CHAPTER 3
TENSE IN TEMPORAL ADJUNCT CLAUSES

This chapter examines the behavior of tense in temporal adjunct clauses (TACs) such as before-, after-, and when-clauses in various languages. The chapter has two main purposes:

On the one hand, we will show that the data on TACs further supports our conclusion from Chapter 2 that a tense syntactically embedded under the scope of another tense may be semantically independent, and that tense systems in natural language allow an embedded tense to 'escape' the scope of the tenses that dominate it without syntactic movement. In Chapter 2, we have proposed a tense system with overt quantification over times in the object language as a system that meets this criterion. But we have not yet discussed another possibility, a possibility that has been shown in Cresswell (1990) to be equivalent in expressive power, i.e., a multiple-index system. In this chapter, we will show that a system with explicit quantification over times can explain data and correlations between seemingly unrelated phenomena in a less stipulative way than a multiple-index system.

On the other hand, our purpose is to explain the cross-linguistic pattern of tense distribution in TACs we saw in Chapter 1. We will see that the pattern regarding tense in TACs is similar to tense in relative clauses: English and Polish/Russian on the one hand show similar behavior and Japanese on the other shows a different pattern. We will argue that this, too, is best explained in terms of the structural difference of TACs in these languages.

This chapter is organized as follows: § 3.1. presents a hypothesis developed in Ogihara (1994, 1996) and the data from Japanese that motivates him to formulate the hypothesis. This hypothesis can be seen as an attempt to account for tense distribution in English and Japanese TACs within a single-index system. In § 3.2., we will see some difficulties that the hypothesis faces. Some of the facts are reported in Arregui and Kusumoto (1998). We will add more data from Japanese. § 3.3 is devoted to an explanation of the cross-linguistic pattern of tense distribution in TACs. We follow Arregui and Kusumoto (1998) and propose that the difference between English/Polish/Russian on the one hand and Japanese on the other is due to the structural difference of TACs in these languages. Specifically, we analyze English/Russian/Polish TACs as relative clauses, as argued in Arregui and Kusumoto, who follow Geis (1970) and Larson (1990). It follows from our conclusion in Chapter 2 that tense in TACs may also be independent of that of the matrix clauses. We will then attempt to give an explanation of the complicated tense distribution in Japanese TACs by analyzing before- and after-clauses as having less structure (i.e., they are not relative clauses) and when-clauses as ambiguous. The discussion in this
subsection will be inconclusive, and we can only suggest what we believe to be on the right track without giving a full explanation. § 3.4. discusses the implication of this analysis regarding issues of explicit quantification over times.

3.1. Ogihara's Relative Tense Hypothesis and Temporal Adjunct Clauses (TACs) in Japanese and English

There is a striking difference between English and Japanese TACs. In English, when the main clause is past tensed, predicates embedded in before- and after-clauses are also past tensed. The present tense results in ungrammaticality.1

(1) a. Eva came home before Elliott left
   b. * Eva came home before Elliott leaves

(2) a. Eva came home after Elliott left
   b. * Eva came home after Elliott leaves

In Japanese, the choice of tense in before- and after-clauses seems to be determined lexically. Tense in the complement clause of mae or maeni 'before' is obligatorily present tense.2,3,4

1 As we have seen in Chapter 1, there are examples where a tense mismatch like (1b) is allowed. See § 3.3.2.

2 The generalization is stated in Nakau (1976), Ogihara (1996), among others.

3 There are cases where mae 'before' allows a past tensed clause.

(i) Taroo-wa bengosidatta mae-wa kookoo-de eigo-o osieteita
    T-top lawyer-be-past before-top high school-at English-acc teach-teiru-past
    'Taroo taught English at high school before he was a lawyer'

(ii) Ota-huzin-ga motinusi-deatta maeni ....
    Ota-Mrs.-nom owner-be-past before
    'Before Mrs. Ota was the owner...'

The (ii) example is cited in Teramura (1980), which is originally from Sembazuru, Kawabata (1965). As far as I know, these exceptions are not discussed in the literature. In addition to the fact that occurrences of past tensed before-clauses are rare, there are two reasons that we believe these to be exceptional. First, past tensed before-clauses are possible only with stative predicates. (As we will see below, Japanese before- and after-clauses do not normally allow stative predicates.) Second, unlike 'normal' before-clauses, these past tensed before-clauses may only have a factual interpretation. We do not know how to account for these cases at this point.

4 mae literally means 'front' and is a noun. It can be used to mean 'before' by itself or it can be followed by a postposition ni 'at'. mae is more restricted in distribution for some
unknown reason; (3a) cannot have mae instead of maeni. And when not followed by the postposition, mae often accompanies the topic marker wa. To my intuition, there is no truth-conditional difference between sentences with mae and maeni when the two words are interchangeable. We do not have any good theory to explain their distribution. In this thesis, we will not distinguish between the two.

There are more variations for the translation of after than before. In addition to atoni, which is derived from the noun ato 'back' plus the postposition ni, we can have ato alone, atode, where de is another postposition meaning 'at', or (te)-kara, where te is the so-called gerundive form of verbs and kara is a postposition meaning 'from'. Some descriptive differences among them are given in Kuno (1973). Again, we will not go into the details of these items.

This is true even when the matrix tense is present or future as shown below:

(i) a. [Junko-ga kita atoni] Satoshi-wa (itumo) kaeru
    J-nom come-past after S-top always leave-pres
    'Satoshi always leaves after Junko comes'

b. * [Junko-ga kuru atoni] Satoshi-wa (itumo) kaeru
    J-nom come-pres after S-top always leave-pres

(ii) a. [Junko-ga kita atoni] Satoshi-wa kaeru daroo
    J-nom come-past after S-top leave-pres probably
    'Satoshi will leave after Junko comes'

b. * [Junko-ga kuru atoni] Satoshi-wa kaeru daroo
    J-nom come-pres after S-top leave-pres probably
It has often been assumed that this is a purely lexical selectional property of before and after in Japanese. (See Nakau 1976 for instance.)

Ogihara (1994, 1996) presents a more interesting account for this difference between English and Japanese. He looks at this difference in connection with another well-known difference between the two languages, namely that English is an SOT language and Japanese is not. He then argues that the difference in tense distribution in TACs follows from the tense system in these languages under one simple hypothesis. The hypothesis is called the relative tense hypothesis, which states that all embedded tenses are interpreted in the scope of structurally higher tenses. This hypothesis is motivated by the behavior of tense in clausal complements. As we saw in Chapter 1, tenses embedded in complement clauses of propositional attitude verbs such as say and believe are not understood as absolute tenses. They are interpreted relative to what we call the 'now' of the matrix subject.

Ogihara extends this theory of tenses to all embedded tenses, including tenses embedded in relative clauses and TACs. We have already seen in Chapter 2 that the hypothesis makes wrong predictions as to tense in relative clauses: the hypothesis has to rely on a movement operation of some sort to predict the availability of the later-than-matrix interpretation of past tensed sentences containing past tensed relative clauses. We have shown that this leads to scope paradoxes. But this fact does not prove that the hypothesis is wrong regarding tense in TACs.

Let us first see how Ogihara explains the peculiar distribution of tense in Japanese TACs. Ogihara argues that what looks like a selectional property of maeni 'before' and atoni 'after' in Japanese follows from the semantics of these connectives, the semantics of the present and past tenses, and the relative tense hypothesis. Very roughly, he proposes the following semantics for before, after, the past and the present tenses in Japanese: $p$

\[
\text{after/before } q \text{ is true iff there is a time } t \text{ such that } p \text{ is true at } t \text{ and there is a time } t' \text{ such that } q \text{ is true at } t' \text{ and } t \text{ is after/before } t'.
\]

\[
\text{Past } p \text{ is true at } t \text{ iff there is a time } t' \text{ such that } t' \text{ is before } t \text{ and } p \text{ is true at } t'.
\]

\[
\text{Pres } q \text{ is true at } t \text{ iff there is a time } t' \text{ such that } t' \text{ is after } t \text{ and } q \text{ is true at } t'.
\]
The semantics of *before, after* is a simplified version of Ogihara's analysis. The semantics of the past tense is quite intuitive. But the semantics of the present tense needs an explanation. It is based on the intuition for sentences like the following:

7 The following are the exact denotations of *atoni* 'after', *maeni* 'before', the present and past tenses proposed in Ogihara (1996, p.183, p.266):

(i) \( atoni = \lambda R<\cdot,\cdot,t>\lambda R'<\cdot,\cdot,t>\lambda t_4\lambda t_3\exists t_2[R(t_3)(t_2) \land R'(t_4)(t_3) \land t_2 < t_3] \)

(ii) \( maeni = \lambda R<\cdot,\cdot,t>\lambda R'<\cdot,\cdot,i>\lambda t_4\lambda t_3\exists t_2[R(t_3)(t_2) \land R'(t_4)(t_3) \land t_3 < t_2] \)

(iii) \( Pres = \lambda P<\cdot,t>\lambda t_4 t'[t < t' \land P(t)] \)

(iv) \( Past = \lambda P<\cdot,t>\lambda t_4 t'[t' < t \land P(t)] \)

Under this proposal, tensed sentences denote temporal relations of type \( \langle \cdot, \cdot, t \rangle \). Truth values of sentences of this type are derived by the Truth Definition stated as follows (Ogihara 1996, p.250):

(v) \( An \ expression \ \phi \ of \ type \ \langle \cdot, \cdot, t \rangle \ is \ true \ at \ t \ iff \ there \ is \ a \ time \ t' \ such \ that \ |\phi\rangle(t')(t) = 1. \)

Here is an example of compositional interpretation based on these semantics.

(vi) a. \([Junko-ga kita \ \atoni] \ Satoshi-wa kaetta\)

\( J-nom \ \ \text{come-past} \after \ \text{S-top} \ \text{leave-past}\)

'Satoshi left after Junko came'

b. \( \lambda t_4\lambda t_3\exists t_2[t_2 < t_3 \land \text{come(Junko)(t_2)} \land t_3 < t_4 \land \text{leave(Satoshi)(t_3)} \land t_2 < t_3] \)

I believe that the simplification we made above does not ruin the point Ogihara makes.

8 The existential analysis of *before, after*, such as the one presented here or Ogihara's original version, has been questioned in the literature. Ogihara (1996) is well aware of it, but choose to use the existential analysis to avoid complication. We will discuss this issue in § 3.3.3. See Anscombe (1964), Heinämäki (1974), Landman (1991), and Ogihara (1995c).
(6)  a. Junko-wa Berlin-ni iku  
    J-top B-to go-pres  
    'Junko will go to Berlin'

          b. asita-wa atuku narimasu
    tomorrow-top hot become-pres  
    'It will be hot tomorrow'

In Japanese, the present tense form can be interpreted as future as shown in (6). This is similar to the usage of the present tense in English for scheduled events, such as the train arrives at 5:45. But as the (b) example shows, Japanese present tense can be used to describe future events in broader cases. Based on the semantics of before and after, and the present and past tenses stated above, Ogihara's story goes as follows: a first fact to be explained is that maeni 'before' takes a present tensed clause as its complement. Let us take (3a) as an example. The sentence has a past tense in the matrix clause. This past tense locates the matrix event time in the past relative to the speech time (step (i) below). According to the relative tense hypothesis, the embedded tense takes the matrix event time as its evaluation time. This means that the embedded present tense in (3a) is futurate relative to the time of Satoshi's leaving (step (ii) below). This is schematized below. (J's coming and S's leaving mean the times of Junko's coming and Satoshi's leaving respectively.)

(7)  (i)

-------------|-------------------|--------------------|-----------------|-------------------->  
    *J's coming  S's leaving  J's coming  s* (= the speech time)  
    past                     future

This ordering of the two event times matches the one that the semantics of before gives. When the wrong tense is used as in (3b), the embedded event time is located in the past relative to the matrix event time (step (iii) above). This ordering given by the tense semantics contradicts the one given by the semantics of before. Thus the (b) sentences are ungrammatical due to incoherence. The second fact, namely that after takes a past tensed clause as its complement, is given basically the same explanation. After only selects the past tense in its complement clause because the embedded event time has to
precede the matrix one according to the semantics of *after* and the past tense is the one that gives the correct ordering when interpreted relative to the matrix event time.

(8)          (i)                                   
-----------|-------------------|--------------------|--------------------> 
*J's coming S's leaving J's coming s* (= the speech time)     past future 
(iii)   (ii) 

By characterizing tense in TACs as a relative tense that takes the matrix event time as its evaluation time, Ogihara's relative tense hypothesis accounts for the restrictions on tense distribution in Japanese *before* - and *after* -clauses with a simple requirement that the information given by tense and temporal connectives be coherent.

