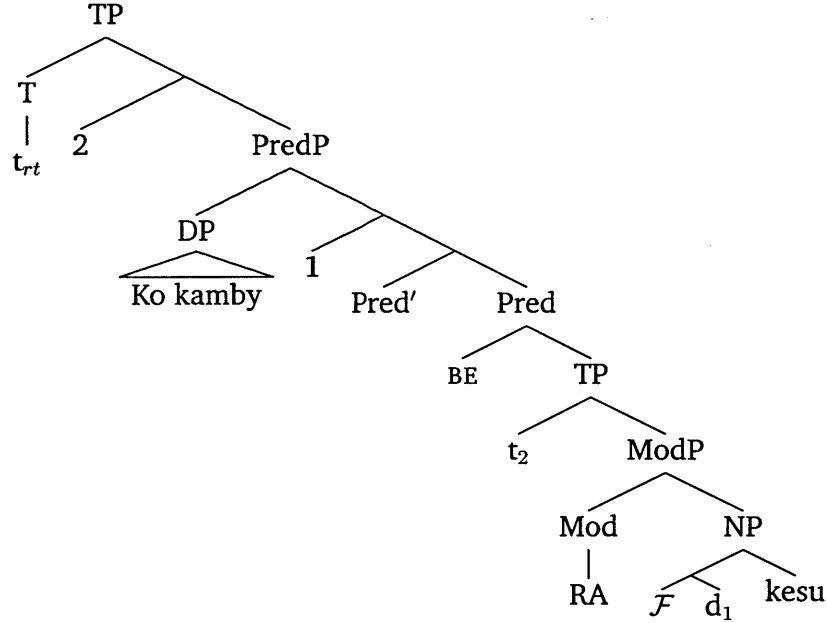
(161) $[\![\mathcal{F}]\!]^{M,w,c} = \lambda x.f(w)(x)$

$[\![1\ \text{Pred}']\!]^{M,w,c} = \lambda x.\forall w'[\mathcal{M}(w)(w')(g_c(t_2))]$
$$\to \exists t'[t' > g_c(t_2) \land \textbf{cheese}(w')(t')(f(x))]$$

$[\![(156)]\!]^{M,w,c} = \forall w'[\mathcal{M}(w)(w')(g_c(t_{rt}))]$
$$\to \exists t'[t' > g_c(t_{rt}) \land \textbf{cheese}(w')(t')(f(\textbf{this milk}))]$$

Since a counterpart function maps a world and an individual to another individual, the counterpart of the portion of milk in the worlds that are quantified over by RA don't have to be portions of milk. What they are will depend on language specific restrictions on the selection of the counterpart function. In this case, I assume that the counterpart function maps the milk to what Tonhauser calls its 'spatiotemporal continuation'. Therefore, this analysis is not fundamentally different from Tonhauser's.

In sum, the asymmetry between the use of -*kue* and -*rã* that is reported in Tonhauser (2006, 2007) can be understood in the unified analysis of nominal and clausal -*rã* that I proposed, as is the putative variation between Paraguayan Guaraní and Mbyá in this respect. I leave a more detailed analysis of these facts to further study.

Chapter 9

Conclusion

In the first part of the dissertation, I have proposed an analysis of temporal implicatures, which is a development of Magri's (2009) theory of mandatory mismatching implicatures and its application to the lifetime effect of past sentences with individual level predicates. I modified Magri's analysis in two respects. First, the computation of temporal implicatures was greatly simplified, especially in sentences with individual level predicates. This was made possible by using Katzir's (2008) theory of structurally defined alternative to exploit a structural asymmetry between present sentences and past or future sentences, see chapter 3. Secondly, I recast the analysis of temporal implicatures within a more precise theory of tense. In particular, I argued against the claim that the present tense is vacuous. I showed that the paradigm of sentences that Sauerland (2002) used to motivate this claim can be analyzed within a non-presuppositional theory of tense, and without assuming that the present tense is vacuous, provided we acknowledge the role of quality implicatures and futurity in the interpretation of sentences of the paradigm, see chapter 5.