The theory might possibly be extended to cover examples like the following. Compare the (a) and (b) examples:

(9)  a.  *Junko-wa gakkoo-ni iru maeni S-&-S-de kaimono-o sita
       J-top school-in be-pres before S&S-at shopping-acc do-past
       'Junko did shopping at S&S before she was at school'

       b. Junko-was gakkoo-ni kuru maeni S&S-de kaimono-o sita
           J-top school-to come-pres before S&S-at shopping-acc do-past
           'Junko did shopping at S&S before she came to school'

The (a) example contains a stative predicate in the TAC, and the sentence is anomalous. The (b) example is minimally different from the (a) example in that it contains an eventive predicate. Ogihara (1995c) leaves this problem open stipulating that there is perhaps a language-specific syntactic constraint in Japanese to prevent stative predicates in *before*-clauses.

But the ungrammaticality of (9a) in fact follows from Ogihara's analysis of TACs. Recall that his relative tense analysis relies on the fact that the present tense yields a futurate interpretation. This is not necessarily the case for stative predicates. Consider the following examples:
With stative predicates, futurate interpretations are not readily available with the present tense.\(^9\) If the present tense with a stative predicate does not have a futurate interpretation but a present interpretation, the ungrammaticality of sentences like (9a) follows: the present tense is evaluated with respect to the event time of the matrix predicate and locates the embedded event time at that time. This is inconsistent with the semantics of *before*.

Unfortunately, the situation is more complicated. It is not only *before* but also *after* that does not allow stative predicates.

(11)  
\[\begin{align*}
a. & \quad \text{Susan-wa [Justin-ga byookidat-ta atode] kare-ni denwa-o sita} \\
& \quad \text{S-top J-nom sick-past after he-dat phone-acc do-past} \\
& \quad '\text{Susan called Justin after he was sick}'
\end{align*}\]

\[\begin{align*}
b. & \quad \text{Susan-wa [Justin-ga byookini nat-ta atode] kare-ni denwa-o sita} \\
& \quad \text{S-top J-nom sick become-past after he-dat phone-acc do-past} \\
& \quad '\text{Susan called Justin after he became sick}'
\end{align*}\]

Let us mention, however, that a stative predicate in *after*-clauses does not always result in ungrammaticality as shown in the following example.

(12)  
\[\begin{align*}
\text{watasi-wa san-zikan niwa-ni ita atode heya-ni haitta} \\
& \text{I-top three-hour garden-in be-past after room-in enter-past} \\
& '\text{I entered the room after I was in the garden for three hours}'
\end{align*}\]

\[^9\text{It is not impossible to get a futurate interpretation for the (a) example, when it is accompanied by a temporal adverb or when it is an answer to the question *where will Junko be tomorrow afternoon*?}\]
To my knowledge, the co-occurrence restrictions on stative predicates in before- and after-clauses have not been studied in the literature, and we will have to leave the problem open as Ogihara did. But Ogihara's analysis of TACs might offer a new direction to find a solution.

Theories like this, which explain the anomaly of certain sentences in terms of semantic incoherence, predict no cross-linguistic difference unless one (or more) of the assumptions are not universal. Everything being equal, we predict the same tense distribution in English for the same reason. This is not true; the distribution of tense in English TACs is different from Japanese. But this need not be a problem. Ogihara (1994, 1996) argues that the crucial difference between English and Japanese is that English is an SOT language, which allows vacuous past tenses. In our system, this amounts to saying that the past tense morphology on the verbs in TACs is licensed non-locally by the matrix \textit{PAST}. Thus the grammatical English sentences in (1) and (2) can have representations like the following:

\begin{align*}
\text{(13) a.} & \quad \text{PAST Elliott leave-past before Eva come-past} \\
\text{b.} & \quad \text{PAST Elliott leave-past after Eva come-past}
\end{align*}

The embedded clauses are virtually tenseless, and as a result, the temporal connectives are the only ones that establish the temporal ordering of the two event times. Hence no incoherence results.

The relative tense hypothesis-based account of tense in TACs achieves the following two results: (i) it explains the distribution of tense in Japanese before- and after-clauses in a non-stipulative way, and (ii) it explains cross-linguistic differences between English and Japanese based on an independently needed parametric difference between the two languages.

Though interesting, the theory is not without problems. For one thing, we have already seen that the relative tense hypothesis is partially incorrect. It cannot be maintained for tense in relative clauses, as we saw in Chapter 2. The reason was as follows: under the relative tense hypothesis, the tense in relative clauses is evaluated relative to the matrix tense. For instance, in the example \textit{Hillary married a man who became the president}, the past tense in the relative clause locates the time of the man's becoming the president in the past with respect to the marrying time. This is one possible interpretation. But the sentence is compatible with a situation where the man became the president after the marriage. This is not predicted under the relative tense hypothesis. In order to derive this interpretation, the past tense in the relative clause has to be outside the scope of the matrix past tense. In other words,
proponents of the relative tense hypothesis have to rely on movement. We have shown that this leads to scope paradoxes.

As we said, this does not prove that the hypothesis is wrong regarding tense in TACs: we could argue that the tense in clausal complements and TACs, but not the tense in relative clauses, is relative. Then we would wonder what makes tense in these two environments but not tense in relative clauses a natural class. More crucially, there are empirical problems, too, to which we will now turn.

3.2. Evidence against the Relative Tense Hypothesis
In this section, we will see some difficulties for a relative tense account of the tense interpretation in TACs. One comes from tense in Japanese itself, and another comes from other non-SOT languages such as Polish and Russian. These two problems are reported in Arregui and Kusumoto (1998). We will also see some additional data that the relative tense hypothesis does not seem to handle well.

A first problematic case is Japanese when-clauses. Japanese when can take a past tense clause as its complement:

(14) a. [Satoshi-ga kita toki] Junko-wa heya-ni ita
    S-nom come-past when J-top room-in be-past
    'Junko was in her room when Satoshi came'

    b. [hikooki-ga nihon-ni tuita toki] ame-ga hutteita
      plane-nom Japan-to arrive-past when rain-nom fall-teiru-past
      'It was raining when the plane arrived in Japan'

If the connective when establishes a relation of simultaneity, these sentences should be ungrammatical under a relative tense based approach for a reason similar to the one which explains why before is incompatible with a past tensed clause. Since Japanese is a non-SOT language, the past tense in these examples cannot be a vacuous one. When interpreted relative to the matrix past tense, the embedded past tense locates the time of the embedded predicate further into the past with respect to the matrix event time. This should contradict the semantics of when.

Ogihara himself (to appear) notices this problem and speculates that the entire when-clauses can 'scope out' and consequently the past tense in these clauses is evaluated with
respect to the speech time. He argues that this line towards a solution is plausible since *toki* 'when' is categorically a noun which means 'time'. Although we agree that the embedded past tenses in these *when*-clauses are absolute tenses that are evaluated with respect to the speech time, deriving the interpretation by movement creates problems. First of all, we need to assume that this kind of movement is free from island constraints. Second, it is not clear why this operation is only available to *toki* 'when' but not *mae* 'before' and *ato* 'after', both of which are also nouns.

One could also give a story like this: the semantics of *when* might not specify the relation of simultaneity. Based on Dowty's (1986) analysis of temporal succession and inclusion in narrative contexts, von Fintel (1997) suggests a possible analysis of *when* in which it roughly means 'right after'. It has been noted that *when* means 'right after' when both matrix and embedded predicates are eventive predicates. (See Heinämäki 1974, for instance.) In the following example, we understand that the event time of the clock ticking follows the time of John's entering.

\[(15) \quad a. \quad \text{The clock on the wall ticked loudly when John entered the president's office}\]

Unlike previous authors who basically say that *when* is ambiguous between the true 'when' meaning and the 'right after' interpretation depending on the predicates, von Fintel argues that it is possible to maintain a uniform meaning, namely that *when* unambiguously means 'right after'. This explains the intuitive meaning of the sentence (15a). But when one of the predicates is stative or progressive as in (b) and (c), we normally understand that the two event times overlap.¹¹,¹²

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¹⁰ Nakamura (1994a) also suggests a solution along this line.

¹¹ More specifically, we understand that the event of the eventive predicates takes place during the event time of the stative predicates.

¹² von Fintel (1997) uses examples where *when*-clauses are preposed. Barbara Partee (p.c.) has pointed out that preposed *when*-clauses do not easily allow a simultaneous interpretation when they contain a stative predicate as in the following examples. (The (i) example is the original von Fintel example, and the (ii) example is from Partee (1984).)

(i) When the clock on the wall was ticking loudly, John entered the president's office

(ii) When the room was empty, the janitor came in

Since the purpose of this discussion is to see if we could explain all the possible intuitive meanings of *when* by positing its meaning as 'right after', and Partee's intuition about examples like (i) and (ii) above are in fact predicted correctly by the 'right after' analysis of
b. The clock on the wall was ticking loudly when John entered the president's office

c. John entered the president's office when the clock on the wall was ticking loudly

Using Dowty's argument for a parallel situation in narrative contexts, von Fintel argues that this may be due to an aspectual property of stative and progressive predicates. Stative and progressive predicates have a property such that when they hold at an interval i, it is possible that they hold at proper super-intervals i' of i. Therefore the (b) and (c) sentences are compatible with situations where the clock was still ticking at the time John entered. Moreover, we preferably understand that the clock was still ticking for a pragmatic reason. If this analysis of *when* can be maintained for Japanese, the examples we considered are not problematic to a relative tense analysis. They can be given a similar explanation as *after*-clauses.

However, Stump (1985) and Hinrichs (1981, 1986) argue that Heinämäki's generalization that *when* always means 'right after' when both *when*-clauses and the matrix clauses contain eventive predicates is too strong. They present examples with eventive predicates where the two events are understood to take place simultaneously.

(16) a. When John wrecked the car, he somehow manage to jump to safety
    b. When John broke his leg, he also hurt his elbow

Stump (1985) also argues that examples of *when*-clauses whose most natural interpretation is to mean 'after' can (and must) have a simultaneous interpretation when the word *exactly* is added:

(17) a. Mary arrived exactly when John did
    b. The clock on the wall ticked loudly exactly when John entered the president's office

There are also examples where *when* seems to mean 'before'. Consider the following examples:

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*when*, we simply changed the order of the main clauses and the *when*-clauses in the example (15b,c) so that they become apparent counter-examples.

13 The (a) example is from Hinrichs (1981) cited in Partee (1984), and the (b) example is from Partee (1984, footnote 25), attributed to a referee.
Both sentences are understood in such a way that the when-clause events took place after the matrix clause events. For instance, in normal circumstances, we invite people before we throw a party. So we could argue based on examples like these that when can sometimes mean 'before'. We could counter this argument by saying that an event of throwing a party includes preparing for it including inviting people, and thus this is just another case of simultaneous when, as argued in Partee (1984).

All these examples seem to suggest that it is difficult to maintain the analysis of when as 'right after'. If we are to choose for the semantics of when between the true 'when' meaning and the 'right after' meaning, it is perhaps more plausible to define when as having the meaning of simultaneity, and derive the 'right after' meaning as a pragmatic effect. Stump's argument about exactly when I believe is especially difficult to explain if when means 'right after'. If so, examples with past tensed when-clauses like (14) are problematic under the relative tense hypothesis. This is because when must mean 'right after' in order for it to work.

Moreover, applying this analysis of when to toki 'when' in Japanese creates a different problem. This is because not all examples involving when-clauses are problematic for a relative tense analysis of TACs. Japanese when-clauses can be present tensed, and they have an episodic simultaneous interpretation, as shown below:

(19) a. [heya-de neteiru tokin] Junko-ga tazunete-ki-ta
    room-at sleep-teiru-pres when J-nom visit-come-past
    'Junko visited me when (I) was sleeping in my room'

    b. [tosyokan-ni iru tokki] zisin-ga atta
    library-at be-pres earthquake-nom be-past
    'There was an earthquake when (I) was in the library'

An episodic simultaneous interpretation is easily obtained when the predicate in when-clauses is stative. The grammaticality of these examples follows from the relative tense hypothesis.

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14 This fact is not reported in Arregui and Kusumoto (1998).

15 There seem some exceptions to this generalization. Here is one, in which an eventive predicate is used in the when-clause, and yet an episodic interpretation is possible:
The embedded present tense takes the event time of the matrix predicate as its evaluation time and places the embedded event time at that time. Hence these two times overlap. This is coherent with the semantics of *when* if we assume that *when* expresses the meaning of simultaneity.

So far, we have seen examples containing *when*-clauses that have an interpretation in which the times of the matrix and *when*-clauses overlap. It has been noted that a present tensed predicate in *when*-clauses can have a futurate interpretation. By a futurate interpretation we mean roughly that the event time of the predicate in a *when*-clause is located after the matrix event time. For instance, when the sentence (20) is true, I had to be inside the front door when the phone rang. In other words, *when* in this case has an interpretation that is equivalent to 'before' as far as the temporal ordering goes.

(20) a.  [genkan-o deru toki] denwa-ga natta
entrance-acc leave-pres when phone-nom ring-past
'The phone rang when (I) was about to go out the front door'
'The phone rang right before I go went out the front door'

b.  [basu-o oriru toki] asimoto-ni ki-o t uketa
bus-acc get off-pres when step-dat attention-acc pay-past
'(I) watched my step when I was about to get / got / was getting off the bus'

These examples are often contrasted with their past tensed counterparts below.

(21) a.  [genkan-o deta toki] denwa-ga natta
entrance-acc leave-past when phone-nom ring-past
'The phone rang when (I) went out the front door'

b.  [basu-o orita toki] asimoto-ni ki-o tuketa
bus-acc get off-past when step-dat attention-acc pay-past
'(I) watched my step after I got off the bus'

(i)  [keeki-o yaku toki] tamago-o zyukko-mo tukat-ta
cake-acc bake-pres when egg-acc ten-CL-as many as use-past
'(I) used as many as ten eggs when I baked a cake'
For (21a) to be true, for instance, I had to be outside the door when the phone rang. (21b) can be used when I was careful not to walk into puddles on the road after I stepped off the bus.

In order to make tense interpretations follow from the relative tense hypothesis, when has to mean 'before' in (20) and 'after' in (21), which is unrealistic.

There is an additional complication reported in Arregui and Kusumoto (1998). Consider the following examples:

(22) a. [Satoshi-ga kuru toki] Junko-wa heya-ni ita
S-nom come-pres when J-top room-in be-past
'Junko was (usually) in her room when Satoshi came'

  b. Taroo-wa [kanasii toki] hurusato-o omoidasita
T-top sad-pres when hometown-acc remember-past
'Taroo (usually) remembered his hometown when he was sad'

Interestingly, these examples have a quantificational, habitual-like interpretation. This contrasts with the episodic interpretation of examples with a past tensed when-clause in (14). The existence of quantificational interpretations in examples like the above does not show that the relative tense hypothesis is wrong. But it does show that the present vs. past distinction in Japanese is not purely temporal, as argued in Arregui and Kusumoto (1998).16

16 As we will see below, this point was taken seriously in the analysis of Arregui and Kusumoto (1998). They provide further evidence like the following for the quantificational contrast between past and present tenses. (The example (ii) is from Kuno 1973.)

(i) a. Junko-wa [Satoshi-ga kuruma-o tyuusyasuru] basyo-de kagi-o nakusita
J-top S-nom car-acc park-pres place-at key-acc lose-past
'Junko lost her key where Satoshi (usually) parked his car'

  b. Junko-wa [Satoshi-ga kuruma-o tyuusyasita] basyo-de kagi-o nakusita
J-top S-nom car-acc park-past place-at key-acc lose-past
'Junko lost her key where Satoshi parked his car'

(ii) a. [maisyuu kuru] hito-wa Hanako-to Taroo desita
every week come-pres people-top H-and T be-past
'Those who had a habit of coming every week were Hanako and Taroo'

  b. [maisyuu kita] hito-wa Hanako-to Taroo desita
every week come-past people-top H-and T be-past
'Those who happened to come every week were Hanako and Taroo'
We have presented some data concerning *when*-clauses that do not seem to be expected under a relative tense account. There are two issues involved here that make it difficult to see whether these data are in fact problematic or not. One is that the data themselves are complicated and it seems that we need to take into account aspectual properties of predicates. Another is that the semantics of *when* concerning temporal ordering is not as straightforward as that of *before* and *after*.

There are two other connectives in Japanese, *to* and *ya-ina-ya*, that are problematic to the relative tense account. Both select a present tensed clause but have an interpretation similar to 'after'. Let us start with *to*-constructions. We do not give an English gloss since there is no one lexical entry in English that fits the interpretation of *to*. Depending on the context, it can mean *when*, *whenever*, *while*, *after*, or *if*. 

\[(23) \quad \text{a. akanboo-wa [watasi-no kao-o miru to] naki-dasita} \]
\[
\text{baby-top I-gen face-acc see-pres TO cry-start-past} \\
\text{'The baby started crying when she saw my face'} 
\]

Although we agree that the contrast is real, we will not be able to take up this point in this thesis. This is due to the data that are not covered in Arregui and Kusumoto. In order to widen the empirical coverage of the analysis, we give up explaining this interesting contrast. We believe that for the full understanding of the relation between quantificational/habitual interpretations and the present tense, we also need to look at root clauses.

\[(iii) \quad \text{a. Satoshi-wa koko-ni kuruma-o tyuusyasuru} \]
\[
\text{S-top here-at car-acc park-pres} \\
\text{'Satoshi parks his car here'} 
\]

\[
\text{b. Satoshi-wa koko-ni kuruma-o tyuusyasita} \]
\[
\text{S-top here-at car-acc park-past} \\
\text{'Satoshi parked his car here'} 
\]

The contrast between these two Japanese sentences is reflected in the English translations. The (a) sentence has a habitual interpretation while the (b) sentence has an episodic interpretation. There are two questions that arise from this contrast. One is why an episodic interpretation (i.e., an interpretation in which Satoshi’s parking is considered as an ongoing event at the speech time) is not available. The other is how present tensed sentences like (iiiia) get a habitual interpretation. See Bennett and Partee (1972), Rothstein (1997), and Enç (1991) for the former. For the latter, Carlson and Pelletier's (1995) *The Generic Book* has several relevant papers, such as Chierchia and Carlson, as well as a good introduction (Krifka et al.).

\[17\text{Kuno (1973) presents an extensive discussion on } to\text{-constructions. We will limit our discussion here to cases where } to\text{ has an episodic interpretation.} \]
b. Cecilia-wa [ha-o migaku to] sassato futon-ni haitta
C-top tooth-acc brush-pres TO quickly bed-enter-past
'Cecilia quickly went to bed after she brushed her teeth'

As shown above, to selects a present tensed clause as its complement. A past tensed clause is ungrammatical:

(24) a. * akanboo-wa [watasi-no kao-o mita to] naki-dasita
   baby-top I-gen face-acc see-past TO cry-start-past
   'The baby started crying when she saw my face'

   b. * Cecilia-wa [ha-o migaita to] sassato futon-ni haitta
      C-top tooth-acc brush-past TO quickly bed-enter-past
      'Cecilia quickly went to bed after she brushed her teeth'

Now consider the temporal ordering of the two event times in these examples. In both examples, the matrix event times follow the embedded event times. The relative tense hypothesis, when applied to explain this construction, makes the wrong prediction.

   A second case is ya-ina-ya 'as soon as' constructions. This connective, too, selects a present tensed clause.

(25) a. haha-wa sirase-o kiku ya-ina-ya ie-o tobidasita
    mother-top new-acc hear-pres as soon as house-acc jump out-past
    'Mother jumped out of the house as soon as she heard the news'

   b. ootoo-wa ie-ni tuku ya-ina-ya kanozyo-ni denwa sita
      brother-top house-to arrive-pres as soon as she-dat phone do-past
      'My brother called her as soon as he came home'

Again, the temporal ordering given by this connective is similar to the one by after: it locates the matrix event times after embedded ones. If the embedded present tense were interpreted relative to the matrix clause event time, as the relative tense hypothesis predicts, the ordering given by the tense interpretation should contradict the one given by the connective, which should result in ungrammaticality. So again, the relative tense hypothesis makes the wrong prediction.
Another difficulty, a more serious one we believe, that the relative tense hypothesis faces is the tense behavior in other non-SOT languages. As we have seen in the previous chapters, Polish is a non-SOT language; its behavior of tense in clausal complements shows the same pattern as Japanese. Keeping this in mind, consider the following examples of Polish TACs:

(26) a. Ania przyszła na przjęcie po tym jak Marcin przyszł
    Ania come/past/perf to party after this how Marcin come/past/perf
    'Ania came to the party after Marcin came'

b. * Ania przyszła na przjęcie po tym jak Marcin przychodzi
    Ania come/past/perf to party after this how Marcin come/pres/perf

In the case of after, when the matrix clause is past tensed, the tense in after-clauses is past, too. This is not surprising. English and Japanese do not differ in after-clauses. Now let us look at before-clauses:

(27) a. Ania przyszła na przjęcie zanim Marcin przyszł
    Ania come/past/perf to party before Marcin come/past/perf
    'Ania came to the party before Marcin came'

b. * Ania przyszła na przjęcie zanim Marcin przychodzi
    Ania come/past/perf to party before Marcin come/pres/perf

c. * Ania przyszła na przjęcie zanim Marcin przyjdzie
    Ania perf-come-past to party before Marcin come/fut/perf

Interestingly, Polish before-clauses follow the English pattern. When the matrix clause is past tensed, the embedded clause has to be past tensed, too. Both present and future tenses result in ungrammaticality.

The same is true in Russian.18

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18 As we have seen in Chapter 2, what is glossed as a future perfective is morphologically a perfective form of a verb with an agreement morpheme that is identical to the one that goes with a present imperfective form.
Recall that Polish and Russian are non-SOT languages. This means that the past tense morpheme must be licensed clause-internally. In other words, representations like (30a) are ungrammatical in this language. The embedded past tense morpheme in (30a) is not licensed. Past tense must be a true past tense in both clauses, as in (30b).

(30) a. * PAST Ania-past come before Marcin-past come
b. PAST Ania-past come before PAST Marcin-past come

But if the past tense in the embedded clause in (30b) is interpreted relative to the matrix event time, the resulting ordering contradicts the ordering given by the semantics of before, and the sentence should be ungrammatical in the same way that its Japanese counterpart is. Thus the relative tense hypothesis fails to explain cross-linguistic differences among non-SOT languages.

To sum up, we have presented two sets of data that the relative tense hypothesis has difficulties in explaining. One comes from Japanese, which first motivated Ogihara's hypothesis, and the other comes from other non-SOT languages, such as Polish and Russian. The problematic Japanese data could be explained by positing ambiguous when, stipulating the possibility of movement, etc. The data from Polish and Russian, I believe, are really a knock-down argument against Ogihara's attempt to relate the tense distribution pattern in TACs and the SOT/non-SOT distinction, which elegantly explains the difference between English and Japanese.
In what follows, we will propose an alternative analysis of TACs in these languages, following Arregui and Kusumoto (1998).

3.3. Structures and Interpretations of TACs
We have examined the distribution of tense in TACs in various languages. We have seen that English and Polish show the same pattern and that it differs from the Japanese pattern. Contrary to what Ogihara (1994, 1996) argues, we claim with Arregui and Kusumoto (1998) that tense distribution in TACs is not directly related to an SOT vs. non-SOT distinction among languages. The difference between English, Polish, and Russian on the one hand and Japanese on the other will be explained in terms of structural differences in TACs between the two groups of languages. We will begin with tense in English and Polish/Russian TACs.

3.3.1. TACs as Relative Clauses: English and Polish/Russian TACs
It is a well-known fact that \textit{wh}-question sentences such as the following are ambiguous.

(31) a. When did you say Earl left?
    b. At what time did the teller say the bank opened?

The (a) sentence, for instance, can be a question asking the time of your utterance or a question asking the time of Earl's leaving. The ambiguity is generally attributed to where the \textit{wh}-phrases \textit{when} and \textit{at what time} are generated. \textit{When} in (31a) can be generated in the matrix clause and moved up to its CP-Spec as in (32a) or it can be generated in the embedded clause and moved to the matrix CP-Spec (perhaps through the embedded CP-Spec) as in (32b).

(32) a. When ī [did you say ti [that Earl left?]]
    b. When ī did you say [that Earl left ti?]

Geis (1970) observes that temporal \textit{when}-clauses in English exhibit a similar ambiguity:¹⁹,²⁰

(33) a. John arrived when Harry told Mary that she should leave
    b. I saw Mary in New York when she claimed that she would arrive

¹⁹ The (a) example is from Geis (1970) and the (b) example from Larson (1990).

²⁰ See also Larson (1990), Iatridou (1990), Munn (1991), and Thompson (1995) for this type of ambiguity.
Take the (a) example. Suppose that Harry told Mary at 3:00 PM that she should leave at 5:00 PM. On one interpretation of (33a), the time at which John arrived is Harry’s utterance time, namely, 3:00 PM. On the other interpretation, it is the time that Mary should leave according to Harry, i.e., 5:00 PM. Let us call the former construal the upper construal, where the time associated with the matrix event time is the event time of the predicate in the higher clause inside the when-clause, and the latter the lower construal. Geis argues that this ambiguity stems from a structural ambiguity in a similar way as in question sentences. The temporal connective when undergoes movement. The ambiguity of the sentence (33a) for instance is structurally represented as follows:

(34)  a. John arrived [wheni Harry told Mary tị [that she should leave] 
b. John arrived [wheni Harry told Mary [that she should leave tị]

One piece of evidence for this analysis comes from island effects observed in examples like the following, as noted by Geis (1970). (35a) should be contrasted with (33a) and (35b) with (33b).