Insofar as there exists no satisfying Gricean analysis of temporal implicatures on the market, this work brings support to the grammatical analysis of quantity implicatures and the use of embeddable exhaustivity operators, see Fox (2007), Chierchia et al. (2009). In particular, it was argued in chapter 4 that Musan's (1995) analysis of temporal implicatures, which is the only existing Gricean analysis of temporal implicatures, fails to remain within the bounds of a purely pragmatic analysis of quantity implicatures. This dissertation also brings support to Katzir's (2008) theory of structurally defined alternatives, to the extent that it greatly simplifies the computation of temporal implicatures.

In the second part of the dissertation, the theory of temporal implicatures was applied to the study of tense in Mbyá. The starting point of this study was Tonhauser's (2006) observation that nominal uses of the temporal morphemes -kue and -rã have properties that are uncharacteristic of tenses, which Tonhauser called the existence and change of state properties. In chapter 6, I confirmed that -kue and -rã in their clausal uses do not have these properties. Rather than conclude like Tonhauser that nominal -kue and -rã are not tenses, I endeavored to derive the

change of state and existence properties from the interaction of temporal implicatures with independent semantic properties of noun phrases. Moreover, I argued that -*kue* and -*rã* in their clausal uses are best analyzed as a relative past tense and a future oriented modal, and I offered a unified analysis of the clausal and nominal uses of these particles.

The second part of the dissertation contributes to the cross-linguistic study of tense in two respects. First of all, it brings support to the claim that the same categories of tense and modality that are used in extended verb phrases can be used in noun phrases, c.f. Lecarme (2012). Syntactically, I proposed that the extended NP has a functional structure that is similar to that of the extended VP. Semantically, the use of embedded exhaustivity operators inside DPs requires that the extended NP denotes a proposition, which I argued is denoted by a nominal TP.

The analysis of Mbyá that was proposed in the second part of the dissertation is also relevant to current debates on the existence of tenseless languages. Tonhauser (2006, 2007, 2011b) argues that Paraguayan Guaraní is a tenseless language. Her proposal is motivated in part by the claim that -*kue* cannot be analyzed as a tense, and in part by the claim that sentences with bare verbs can only be analyzed as tenseless sentences. Although Tonhauser and I discuss different languages, I think that Mbyá Guaraní and Paraguayan Guaraní are similar enough to warrant a comparison of our works. By proposing a unified analysis of -*kue* as a relative past tense in its nominal and clausal uses, I remove the first obstacle to a tensed analysis of Mbyá. Indeed, I argue that the analysis of -*kue* as a relative past tense is superior to alternative analyses as a form of aspect or as a temporal adverb. In chapter 6, following Matthewson's (2003) work on St'at'imcets, I proposed an analysis of sentences with bare verbs that posits an underspecified null tense. I argued that this analysis accounts for the same range of data than Tonhauser's (2011b) tenseless analysis in Paraguayan Guaraní, and I challenged the claims that it is conceptually inferior to a tenseless analysis.

Appendix A

Glosses

A1SG: 1st person singular agreement, class A ('active' verbs)
B1SG: 1st person singular agreement, class B ('inactive' verbs)
A1PL: 1st person plural agreement, class A
INC: Inclusive
IMP: Imperative
NEG: Negation
NLZ: Nominalizer
OBJ: Differential object marking (human accusative)
OBL: Oblique
PROS: Prospective Aspect
Q: Question Marker
REL: Relativizer
TOP: Topic marking

Appendix B

Mbyá orthography

The PEIB was still working on an official orthography of Mbyá in Misiones at the time of writing the dissertation. The orthography I adopt reflects the common usage of speakers of the province, judging from published and unpublished texts I have examined Gamba et al. (see e.g. 1984), Gamba & Ramos (see e.g. 2002).
Consonants:

IPA	Orthography	IPA	Orthography
/p/	p	/ŋʷ/	ngu
/t/	t	/g/	g
/k/	k	/β/	v
/k/	c (except before 'e' and 'i')	/ɾ/	r
/m/	m	/ɲ/	ñ
/mᵇ/	mb	/ʧ/	ch
/n/	n	/ʔ/	'
/nᵈ/	nd	/h/	h
/ŋ/	ng		

Vowels:

IPA	Orthography
/a/	a
/ã/	ã or a
/ɛ/	e
/ɛ̃/	e or ẽ
/i/	i
/ĩ/	ĩ or i
/ɨ/	y
/ɨ̃/	ỹ or y

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