(35)  a. John arrived when Harry told Mary about his desire that she should leave 
b. I saw Mary in New York when she made the claim that she would arrive

These examples are not ambiguous in the same manner as the examples in (33) are. The sentences only have the upper construal, i.e., the interpretation in which the time of the matrix clause event is associated with the time of the higher predicate in the when-clause. For instance, if Harry told Mary at 3:00 PM about his desire that she should leave at 5:00 PM, the sentence can only mean that John arrived at 3:00 PM. This is because of restrictions on the movement of when, Geis argues. In (35), when cannot undergo long-distance movement due to the presence of an island. Hence these sentences only allow one interpretation where when is moved from the higher clause.

Secondly, as Larson (1990) points out, the number of ways in which sentences can be ambiguous increases as we increase the number of embeddings in when-clauses, as shown below:

(36)  I saw Mary in New York when John said that she claimed that she would arrive
This sentence is three ways ambiguous; the time I see Mary can be at John's utterance time, Mary's alleged claiming time, or her alleged arriving time. This is parallel to the ambiguity observed in question sentences, such as when did you say Satoshi claimed he would arrive?

Geis' and Larson's analysis of when-clauses can be given the following compositional semantic implementation. Let us take a sentence with a simple when-clause such as Tom was home when Karen called. The wh-phrase when is decomposed into (at a time) at which. The when-clause when Karen called is analyzed as (at a time) whichi Karen called at ti. At this point, we need an analysis of how temporal modifiers such as at ti is interpreted. We argue that these modifiers denote properties of times and are VP modifiers. Here is an example of compositional interpretation.

(37) a. Karen called at 5:00
b. 
   \[ \lambda t_1 \lambda w[\text{call}(Karen)(t)(w)] \]
   \[ \lambda t_2 \lambda w[t = 5:00 \text{ in } w] \]

The PP adjoins to the VP, and the denotation of the higher VP is calculated by taking the intersection of the denotations of the two daughter constituents. We further argue that the PP at ti in when-clauses is interpreted in the same way. With this analysis of temporal modifiers, the entire when-clause has the following LF:

(38) a. when Karen called
b. (at a time) whichi Karen called at ti

---

21 Both of their analyses are slightly different from what is proposed here. Geis analyzes when-clauses as true relative clauses with head nouns, i.e., when S is analyzed as at the time when S, where the PP at the time is later deleted. Larson, on the other hand, does not posit a different structure than what we see as when-clauses. So Larson himself might not call his own analysis of when-clauses a relative-clause analysis. Nonetheless, we will lump their analyses together and refer to them as relative-clause analyses.
Under this analysis, *when*-clauses are analyzed as relative clauses. Consequently, as we have seen in Chapter 2, *when*-clauses as well as 'normal' relative clauses have their own tense and the event time of predicates embedded in these clauses is independently ordered with respect to the speech time. But *when*-clauses are different from 'normal' relative clauses in that the former cannot have an interpretation temporally independent of the matrix tense interpretation. We argue that this is due to the way *when*-clauses modify matrix predicates and the identity condition imposed by the semantics of *at*. We propose that *when*-clauses are also VP modifiers. As with other kinds of modifiers, the interpretation of a modifier plus a modifiee is derived by intersection. In the structure below, both the lower VP and the CP denote properties of times and the denotation of the upper VP is their intersection. From there on, the compositional interpretation goes as usual and we get the truth conditions in (39c).
(39) a. Tom was home when Karen called
b. TP

\[ T' \]
\[ \lambda k \text{past}_k \]
\[ \text{VP: } \lambda t \lambda w[\text{be-home}(\text{Tom}(t)(w) \& \exists t'[t' < s^* & \text{call}(\text{Karen})(t')(w) \& t' = t]] \]
\[ \lambda t \lambda w[\text{be-home}(\text{Tom}(t)(w)) \& \lambda j \lambda w[\exists t'[t' < s^* \& \text{call}(\text{Karen})(t')(w) \& t' = t_j] \]
\[ \text{Tom be home} \]
\[ \text{which}_j \text{Karen called at } t_j \]

c. \[ [(39b)]^{\text{ig-c}}(w) = 1 \text{ iff there is a time } t \text{ such that } t < s^* \text{ and Tom is home at } t \text{ in } w, \text{ and there is a time } t' \text{ such that } t' < s^* \text{ and Karen calls at } t' \text{ in } w \text{ and } t' = t \]

Now let us turn to other TACs, before- and after-clauses. Geis (1970) observes that the ambiguity that we find with when-clauses is also present in before- and after-clauses. Consider the following examples:

(40) a. John arrived after Harry told Mary that she should leave
b. I saw Mary in New York before she said she would arrive

Imagine the scenario we saw above: Harry told Mary at 3:00 PM that she should leave at 5:00 PM. The (a) sentence can mean that John arrived after 3:00 PM or after 5:00 PM. Similarly for the (b) sentence.

As we saw for when-clauses, the ambiguity disappears when there is an island between the most embedded clause and the intermediate clause.

(41) a. John arrived after Harry told Mary about his desire that she should leave
b. I saw Mary in New York before she made the claim that she would arrive

Both sentences lack the lower construal, i.e., an interpretation in which the matrix event time is associated with the most embedded event time.
Unbounded dependency is also observed: as with *when*-clauses, ambiguities increase with the number of embeddings.

(42)  a. I saw Mary in New York before John said that she claimed that she would arrive  
b. I saw Mary in New York after John said that she claimed that she would arrive

In the same way that the sentence (36) is, these sentences are three ways ambiguous. This suggests, as Geis (1970) and Larson (1990) argue, that the same kind of movement is involved in *before* - and *after* -clauses, too. Let us therefore analyze *before* - and *after*-clauses as relative clauses.

(43)  a. before/after Karen called  
b. before/after (a time) which Karen called at t_i  
c. PP

\[
\begin{align*}
\text{before/after} & \quad \text{CP} \\
& \quad \text{which} \quad \lambda_j \lambda w \exists t' [t' < s^* \land \text{call(Karen)}(t') (w) \land t' = t_j] \\
& \quad \lambda_j \quad \text{TP: } \lambda w \exists t' [t' < s^* \land \text{call(Karen)}(t') (w) \land t' = t_j] \\
& \quad t^* \quad \lambda t \lambda w \exists t' [t' < t \land \text{call(Karen)}(t') (w) \land t' = t_j] \\
& \quad \text{PAST} \quad \lambda t \lambda w [\text{call(Karen)}(t)(w) \land t = t_j] \\
& \quad \lambda_i \quad \lambda w [\text{call(Karen)}(t_i)(w) \land t_i = t_j] \\
& \quad \text{past}_i \quad \text{VP: } \lambda t \lambda w [\text{call(Karen)}(t_i)(w) \land t = t_j] \\
& \quad \text{Karen call at } t_j
\end{align*}
\]

In order to determine the interpretation of *before* - and *after*-clauses, we need to know what *before* and *after* themselves mean. Intuitively, *before* and *after* order two event times. Let us propose that these connectives take a clause as their complement and the entire constituent is
a VP modifier in a manner parallel to *when*-clauses. We have the following denotations:22,23

\[(44)\]  
\[a. \quad [[\text{after}]]_{g,c} = f : D_{i,st} \rightarrow D_{i,st}\]  
For all \(p \in D_{\text{<i, st>}}, t \in D_i, \text{ and } w \in D_s, f(p)(t)(w) = 1 \text{ iff there is a time } t' \text{ such that } t' < t \text{ and } p(t')(w) = 1\]  

\[b. \quad [[\text{before}]]_{g,c} = f : D_{i,st} \rightarrow D_{i,st}\]  
For all \(p \in D_{\text{<i, st>}}, t \in D_i, \text{ and } w \in D_s, f(p)(t)(w) = 1 \text{ iff there is a time } t' \text{ such that } t < t' \text{ and } p(t')(w) = 1\]  

This semantics treats *before* and *after* identically except for the ordering of the two event times. In other words, this predicts that \(p \text{ after } q \) and \( q \text{ before } p \) have the same truth conditions. But this is not the case. It has been noted in Anscombe (1964), Heinämäki (1974) and others that *before* and *after* differ in many other ways. We will come back to this issue in the following section.

Now let us come back to how tense interpretation in *before*- and *after*-clauses goes. Given structures like (43) and the semantics given in (44), the rest of the compositional interpretation goes the same way as in *when*-clauses. We get truth conditions like the following:

\[(45)\]  
\[a. \quad \text{Karen gave us a massage after we helped Susan move}\]  
\[b. \quad [[(45a)]]_{g,c}(w) = 1 \text{ iff there is a time } t \text{ such that } t < s^* \text{ and Karen gave us a massage at } t \text{ in } w, \text{ and there is a time } t' \text{ such that } t' < s^* \text{ and we help Susan move at } t' \text{ in } w, \text{ and } t' < t.\]  

\[(46)\]  
\[a. \quad \text{Ana and I had breakfast together before we went to the farmer's market}\]  
\[b. \quad [[(46a)]]_{g,c}(w) = 1 \text{ iff there is a time } t \text{ such that } t < s^* \text{ and Ana and I have breakfast at } t \text{ in } w, \text{ and there is a time } t' \text{ such that } t < t' \text{ and we go to the farmer's market at } t' \text{ in } w.\]  

---

22 The denotations are from Stump (1985).

23 These denotations ignore that fact that *before* and *after* may take an NP as their complement, as in *before the party* and *after John’s arrival*. We simply assume that *before* and *after* are ambiguous.
Stump (1985) notices that truth conditions like the above make an unwelcome prediction. The sentence (46a) is predicted to be true when Ana and I had breakfast together in the morning of July 8th and went to the farmer's market three days later. (Suppose that this is the only time we went to the farmer's market.) But the sentence sounds odd in this situation.

This problem is already solved by our semantics of the past tense. Recall that the context dependency of the past tense is accounted for in our semantics by domain restrictions imposed by the variable $C$. Our analysis of before- and after-clauses treats tense in these clauses as an independent tense. It is therefore natural to assume that the mechanism to derive context dependency should also be available to tense in these clauses.

Under this analysis of tense in TACs, there is no direct dependency of embedded tenses on matrix tenses. It follows therefore that past tenses are required in TACs when the matrix clauses are past tensed.

This analysis together with the analysis of participles we proposed in Chapter 2 makes an interesting prediction for the contrast we find between the (a) and (b) examples in (47) and (48). The (a) sentences are ambiguous but the (b) sentences are not.

(47) a. Justin left after he said he would
    b. Justin left after saying he would

(48) a. Chris left before he said he would
    b. Chris left before saying he would

This contrast is observed in Johnson (1988). The (a) examples are the ones we have considered so far to support a relative clause analysis of TACs. They contain a finite clause in the before- and after-clauses, and they exhibit an ambiguity. According to Johnson, the (b) examples, which have a clausal gerund in the before- and after-clauses, lack this ambiguity. They only have the upper construal, an interpretation in which after and before relate the matrix time with the saying time. What makes these examples different from the (a) examples? Let us see what should happen to make the lower construal available in the (b) examples. We argued with Geis and Larson that the lower construal is the result of generating a relative pronoun in the most embedded clause and moving it to the Spec of the CP which is the complement of before and after. Applying the same analysis to clausal gerunds, we should have a structure like the following:

(49) a. before/after PRO$_i$ saying he would
If our analysis of participles is correct, this tree is not interpretable due to type mismatch.\(^{24}\)

We have argued that when predicates are not tensed as in *saying* in (49), their time argument is not saturated and they denote properties of times. Assuming that PRO in the subject position is controlled by the matrix subject, the denotation of the 'PartP' above is the property of times \(t\) such that Justin says at \(t\) that he would leave. When the relative pronoun abstracts over the trace it left, the resulting constituent becomes an element of type \(<i, <i, <s, t>>\). And this is not what *before* and *after* want.\(^{25}\)

The analysis implies that relative pronoun movement is not possible in these constructions at all. Whether a relative pronoun originates in the lower clause or the upper clause, the structure should result in uninterpretability. Recall, however, that the sentences are not ungrammatical. We can get the upper construal. How is it possible? We propose that relative pronoun movement is not involved at all. *Before* and *after* directly take the 'PartP' *saying that he would*, which is already of the right type.

\(^{24}\)The *-ing* form in examples like (47b) and (48b) is called a gerund and often distinguished from participles. This distinction is not relevant to our analysis of temporal interpretation. Either way it is obvious that the *-ing* form in this example, i.e., *saying*, is tenseless, and this is what is relevant to our analysis.

\(^{25}\)Angelika Kratzer (p.c.) pointed out that a type mismatch would not arise if we saturate the time argument position of the participle with the distinguished variable. Thus, we predict that sentences like the following exhibit the ambiguity.

(i) John is leaving before/after saying that he is leaving

This prediction is not borne out. I have no explanation for why this is so.
This would necessarily yield the upper construal.\textsuperscript{26}

\textsuperscript{26} Another prediction of the analysis of TACs as relative clauses is the following. Consider the following examples:

(i) a. Heather said that Blanche left after she did
    b. Heather said that Blanche left before she did
    c. Heather said that Blanche left when she did

Let us only consider interpretations where she is coreferent to Blanche and the TACs modify the embedded VPs. These examples are two ways ambiguous regarding the interpretation of the TACs. On one interpretation of (ia), for instance, what Heather said was something like "Blanche left after she did", which is anomalous. The other interpretation, a sensible one, says that the alleged time of Blanche's leaving according to Heather is later than the actual time of Blanche's leaving. Let us call the former the opaque interpretation, and the latter the transparent interpretation.

Under the transparent interpretation, the most embedded predicate did (leave) should be evaluated with respect to the speech time (and the actual world). (This suggests that we need explicit quantification over worlds in the object language, contrary to our assumption. This is in accordance with the conclusion drawn by Cresswell (1990).) This can be done in our analysis by leaving the evaluation time variable of the most embedded past tense operator $t^*$ free. If we choose to use a framework like Priorian tense logic, we will have to rely on movement of these TACs outside the scope of the matrix past tense operator. It is not hard to imagine what wrong predications this would make regarding quantifier scope. For instance, consider the following examples:

(ii) a. Heather said that every female demo dancer left before/after/when she left
    b. Heather denied that anybody left before/after/when she left

The sentence (iia) may be true when what Heather said was something like "Karen left at 5:00, Jen left at 5:15 and Susan left at 5:20", but each of the women in fact left before/after/at the time Heather said she did. Similarly for (iib). If the TAC has to move out of the complement clause, it also escapes the scope of the subject every female demo dancer, and the bound variable reading should be impossible. Note that Heather might be wrong about who the female demo dancers are. So the possibility of the NP scoping out above the moved TAC is not necessarily an option.

The ambiguity of the examples in (i) above is similar to the one that Russell (1905) discusses using comparative structures like the following:
We now turn to tense in TACs in Polish. We propose that Polish TACs have the same structure as English ones, namely that Polish TACs are relative clauses. One piece of evidence comes from the ambiguity of the following sentences:

(51) a. Widziałem Lizę po tym jak powiedziała, że jej nie będzie
see-perf-past Lisa after this how say-perf-past that her not be-fut
'(I) saw Lisa after (she) said that she would leave'

(iii) John believes that my yacht is larger than it is

The sentence has an anomalous interpretation in which what John believes is something like "your yacht is larger than it is", and a sensible interpretation that says that the size that John believes my yacht is is larger the actual size of my yacht. As an account for this ambiguity, an analysis along the line presented above, i.e., an in situ analysis, is discussed in von Stechow (1984) as an implementation of Postal's (1974) analysis, and argued for in Heim (1985).

This conclusion is not uncontroversial, however. Wilder (1997) argues that transparent interpretations of sentences like (i) (and (iii)) are due to movement of the TACs outside the scope of the propositional attitude verbs. (A scope-based analysis is already suggested in Russell 1905.) Wilder presents four arguments for a movement analysis; island effects, topic freezing effects, the effects of parentheticals, and Condition C effects.

(iv) island effects
   a. # John regrets that Mary left before she did
   b. # John wonders whether Mary left before she did

(v) topic freezing effects
   # John said that before she actually did (leave), Mary left

(vi) effects of parentheticals
    # Mary left, John thinks, before she did

(vii) Condition C effects
     ? John thinks that she left before Mary did
     (Ok, only if the TAC gets a transparent reading.)

I suspect that island effects are due to the semantics of embedding predicates and topic freezing effects are somehow related to some property of preposed TACs. It has been known that preposed (clause-initial) TACs behave differently than postposed (clause-final) ones in many ways. See Thompson (1995) for the lack of the Geis-ambiguity, Rooth (1985) and Johnston (1994a,b) for the lack of the so-called head-restriction interpretation, and Ogihara (1995c) for the lack of non-factual interpretations in preposed TACs. I do not have any good explanation for any of Wilder's arguments, though.
b. Widzialem Lizę zanim powiedziała, że jej nie będzie

'I saw Lisa before (she) said that she would leave'

These sentences show an ambiguity similar to what we saw for English examples in (33). If Polish TACs are to be analyzed in the same way as English ones, it is no surprise that their tense distribution patterns with English. Tenses embedded in before- and after-clauses are absolute tenses, and therefore in describing past events, the past tense has to be used.

3.3.2. Some Remarks on Tense Mismatch

We have seen what LF structures grammatical sentences containing TACs receive and how they are interpreted. We have not discussed, however, how sentences like the following, where the tense in the TACs and that in the matrix clauses do not match, are excluded.

(52) a. * Eva came home after Elliott leaves
    b. * Eva came home after Elliott will leave
    c. * Eva came home before Elliott leaves
    d. * Eva came home before Elliott will leave

Stump (1985) argues against a syntactic (or morphological) constraint that forces tense agreement between the two tenses. Such a constraint would rule out examples like the following, which are grammatical:

(53) a. John left after Mary believes that he did
    b. John will leave before Mary said he would

Let us see whether the ungrammaticality of the sentences in (52) follows from the sentences' meaning. We have argued that tense in TACs is an absolute tense. This means that the present tense and the future will in these examples are evaluated with respect to the speech time.

27 It has been known that wh-movement out of tensed clauses is ungrammatical in Slavic languages, such as Polish and Russian. But there is variation among native speakers. Fortunately our two Polish informants accept overt wh-movement in Polish counterparts of sentences like when did you say [John left $ti$]? We suspect that the ambiguity we observe in the example (51) only arises for those who accept wh-movement out of tensed clauses. We could not find any Russian informants who accept wh-movement out of finite clauses. Therefore, we could only provide evidence for a relative clause analysis in Polish. But we believe that Russian TACs should be analyzed on a par.
This explains the ungrammaticality of the (a) and (b) sentences in (52). These sentences are simply contradictory. In the (52b) examples, for instance, the event time of Eva's coming home is in the past and the event time of Elliott's leaving is in the future according to the tense semantics. But the connective after requires the former to follow the latter.

Examples like (c) and (d) in (52) are problematic for this line of explanation. The semantics of before does not contradict the temporal ordering given by tense semantics. When Eva's coming home takes place in the past and Elliott's leaving takes place at the speech time or in the future, it necessarily follows that the former is before the latter. Heinämäki (1974, p.74) suggests that this is the problem. If we know the temporal ordering of the two event times just by putting a past tense on one predicate and a present tense on the other, the connective before does not contribute to the sentence meaning at all. It is unnecessary to express the ordering by using before. It is this redundancy that makes sentences like (c) and (d) anomalous.

This particular answer is not completely satisfactory partly because redundancy does not always result in anomaly. Sentences such as we went to the pond yesterday and Mina is sleeping now are fine despite the fact that the contribution by the tense morphemes is redundant. I am inclined to suspect, however, that the anomaly of sentences like (52) is pragmatic, along the line suggested by Heinämäki.

Note that the sentences (52c,d) become acceptable when modified in the following way as suggested by Barbara Partee (p.c.):

(54) a. Eva came home just a few days before Elliott leaves for the summit meeting

d. Eva came home shortly before the new deputies take office

These are variants of newspaper report cases presented in Chapter 1, repeated below:

(55) a. Just three days after Kennedy's body was recovered, he will be returned to the sea in a private burial.

b. Two days after Yeltsin fired his most recent prime minister, he will meet with the Duma to present his choice of the new prime minister.

c. The Prime Minister arrived in Washington four days before he is to meet with a special joint session of Congress, and has been meeting with cabinet officials and representatives of the Defense Department.
These examples all have one thing in common; they have an explicit measure phrase, such as just three days (after) and a few days (before). These phrases add further information about the relation between the matrix and embedded event times. In other words, the phrases just three days after and a few days before are not redundant. For instance, it does not necessarily follow from the ordering given by tense semantics in (54a), i.e., that Eva's coming home is in the past and Elliott's leaving is in the future, that the former took place a few days before the latter. Perhaps this is why adding a measure phrase improves the acceptability of sentences with tense mismatch.

This is nothing more than a speculation, and we have not made much progress since Heinämäki (1974). But we will have to leave it as it is at this point.

3.3.3. The Semantics of Before
It has been noted in Anscombe (1964), Heinämäki (1974) and others that there are differences between before and after that cannot be reduced to just temporal differences. Compare the following examples:

(56) a. I watered the plant after it died
b. I watered the plant before it died

In order for the (a) sentence to be true, it has to be the case that both my watering event and the plant's dying event took place. For the (b) sentence to be true, the plant's dying event did not have to occur, however. In other words, the sentence is compatible with a situation in which the plant did not die thanks to my watering it.

Ogihara (1995c) following Anscombe (1964) proposes that a fundamental difference between the semantics of before and after lies in their quantificational force. Specifically the denotation of before is revised in the following way. (We repeat the denotation of after here for comparison.)

(57) a. \[ [[\text{before}]]_{g,c}^\mathcal{E} = f : \mathcal{D}_{i,\text{st}} \to \mathcal{D}_{i,\text{st}} \]
For all \( p \in \mathcal{D}_{i,\text{st}} \), \( t \in \mathcal{D}_i \), and \( w \in \mathcal{D}_s \), \( f(p)(t)(w) = 1 \) iff for all \( t' \) such that \( p(t')(w) = 1 \), \( t < t' \)

b. \[ [[\text{after}]]_{g,c}^\mathcal{E} = f : \mathcal{D}_{i,\text{st}} \to \mathcal{D}_{i,\text{st}} \]
For all \( p \in \mathcal{D}_{i,\text{st}} \), \( t \in \mathcal{D}_i \), and \( w \in \mathcal{D}_s \), \( f(p)(t)(w) = 1 \) iff there is a time \( t' \) such that \( t' < t \) and \( p(t')(w) = 1 \)
According to this semantics, a sentence with the form \( p \) before \( q \) does not entail \( q \) while \( p \) after \( q \) does. Thus, it correctly predicts the non-factual reading of sentences like (56b).\(^{28}\)

Ogihara (1995c) claims that this semantics of \( \text{before} \) is not completely satisfactory. This is because this semantics of \( \text{before} \) predicts no difference between the following two examples.

(58)  
\[
\begin{align*}
\text{a.} & \quad \text{My grandfather died before he saw his grandchildren} \\
\text{b.} & \quad \text{The Namibian boy died of starvation before he became the president of the U.S.}
\end{align*}
\]

Suppose that my grandfather and the Namibian boy actually died. Both sentences are predicted to be true, but the (b) sentence sounds very odd. Ogihara argues that the semantics of \( \text{before} \) requires a situation described by the complement clause to be 'likely' in a relevant sense. This means that \( \text{before} \) involves quantification over worlds as well as times. Here is a denotation of \( \text{before} \) which is based on this idea:

\(^{28}\) There are two independent arguments for an analysis of \( \text{before} \) as a universal quantifier. One is the difference between \( \text{before-} \) and \( \text{after-} \) clauses when they contain stative predicates. Anscombe (1964) observes that both (a) and (b) sentences in (i) may be true under the situation described in (ii), where each line --- expresses the interval that the Parthenon and St. Peter's existed. But (c) and (d) cannot both be true. Under this situation, (d) is judged false.

(i)  
\[
\begin{align*}
\text{a.} & \quad \text{St. Peter's was there after the Parthenon was there} \\
\text{b.} & \quad \text{The Parthenon was there after St. Peter's was there} \\
\text{c.} & \quad \text{The Parthenon was there before St. Peter's was there} \\
\text{d.} & \quad \text{St. Peter's was there before the Parthenon was there}
\end{align*}
\]

(ii)  
\[
\begin{array}{c}
\text{The Parthenon} \\
\hline
\text{St. Peter's}
\end{array}
\]

The universal analysis of \( \text{before} \) correctly predicts this: in order for \( p \) to be before \( q \), there has to be an interval that follows all the intervals at which \( q \) is true. Under the situation above, there is no interval of St Peter's existence that is after all the intervals of the Parthenon's existence.

The other welcome prediction of this analysis is that \( \text{before} \) licenses NPIs.

(iii) John came before anybody left

According to Ladusaw (1979), NPIs are licensed in downward entailing contexts, and according to the denotation of \( \text{before} \) in (57a), \( \text{before-} \) clauses are downward entailing contexts, as shown in Landman (1991). Therefore, it correctly predicts that NPIs may be licensed in \( \text{before-} \) clauses.
(59) \[[\text{**before**}]\]^{g,c} = D_{i,st} \rightarrow D_{i,st}
For all \( p \in D_{i,st}, t \in D_i, \) and \( w \in D_s, \) \( f(p)(t)(w) \) is defined iff there is a 'normal' continuation world \( w' \) of \( w \) from a time \( t' \) such that \( t' < t, \) and there is a time \( t'' \) such that \( t' < t'' \) and \( p(t'')(w') \).
When defined, \[[\text{**before**}]\]^{g,c}(p)(t)(w) = 1 iff for all \( t''' \) such that there is a continuation world \( w' \) of \( w \) from a time \( t' \) such that \( t' < t, \) and \( t' < t''' \), and \( p(t''')(w'), t < t'''

According to this definition, the sentence (58b) is predicted to be a case of presupposition failure. This is because in no 'normal' continuation world does the Namibian boy become the president of the U.S., given the current U.S. constitution.

The denotation in (59) is based on Ogihara's insight but differs from the one proposed by him. In his proposal, \textit{before} is a universal quantifier over continuation worlds. I believe that this is too strong. Imagine the following situation: my grandfather was diagnosed with terminal cancer while my mother was pregnant with me, who was going to be his first grandchild. According to the doctor, his chances of seeing me were very slim. Intuitively, the sentence \textit{my grandfather died before he saw his grandchildren} is judged true in this situation when he in fact died before my birth. But in many continuation worlds, he does not see his grandchildren according to the doctor. The universal quantification analysis makes a wrong prediction.

3.3.4. Japanese TACs
Let us now turn to Japanese TACs. As we have seen at the beginning of this chapter, Japanese TACs can sometimes have a present tense even when they are embedded under a past tensed clause. Typical cases are \textit{before}, which almost exclusively takes a present tensed clause, and \textit{when}, which allows both a present and a past tensed clause. In § 3.3.4.1., we will discuss \textit{before}- and \textit{after}-clauses in Japanese. We will observe that \textit{before}- and \textit{after}-clauses in Japanese do not show the Geis-type ambiguity as those in English and Polish do. We will argue that this is due to the structure of \textit{before}- and \textit{after}-clauses. The discussion in this subsection will be inconclusive: we can only analyze how grammatical sentences containing \textit{before} and \textit{after} are interpreted and show how this is related to the lack of the Geis-type ambiguity. We are unable to show why \textit{before} and \textit{after} select the particular tenses they select. § 3.3.4.2. offers an analysis of \textit{when}-clauses in Japanese.
3.3.4.1. Japanese Before- and After-Claus es
We begin with before- and after-clauses. We have seen that Japanese before- and after-clauses are different from English and Polish ones. They show a strange pattern of tense distribution.

Another striking difference between English/Polish TACs on the one hand and Japanese ones on the other is that Japanese before- and after-clauses do not show the ambiguity we observed in English/Polish TACs, as observed in Arregui and Kusumoto (1998).²⁹

(60) a. Junko-wa [zibun-ga [kaeru to] itta atode] kaetta
   J-top self-nom leave-pres comp say-past after leave-past
   'Junko left after she said (she) would'

   b. Watasi-wa Satoshi-ni [Junko-ga [kaetta to] iu maeni]
   I-top S-dat J-nom leave-past com say-pres before
   Amherst-de atta
   A-in meet-past
   'I met Satoshi in Amherst before Junko said (he) left'

These sentences are unambiguous: the sentence (60a) only has the upper construal, i.e., an interpretation in which Junko left after saying "I will leave". Notice that in the English counterpart of this sentence, this interpretation is less salient. This suggests that the interpretation that is missing, the one that associates the matrix event time with the most embedded event time, is not missing for extralinguistic reasons.

One could easily imagine a story like the following: Japanese TACs have the same structure as Polish/English ones, namely relative-clause-like structures. But Japanese, unlike Polish and English, has a stricter constraint on movement. Wh-movement from the lower clauses in (60) is prohibited for independent reasons, like the English examples with islands. In these English examples, we know of an independent reason why wh-movement from the lower clauses is illegitimate, namely island constraints. And this explains the lack of ambiguity in these cases.

²⁹Miyamoto (1996) claims that Japanese observes the same type of ambiguity in before- and after-clauses. However, he uses different constructions than the ones we examine here, where maeni and atode do not directly take tensed clauses, but the expression yori 'than' intervenes. We will come back to this type of construction later.
This line of explanation turns out to be untenable. 'Normal' relative clauses in Japanese observe the same kind of ambiguity:

(61) [Mary-ga [John-ga tazunetekuru to] itta] hi
     M-nom J-nom visit-come-pres comp say-past day
     'the day Mary said that John would come to visit her'

By this phrase, we could mean the day of Mary's utterance, or the day of John's visiting according to Mary. Overt and covert wh-movement is also possible out of embedded clauses.

(62) a. itu [Satoshi-wa [zibuntati-ga tyuugoku-ni iku to] itta] no
     when S-top self-pl-nom China-to go-pres comp say-past Q
     'When did Satoshi say that they would go to China?'

b. [Satoshi-wa [zibuntati-ga itu tyuugoku-ni iku to] itta] no
     S-top self-pl-nom when China-to go-pres comp say-past Q
     'When did Satoshi say that they would go to China?'

The interpretation we are interested in is the one in which the entire sentence is a question about the date they go to China. In both examples, it is not only a possible interpretation but also a prominent one.

Moreover, as we have seen in Chapter 2, relativization in Japanese is much less constrained than that in English. We repeat some examples:

(63) a. [sono sinsi-ga kiteiru] yoohuku-ga yogoreteiru
     that gentleman-nom wear-pres suit-nom dirty-pres
     'The suit which that gentleman wear is wearing is dirty'

b. [[[kiteiru] yoohuku-ga yogoreteiru] sinsi (-ni atta)
     wear-pres suit-nom dirty-pres gentleman (-dat meet-past)
     '(I met) a gentleman whose suit is dirty'
     (Lit. (I met) a gentleman who the suit (he) is wearing is dirty)
In (63b), relativization occurs out of a relative clause, and the sentence is fine. We attributed this to the lack of movement itself. Whether we were correct or Japanese simply does not impose island constraints on movement, it is very unlikely that movement of a covert wh-element is blocked only in before- and after-clauses.

Having denied one plausible story of why the lower construal is not possible in Japanese TACs, we now present our proposal. We propose with Arregui and Kusumoto (1998) that Japanese before and after select TP directly, and therefore there is no wh-movement involved (assuming that wh-movement targets CP-Spec.) As we have seen in the case of clausal gerunds in English, relative pronoun movement is not necessary when the complement of before and after already denotes properties of times. And this ensures that only the upper construal is available. Roughly, we propose a structure like the following where the TP is of type <i,st>:

(64) PP
      /  \
     TP  P
        /\   \
       atode/maeni

This accounts for the lack of ambiguity in Japanese. But does it explain the tense distribution we observed? Given our tense system and the semantics of these connectives, the structure of after-clauses will be something like the following, as suggested in Arregui and Kusumoto (1998):

(65) a. Junko-ga kita atode
    J-nom come-past after
    'after Junko came'
Analyzing *after*-clauses in this way forces us to interpret embedded tenses as relative tenses. The past tense operator above cannot be evaluated with respect to the speech time since the evaluation time variable $t^*$ cannot occur in this representation for compositional reasons. Recall the semantics of *atode* 'after'. It requires its complement to be of type $<i,st>$. The TP above is the right type for it. If the past tense operator takes a time variable as its evaluation time in syntax, then the resulting structure denotes a proposition, which leads to uninterpretability. This problem does not arise in English and Polish due to the presence of a relative pronoun, which serves as an abstractor over a variable of type $<i>$. Given the structure in (65), and other assumptions we have made so far about tense interpretation and modification, sentences with an *after*-clause such as the following are interpreted as in (66b)

\[(66)\]

a. \[
\text{[Junko-ga kita atode] Satoshi-wa kaetta}
\]
\[
\text{J-nom come-past after S-top leave-past}
\]
\[
\text{"Satoshi left after Junko came"}
\]

b. \[
\text{There is a time } t \text{ such that } t < s^* \text{ and Satoshi leaves at } t \text{ in } w, \text{ and there is a time } t' \text{ such that Junko comes at } t' \text{ in } w \text{ and } t' < t
\]

Let us now look at *before*-clauses in Japanese. Given the denotation of *maeni* 'before', repeated below, the truth conditions of the sentence (68a) should be something like (68b):
(67) $[[\text{before}]^{g,c} = D_{<i,st}> \rightarrow D_{<i,st>}$  
For all $p \in D_{<i,st>}$, $t \in D_i$, and $w \in D_s$, $f(p)(t)(w)$ is defined iff there is a 'normal' continuation world $w'$ of $w$ from a time $t'$ such that $t' < t$, and there is a time $t''$ such that $t' < t''$ and $p(t'')(w')$.  
When defined, $[[\text{before}]^{g,c}(p)(t)(w) = 1$ iff for all $t'''$ such that there is a 'normal' continuation world $w'$ of $w$ from a time $t'$ such that $t' < t$, and $t' < t'''$, and $p(t''')(w')$, $t < t'''$

(68) a. [Junko-ga kuru maeni] Satoshi-wa kaetta  
J-nom come-pres before S-top leave-past  
'Satoshi left before Junko came'

b. When defined, $[[((68a)]^{g,c}(w) = 1$ there is a time $t$ such that $t < s^*$ and  
Satoshi leaves at $t$ in $w$, and for all $t'''$ such that there is a continuation world $w'$ of $w$ from a time $t''$ such that $t'' < t$, $t'' < t'''$, and Junko comes at $t'''$, $t < t'''$

We have seen that before in Japanese takes a present tensed clause as its complement. Our syntax of a present tensed sentence is something like the following:

(69)  
```
    TP  
   /   
 VP t*  
   /  
 Junko-ga kuru  
   J-nom  come-pres
```

This means that the TP denotes a proposition, not the right type for before. Let us argue, however, based on the semantics of before presented in § 3.3.3., that the variable $t^*$ can be bound in before-clauses; before creates an intensional context, a binding environment for the variable $t^*$. Assuming free insertion of lambda operators, the structure of the before-clause above is something like the following:

(70) a. Junko-ga kuru maeni  
J-nom come-pres before  
'before Junko comes'
b.                P P
        TP λ_i        | maeni
       VP t*_i  before
Junko-ga kur-u
J-nom  come-pres

We have seen how a given grammatical sentence containing a before- or after-clause is interpreted. However we have not explained why before and after select the particular tense they select. In particular, we do not know why maeni 'before' cannot take a past tensed clause and bind the evaluation time variable, t*, of the past tense operator as shown below:

30 In Arregui and Kusumoto (1998), the following story is given. There it is argued that the present tense in Japanese is a time variable while the past tense is roughly the same as what we have as shown below.

(i) a. Mako-wa nihon-ni iru
     M-top  Japan-in be-pres
     'Mako is in Japan'

b.        TP
       VP  pres_i
Mako-wa nihon-ni ir -u
M-top  Japan-in be

(ii) a. Mako-wa nihon-ni ita
     M-top  Japan-in be-past
     'Mako was in Japan'

b.        TP t*
       T' λ_i  PAST
       VP past_i
Mako-wa nihon-ni i -ta
M-top  Japan-in be

Therefore, a present tensed sentence is necessarily of type <s,t> since the present tense itself is a time variable. A past tensed sentence can denote a property of times when its evaluation time is not saturated. With the semantics of before and after given above, the selectional
We are unable to resolve this problem at this point, and therefore cannot choose between our line of analysis and the one given in Ogihara (1996). Recall that the difficulties we presented in § 3.2. are not against Ogihara's particular analysis of tense in before- and after-clauses in Japanese. They are against his overall approach to tense in embedded contexts, i.e., the relative tense hypothesis that says that all embedded tenses are relative to the next higher tenses, and relating tense in TACs with the presence or absence of SOT phenomena. We will leave problems concerning Japanese before- and after-clauses for future research.

Before closing this section, let us present another argument that suggests a correlation between the relative clause analysis of TACs and their tense interpretation. Examples like the following are discussed in Miyamoto (1996), where he argues for a relative clause analysis of before- and after-clauses in Japanese.

---

property they exhibit is reduced to interpretability with one crucial assumption, namely, that before can bind a present tense variable but not $t^*$. Before cannot take a past tensed clause and after cannot take a present tensed clause simply because they are of the wrong types.

This cannot be modified to fit into our system. This is because we do not distinguish the two time variables, i.e., the present tense variable and the distinguished variable. Moreover, we have seen in Chapter 2 that the evaluation time variable of the past tense operator (i.e., the distinguished variable) must be able to be bound (see § 2.1.3.). This means that the crucial assumption in Arregui and Kusumoto's analysis has to be abandoned anyway.

---
Miyamoto reports that the sentence has an interpretation in which the time I met Junko was before her alleged arrival time according to what everybody was saying (and everybody was telling the same story.) My informants and I agree. Notice, however, that the construction involved in this sentence is different. *Yori maeni*, which translates literally into 'before than', instead of *maeni* alone is used. It is not clear to me what role the word *yori* plays in this case. As the gloss suggests, *yori* is typically used in comparative sentences. (Japanese does not have a comparative morpheme corresponding to *-er* and *more* in English.)

(73) a. Jen-wa Mariko-yori hayaku oyogeru
   J-top M-than fast swim-can-pres
   'Jen can swim faster than Mariko'

   b. kinoo yori takusan-no hito-ga kita
   yesterday-than many-gen people-nom come-past
   'More people than yesterday came'

We can only speculate that the presence of *yori* makes the embedded clause a relative clause. More importantly for our purpose, however, the clause directly embedded under *maeni* is past tensed. This is only possible when *yori* is present. Moreover, this past tense is understood as an absolute tense.

Although we do not know the exact nature of the *yori* construction in TACs, it does not seem merely an accident that the presence of this expression is what makes the lower construal possible and at the same time allows a past tensed clause in *before*-clauses. We believe that this correlation suggests that we are on the right track relating the two issues in terms of compositionality.
3.3.4.2. Japanese When-Clauses

Let us now turn to when-clauses. We propose with Arregui and Kusumoto (1998) that when-clauses in Japanese may be analyzed as relative clauses. To support the proposal, we present the following example.

(74) Watasi-wa [Junko-ga [Satoshi-ga tuku to] itta tokini
  I-top J-nom S-nom arrive-pres com say-past when
  eki-de kare-o matteita
  station-at he-acc wait-teiru-past
'I was waiting for Satoshi at the station when Junko said that he would arrive'

This example shows the same ambiguity as English and Polish: I could be waiting for Satoshi at the time of Junko's utterance, or more naturally at the time of his arrival according to Junko.

If we are to analyze Japanese when-clauses as relative clauses, then we can expect an absolute tense in when-clauses. This follows compositionally as we have shown for English and Polish: since we are assuming that a relative pronoun is an abstractor over a variable of type <i>, and that when-clauses as a whole have the denotation of a temporal modifier, i.e., type <i,st>, the complement clause of when has to be of type <s,t>. This means that the evaluation time of the past tense operator has to be saturated as shown below:

(75) a. [Satoshi-ga kita toki] (Junko-wa heya-ni ita)
  S-nom come-past when J-top room-in be-past
  'Junko was in her room when Satoshi came'
Given this structure, we can see that the when-clause predicate is evaluated with respect to the speech time independently of the matrix tense. Since we are talking about two past events in sentences like the above, we predict that a past tensed when-clause modifying a past tense predicate is interpretable, and in fact has a sensible interpretation as follows:

c. There is a time $t$ such that $t < s^*$ and Junko is in her room at $t$ and there is a time $t'$ such that $t' < s^*$ and Satoshi comes at $t'$ and $t = t'$.

Cases of past tensed when-clauses embedded under past tensed matrix clauses are accounted for in this way. But this cannot be the end of the story. If we extend this relative clause analysis to present tensed when-clauses, such as the following, they are assigned structures like (76b)

(76) a. heya-de neteiru tokini Junko-ga tazunete-ki-ta
    room-at sleep-teiru-pres when J-nom visit-come-past
    'Junko visited me when (I) was sleeping in my room'
b. 

\[ \text{PP} \]
\[ \text{TP} \quad \lambda \cdot i \quad \text{when} \]
\[ \text{VP} \quad t^* \]
\[
(\text{at proj}) \text{heya-de neteiru}
\text{room-in sleep-teiru-pres}
\]

This yields the following truth conditions for the sentence above:

c. There is a time \(t\) such that \(t < s^*\) and Junko visits me at \(t\) and I am sleeping at \(s^*\) and \(s^* = t\)

This is contradictory: the time of Junko's visiting (i.e., \(t\) above) cannot both coincide with the speech time and precede it. This means that a present tensed when-clause cannot modify a past tensed predicate. But it certainly can in Japanese.

We propose that Japanese when-clauses are structurally ambiguous: they can have a relative clause structure as above, or else they can embed a structure like the following:

\[
(77)
\]

\[ \text{PP} \]
\[ \text{VP} \quad \text{toki(-ni)} \quad \text{when} \]
\[ \text{heya-de neteiru} \]
\[ \text{room-in sleep-teiru-pres} \]

The PP denotes a property of times at which I am sleeping in my room. This yields the right interpretation for the sentence.

This also accounts for futurate interpretations of present tensed when-clauses assuming that we have an appropriate theory for the stative vs. eventive difference regarding temporal interpretations. We will need a theory for this difference independently of the temporal interpretation of TACs to account for the following contrast:
(78)  a.  Mako-wa nihon-ni iru
    M-top Japan-in be-pres
    'Mako is in Japan'

   b.  Mako-wa amerika-ni kaette-kuru
    M-top the U.S.-to return-come-pres
    'Mako will come back to the States'

Let us stipulate a silent element that corresponds to will that cooccurs with a present tensed eventive predicate. To simplify the discussion, we ignore quantification over worlds in the semantics of will. The when-clause in the following example then denotes the property of times that precede my going out the front door as in (79b).

(79)  a.  genkan-o deru toki denwa-ga natta
    entrance-acc leave-pres when phone-nom ring-past
    'The phone rang when (I) was about to go out the front door'
    'The phone rang right before I went out the front door'

   b.  \[t.\lambda w[\exists t'[t < t' & go-out(the front door)(I)(t')]]

This correctly yields the interpretation we want.

Lastly, we turn to examples with a habitual interpretation, repeated here:

(80)  a.  [Satoshi-ga kuru toki] Junko-wa heya-ni ita
    S-nom come-pres when J-top room-in be-past
    'Junko was (usually) in her room when Satoshi came'

   b.  Taroo-wa [kanasii toki] hurusato-o omoidasita
    T-top sad-pres when hometown-acc remember-past
    'Taroo (usually) remembered his hometown when he was sad'

The when-clauses in these examples have an interpretation that is roughly translated as whenever. In Arregui and Kusumoto (1998), these examples were contrasted with their past tensed counterparts, whose most prominent interpretations are episodic interpretations:
(81) a. [Satoshi-ga kita toki] Junko-wa heya-ni ita
   S-nom come-past when J-top room-in be-past
   'Junko was in her room when Satoshi came'

   b. Taroo-wa [kanasikatta toki] hurusato-o omoidasita
   T-top sad-past when hometown-acc remember-past
   'Taroo remembered his hometown when he was sad'

Arregui and Kusumoto (1998) argue that this difference in interpretation, i.e., habitual vs. episodic interpretations, is solely due to the difference in tense in the *when*-clauses. There, the following account is proposed: (i) the present tense in Japanese is a variable, (ii) there is an implicit adverb of quantification, (see Kratzer 1986), and (iii) *when*-clauses can function as a restrictor of the adverb of quantification (see Kratzer 1995a and Lewis 1975).

(82) \[ t^* \]
    \[ \text{PAST} \]
    \[ \lambda_i \]
    \[ \text{past}_i \]
    \[ \text{VP} \]
    \[ \text{always} \]
    \[ \lambda_j \]
    \[ \text{when} \]
    \[ \text{pres}_j \]
    \[ \text{VP} \]

(83) \[[\text{always}]^{g,c} = f: D_{<i, st>} \rightarrow D_{<<i, st><i, st>>}\]

For all \( p \) and \( q \in D_{<i, st>}, t \in D_i, \) and \( w \in D_s, \) \( f(p)(q)(t)(w) = 1 \) iff for all times \( t' \) such that \( t' \subseteq t \) and \( p(t)(w), \) there is a time \( t'' \) such that \( t'' \) overlaps \( t' \) and \( q(t'')(w) = 1. \)

This correctly yields the desired truth conditions.

(84) \[[\text{(82)}]^{g,c}(w) = 1 \text{ iff there is a time } t \text{ such that } t < s^* \text{ and for all times } t' \text{ such that } t' \subseteq t \text{ and Satoshi comes at } t', \text{ there is a time } t'' \text{ such that } t'' \text{ overlaps } t' \text{ and Junko is in her room at } t''.\]
Although positing an implicit adverb of quantification and restricting it by *when*-clauses makes the correct prediction regarding sentences like (80), it does not account for the episodic simultaneous interpretation in sentences like (76a) and the episodic futurate interpretation in sentences like (79), both of which are not discussed in Arregui and Kusumoto (1998).

Also it is not clear under this analysis how this particular case of habitual interpretation relates to a general theory of adverbs of quantification. All the examples that we said have an episodic interpretation yield a quantificational interpretation when adverbs of quantification like *itumo* 'always' are inserted.

(85)  a. [Satoshi-ga kita toki] Junko-wa itumo heya-ni ita
     S-nom come-past when J-top always room-in be-past
     'Junko was in her room whenever Satoshi came'

     b. [heya-de neteiru tokini] itumo Junko-ga tazunete-ki-ta
        room-at sleep-teiru-pres when always J-nom visit-come-past
        'Junko visited me whenever (I) was sleeping in my room'

     c. [genkan-o deru toki] itumo denwa-ga natta
        entrance-acc leave-pres when always phone-nom ring-past
        'The phone rang whenever (I) was about to go out the front door'

The quantificational interpretation is also possible without such an adverb if an appropriate context is provided.

We would like to argue that both episodic and quantificational interpretations are always possible, but depending on the context in which a given sentence appears, one or the other is more prominent. This in fact goes with the observation that it is also possible to get an episodic interpretation with the examples that have a habitual interpretation. When we add frame adverbials like *kinoo* 'yesterday', the sentences may have an episodic interpretation in which one particular event that took place yesterday is being discussed.

(86)  a. [kinoo Satoshi-ga kuru toki] Junko-wa heya-ni ita
     yesterday S-nom come-*pres* when J-top room-in be-past
     'Junko was in her room when Satoshi came (lit. comes) yesterday'
b. Taroo-wa [kinoo kanasii toki] hurusato-o omoidasita  
T-top yesterday sad-pres when hometown-acc remember-past  
'Taroo remembered his hometown when he was (lit. is) sad yesterday'

When these sentences have an episodic interpretation, they pattern with other examples with present tensed when-clauses; when when-clauses contain an eventive predicate as in (86a), the when-clauses have a futurate interpretation with respect to the matrix event times. When when-clauses contain a stative or progressive predicate as in (86b), they yield a simultaneous interpretation.

We do not know what makes examples like (80) different from others in that the quantificational interpretation is very prominent without any adverbs of quantification. But we assume that an episodic interpretation is not impossible to get in these examples. Therefore, we assume that both episodic and quantificational interpretations are available to all the cases with different degree of prominence toward one or the other. If we are correct about it, what we need is a theory to derive both interpretations irrespective of the tense in when-clauses.

We already have an analysis for episodic when-clauses. We argued that when-clauses are VP modifiers. They denote properties of times at which the when-clause event takes place. They are intersected with the matrix VP denotation.

(87) 
\[ t^* \]
\[ \text{PAST} \]
\[ \lambda i \]
\[ \text{past}_i \]
\[ \text{VP} \]
\[ \text{VP} \]
\[ \text{CP} \]
\[ \text{when} \]

What about a quantificational interpretation? When there is no overt adverb of quantification, we assume that there is a covert one. Instead of restricting it by the when-clause in the LF syntax, as argued in Arregui and Kusumoto (1998), we argue that adverbs of quantification only have implicit restrictors at LF determined by context, following Rooth (1985), von Fintel (1994) and others. What is mapped into restrictors depends on focus in the rest of the sentence.
Below, we will present Heim's (1997b) implementation of Rooth's focus semantics. In calculating the truth conditions, we compute the focus semantic value of an expression $\alpha$, $\llbracket \alpha \rrbracket$, in addition to the ordinary semantic value $\llbracket [\alpha] \rrbracket$. The focus semantic value of $\alpha$ is the set of all possible alternatives to the constituent when it is focused. Every focus must be in the scope of a two-place focus interpretation operator $\cup\sim$. It takes a 'clause' $\phi$ and an implicit anaphoric element as its argument. The semantics of the focus operator is as follows. (We will illustrate how it works below.)

(88) $\llbracket [\phi \cup\sim C] \rrbracket_{g,c}$ is only defined when $g(C) \subseteq \cup\llbracket \phi \rrbracket_{g}$

When defined, $\llbracket [\phi \cup\sim C] \rrbracket_{g,c} = \llbracket [\phi] \rrbracket_{g,c}$

We assume that tense takes maximal scope over the rest of the sentence including an implicit adverb of quantification. We also assume that the focus anaphor and the implicit restrictor are coindexed. Thus, when a quantificational interpretation arises, we have structures like the following:

(89)

Now let us turn to our examples. The following is one of the examples where a quantificational interpretation is prominent.

(90) a. Taroo-wa [kanasii toki] hurusato-o omoidasita
   T-top sad-pres hometown-acc remember-past
   'Taroo remembered his hometown whenever he was sad'

Suppose that the sentence is uttered in response to the question \textit{what did Taroo usually do when he was sad?} The matrix predicate is focused in this case.
b. Taroo-wa kanasii toki [hurusato-o omoidasita]¥

According to the definedness condition of the focus operator, the value of the implicit variable $C_1$ has to be a subset of the union of the focus semantic value of the clausal argument of the operator, i.e., the upper VP in (89). The union of the focus semantic value of the sentence is the following:

\[
\bigcup \{P: \exists Q. P = \lambda t \lambda w[Q(t)(w) = 1 \& \text{Taroo is sad at } t \text{ in } w]\}
\]

\[
= \lambda t \lambda w[\text{Taroo is sad at } t \text{ in } w]
\]

Thus, in order for the interpretation of the sentence to be defined, the value of $C_1$ assigned by $g$ must be a subset of this property of times. Notice that the restrictor of the implicit adverb of quantification is coindexed with the focus anaphor. This gives us the desired result.

This analysis also correctly predicts another possible quantificational interpretation, called a head-restriction interpretation, available to the sentence. (See Rooth 1985 and Johnston 1994a,b.) Consider the same sentence as an answer to the question when did Taroo usually remember his hometown? A focus is placed on the when-clause in this context.

(92) Taroo-wa [kanasii toki]¥ hurusato-o omoidasita

The value assigned to $C_1$ has to be a subset of the property of times at which Taroo remembered his hometown. The interpretation of the sentence in this context is as follows: there is a past time $t$ such that for most times $t'$ such that $t'$ is part of $t$ and Taroo remembers his hometown at $t$, he is sad at $t$.

To sum up, we have presented an analysis of two possible interpretations of when-clauses, an episodic interpretation and a quantificational one. We have argued, contrary to what is argued in Arregui and Kusumoto (1998), that there is no syntactic difference in the attachment of when-clauses between the two interpretations. The difference is derived by positing an implicit adverb of quantification and restricting it by an implicit restrictor which is affected by focus structure of the sentence. In Arregui and Kusumoto (1998), on the other hand, present tensed when-clauses are analyzed as a syntactic argument of implicit adverbs of quantification while past tensed when-clauses are analyzed as VP modifiers. We believe that the analysis presented here is more satisfactory than the analysis presented in Arregui and Kusumoto (1998) regarding its empirical coverage. The former can account for episodic
interpretations of present tensed *when*-clauses, head-restriction interpretations, and also quantificational interpretations, in a unified way. Note that implicit restrictions of adverbs of quantification and the focus semantics are both independently motivated. Thus we do not need to introduce any new mechanism to derive quantificational interpretations. A disadvantage of this analysis is that it does not predict why native speakers have preference to get a quantificational interpretation in certain sentences even without a contextual bias. We will leave this problem open.

3.4. Implications for Issues of Explicit Quantification over Times
We have given an account for tense distribution and interpretation in TACs in various languages. We have argued against an account of the distribution of tense in TACs that subsumes it as a case of the SOT phenomena. Most crucially, a relative tense account does not explain the tense distribution in Russian and Polish. Instead, we have attributed the observed difference between English and Polish on the one hand and Japanese on the other to a structural difference of their TACs. This not only accounts for the difference between Polish and Japanese in their tense distribution in before-clauses but also relates this fact to the presence or absence of Geis-type ambiguities in TACs in terms of interpretability.

In this section, we will show that to the extent that our analysis of TACs as relative clauses is successful, it provides evidence that favors a tense system with explicit quantification over times in the object language over a multiple-index system. Let us first briefly present the core argument. In our analysis, tense in TACs being an absolute tense is a consequence of analyzing TACs as relative clauses. (i) TACs are VP modifiers and thus are of type <i, st>. (ii) A relative pronoun serves as an abstractor over a variable of type <i>. (iii) Therefore, TACs before abstraction have to denote propositions, i.e., of type <s, t>. This means that the temporal argument slot of a tense operator is saturated by an overt time variable, which in turn means that tenses in these clauses are absolute. In short, whether the time variable \( t^* \) is realized in syntax or not results in a difference in types. According to a relative clauses analysis of TACs, its absence means uninterpretability.

In a multiple-index system such as the one we examined in Chapter 1, whether a tense operator is evaluated with respect to the speech time or the next higher element that affects tense interpretations depends on the presence or absence of the \( N \) operator. But this does not affect the semantic types of sentences: they denote truth-values (with respect to whatever indices we have). Therefore, the correlation between the relative clause status of TACs and tense distribution does not follow from compositionality.

In what follows, we try to spell this out in more detail. As is obvious, our analysis of TACs as relative clauses crucially relies on explicit quantification over times in the object
language: the trace left by moving a relative pronoun in TACs is a variable of type $<i>$ and the relative pronoun serves as an abstractor over this type of variable. One advantage of analyzing TACs as relative clauses is that we are able to account for the Geis-type ambiguity naturally. We cannot import this analysis of TACs to a system where there is no element of type $<i>$ in the object language. But the observed ambiguity is something to be explained. If giving up a system with explicit quantification over times necessarily means giving up an explanation for this Geis ambiguity, we can say that a system with overt quantification over times is empirically more adequate than one without it. But is it so? The question we want to ask first is whether we can account for the ambiguity without appealing to quantification over times.

Let us first see how in a multiple-index system we could derive interpretations of sentences containing TACs. Below are the denotations of operators within a multiple-index system.

(93) a. $[[N_n \phi]]^\tau = 1$ iff $[[\phi]]^{\tau[n/0]} = 1$
b. $[[K_n \phi]]^\tau = 1$ iff $[[\phi]]^{\tau[0/n]} = 1$
c. $[[\text{Past} \phi]]^\tau = 1$ iff there is a time $t$ such that $t < \tau(0)$ and $[[\phi]]^{\tau[t/0]} = 1$
d. $[[\text{Pres} \phi]]^\tau = 1$ iff there is a time $t$ such that $t$ overlaps $\tau(0)$ and $[[\phi]]^{\tau[t/0]} = 1$
e. $[[\phi]]^\tau = 1$ iff $\phi$ is true at $\tau(0)$

We have argued that tense in TACs in English and Polish is an absolute tense: it takes the original evaluation time as its reference time. To do so in a multiple-index system, we need to have representations like the following:

(94) a. Eva came home before Elliott left
b. $K_i \text{Past} \text{Eva come home before} N_i \text{Past Elliott leave}$

We first apply the $K$ operator and store the original evaluation time. This does not affect the interpretation of the matrix past tense. This past tense shifts the evaluation time into the past. When evaluating the embedded clause, we first apply the $N$ operator to get the original evaluation time, and then the embedded past tense takes this new time as its evaluation time. Now we need to determine the semantics of $\text{before}$ in this system. Here $\text{before}$ cannot be a modifier but has to be a sentence connective since its complement is a full sentence. So it has to be defined in the form of ‘where $\phi$ and $\psi$ are sentences, $[[\text{before} \; \phi \; \psi]]^\tau = 1$ iff…’ The semantics has to specify the temporal ordering of two event times. It has to contain a formula $t < t'$ where $t'$ is the embedded event time and $t$ is the matrix event time. A
problem is that in representations like (95b), before needs to have access to the times at which the tenseless sentences Eva come home and Elliott leave are evaluated (i.e., the event times of these sentences.) Denotations like the following cannot accomplish this. (To simplify the discussion, we will assume that before is not intensional.)

(95) Where φ and ψ are sentences,
\[
[[\text{before } \phi \psi]]^\tau = 1 \text{ iff there is a time } t \text{ and } t' \text{ such that } [[\phi]]^\tau[t/0] = 1 \text{ and } [[\psi]]^\tau[t'/0] = 1 \text{ and } t < t'
\]

This is because this semantics orders the evaluation times of the entire matrix and embedded sentences including the past tense operator. In order for a semantics like this to work, it has to take two tenseless sentences. The sentence (95a) should have an LF where the past tense operator takes scope over the entire sentence.

(96) Past [Eva come home before Elliott leave]

This yields the right interpretation, but leaves the question open as to why the embedded predicate surfaces as a past tensed predicate. This is problematic for non-SOT languages like Polish. Moreover even if we manage to solve this problem, we still have to see how we can derive the lower construal when before contains a more complex structure.

This means that we need a device that allows us to have access to times that are introduced inside some tense operator, a device equivalent to a relative pronoun movement in the proposed system. Any such device I can think of causes problems in other aspects of interpretation. But let us ignore those potential problems and see the consequences of such a system since what we want to show in the end is that such a system cannot account for a correlation between the availability of the Geis-type ambiguity and absolute interpretation of the embedded past tense.

Here is one way: suppose that each sentence has a covert adverb equivalent to then with an index. Moreover, let us say that it is only defined in the immediate scope of a tense operator.

(97) \[
[[\text{then}_i \phi]]^\tau[t/0] = 1 \text{ iff there is a time } t' \text{ such that } t' \subseteq \tau(t), t' = g(i), \text{ and } [[\phi]]^\tau[t'/0] = 1
\]

Suppose further that before has two indices through which it orders two event times:
Where $\phi$ and $\psi$ are sentences which contain the adverb $then_i$ and $then_j$ respectively,
\[
[[before_{i,j} \phi \psi]] = 1 \text{ iff there is a time } t \text{ and } t' \text{ such that } [[\phi]]_{t/0} = 1, [[\psi]]_{t'/0} = 1 \text{ and } g(i) < g(j)
\]

Using this denotation of before, sentences like the following can be given two different structures.

(99) Eva came home before Elliott said she did
   a. $K_1$ Past then$_i$ Eva come home before$_{i,j}$ N$_1$ Past then$_j$ Elliott say that she Past
   b. $K_1$ Past then$_i$ Eva come home before$_{i,k}$ N$_1$ Past then$_j$ Elliott say that she Past

This enables us to capture the ambiguity without explicit quantification over times.

Now let us see its consequences. To simplify, let us consider a simpler sentence like the following. In this system, there are at least three ways to derive the right truth conditions for the sentence.

(100) Eva came home before Elliott left
   a. $K_1$ Past then$_i$ Eva come home before$_{i,j}$ N$_1$ Past then$_j$ Elliott leave
   b. Past then$_i$ Eva come home before$_{i,j}$ Past then$_j$ Elliott leave
   c. Past then$_i$ Eva come home before$_{i,j}$ Pres then$_j$ Elliott leave

Crucially, this analysis predicts that the (c) representation is interpretable and yields the interpretation that is equivalent to the one we get from the (a) or (b) representations. But the before-clause predicate cannot be present tensed in this case. So we need to stipulate an independent reason to exclude this representation. One might argue that this is due to the indexical nature of the present tense in English. We have seen some evidence for this view in the previous chapters. Adopting this view in this framework means that we cannot have representations like (c). Instead we have (d).

   d. $K_1$ Past then$_i$ Eva come home before$_{i,j}$ N$_1$ Pres then$_j$ Elliott leave

Then, the anomaly of sentences like *Eva came home before Elliott leaves* should be attributed to a pragmatic story: the truth conditions say that the time of Elliott's leaving is at the speech time (or if we analyze a present tensed eventive predicate as having a futurate interpretation,
the time of leaving is in the future relative to the speech time) and the time of Eva's coming home in the past.

This story cannot cover the Polish data, however. There, we simply have to stipulate that representations like (c) are not allowed. If so, why are they allowed in Japanese? The difference between Japanese and Polish regarding tense interpretation and distribution in TACs ends up as an arbitrary choice. And the correlation with Geis-type ambiguity becomes merely accidental.

We hope to have shown that the correlation between the presence or absence of the Geis-type ambiguity and embedded tenses being construed as absolute tenses is better captured in a system with explicit quantification over times than in a multiple-index system. I tried to account for the Geis-type ambiguity within a multiple-index system, where there is no element of type <i> in the object language. Perhaps I did not do a good job, and perhaps that is why we are led to the conclusion that a system with explicit quantification over times is better. Perhaps it is possible to come up with a way in a multiple-index system to derive everything we could derive in a system with explicit quantification over times. But to the extent I am right, the arguments presented here can be taken as evidence for a system with explicit quantification over times over a multiple-index system, which employs completely different mechanisms to account for tense interpretation in natural language, but nonetheless has been proved to be equivalent in expressive power. At least I hope to have raised an interesting issue regarding what the proper treatment of tense in natural language should be.

3.5. Conclusions
The results of this investigation are summarized as follows:

Natural language employs explicit quantification over times in the object language.

a. The evaluation time of tense operators is represented by the distinguished time variable.

b. The event time of simple tensed predicates is represented by tense morphemes.

c. The event time of tenseless predicates, such as nouns and their modifiers, is not represented.

We have arrived at this conclusion by looking at different languages and different kinds of embedded contexts. In particular, we have shown that our proposal explains (i) differences between tensed and tenseless expressions regarding their temporal interpretations, and (ii)
differences among non-SOT languages in their tense interpretation in relative clauses and temporal adjunct clauses.

We want to emphasize the importance of investigation across languages and across different constructions, following the work of Ogihara (1989, 1996) in particular, in the area of the SOT phenomena and tense in embedded contexts. Although we have looked at a wider range of data in detail than the previous literature, the coverage of this thesis is still very small: we only looked at three different embedded contexts in four different languages. It is not hard to imagine that we might find a language in which our proposal does not work. But we hope that the progress we made since Ogihara will not completely be lost.