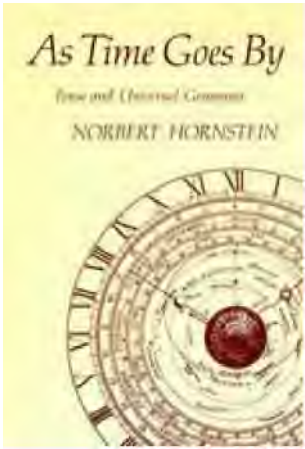
As Time Goes By

Tense and *Universal*

NORBERT HORNSTEIN



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As Time Goes By

Tense and Universal Grammar

Norbert Hornstein

Introduction: Tense and the Language Faculty

Natural languages pair sounds and meanings over an unbounded domain of structures. Humans, on the basis of a rather slender data base, come to master this practically infinite mapping in a surprisingly short time, without conscious effort, explicit instruction, or apparent difficulty. Generative grammarians have made this phenomenon their central focus of research. How is it that humans accomplish this?

The problem can be characterized in the abstract as follows: Human beings have the capacity to acquire any human language if placed in the appropriate speech community. The knowledge attained by the end of the process extends to an infinite domain of sentences. On the face of it, the data available to the child during the acquisition process—the primary linguistic data—are seriously inadequate to guiding the task at hand.

First, the set of sentences the child is actually exposed to is finite; for all practical purposes, however, the knowledge attained extends over an infinite domain of sentences.

Second, the child is actually exposed not to sentences but to *utterances* of sentences. These utterances are not perfect vehicles for the transmission of sentential information. They can be defective in various ways. Slurred speech, incomplete thoughts, slips of the tongue, convoluted syntax, and mispronunciations are only some of the ways that utterances can obscure sentence structure.

Third, acquisition takes place without much explicit guidance by the speech community. This is true for several reasons: Children do not make many errors, when one considers the range of logically possible mistakes. Moreover, adults do not really engage in much systematic correction of errors that do occur. Most parents are thrilled that Melissa is speaking at all, and criticism is elbowed aside by unabashed delight. In

addition, children appear to be highly immune to correction. Even when adults intrude to lend a helping hand, junior seems not to understand what the fuss is all about, nor to care.

Fourth, and most important, of the data theoretically available to the child, it is likely that only the *simple* sentences can be absorbed. The gap between input and intake is attributable to various cognitive limitations, such as short attention span and restricted short-term memory capacity. These cognitive limitations seriously affect the processing of complex utterances. This leaves simple sentence utterances as the only real source of robust linguistic information for the child. The significance of this last point cannot be overestimated. It implies that the process of language acquisition is primarily guided by the information available in *well-formed, simple sentences.* Negative data (the information available in unacceptable ill-formed sentences) and complex data (the information yielded by complex constructions) are *not* among the primary linguistic data that guide the process of grammar acquisition. The child, in the process of grammar construction, is limited to an informationally restricted subset of the potentially relevant data. In contrast to the full range of linguistic data (both exotic and mundane) to which the linguist has access when constructing a theory, the infomation that the child can actually use to guide the process of grammar acquisition is severely impoverished.[1] This suggests that wherever the linguistic properties of complex clauses diverge from simple ones, the acquisition of this knowledge cannot be data-driven. Induction is insufficient to the task, as the relevant information is simply not available in the data set to which the child has access.

Where does all this lead? It leads to the conclusion that children come equipped with a rich innate system of knowledge that guides language acquisition, in general, and grammar construction, in particular. This innate system is supple enough to guide the acquisition of the grammer of any of the myriad natural languages, yet it is rigid enough to guide the acquisition process despite the obvious degeneracy and deficiency of the primary linguistic data. The aim of a linguistic theory in a particular linguistic domain is to adumbrate the fine structure of this innate capacity. The four points alluded to above serve as boundary conditions on any adequate linguistic account. A theory is evaluated not only in terms of how many sentences it handles correctly, though this is not a trivial aspect of any serious proposal, but also in terms of how well it addresses the how-is-acquisition-possible-at-all problem that frames the particular account.2

There is a practical reflex of this perspective. Research concentrates on the exotic, unacceptable, and complex constructions within a given language. It is here that the effects of the innate system should be most directly visible, for it is in such cases that the knowledge attained by a native speaker of a given language cannot reasonably be traced to the shaping effects of linguistic input.

Let me put this another way, for the point is important: We can attribute the convergent judgments of native speakers concerning the acceptability or interpretation of a given construction in their language either to the shaping effects of a robust environment or to the innate capacity of the native speakers. If we concentrate on "exotic" constructions, then we control for the shaping effects of the linguistic environment. We then expect two possible outcomes: Either judgments concerning these constructions diverge randomly, with different native speakers judging the acceptability of a given construction in incompatible ways, or there is a convergence in native speakers' judgments, and this convergence in judgments is explained by alluding to some innate knowledge that humans bring to the task of language acquisition. As the latter system of innate knowledge is what is of interest, it pays to examine exotic constructions whose properties native speakers agree upon. This focus allows us to get a fix on the details of the innate system.

Theoretically, this perspective leads one to develop formal systems embodying universal principles that are responsive to the acquisition problem. These principles come in two varieties: structural universals, which limit the range of configurations in a natural language, and substantive universals, which limit the kinds of formatives a natural language may have. Both act to restrict the variety of grammars available for language acquisition. Both act to compensate for the poverty of the linguistic stimulus for the process of grammar construction.

Most work in contemporary linguistics acknowledges the appropriateness of these concerns.[3] This is manifest in the attempt to discover linguistic universals capable of restricting the range of grammatical options available to the child. It is manifest in the concern for the question "Why are such and such structures not attested in natural languages?" It is manifest in the attempts to design formal systems that will naturally encode the limitations suspected to characterize the grammars of natural languages. I will adopt this perspective in laying out a theory of tense for natural language.

Is this an appropriate stance to take? In other words, is it appropriate to evaluate theories of tense as we evaluate more familiar syntactic or

phonological theories? It is, if the same sort of acquisition problem arises in the domain of tense as characterizes these other areas. A parallel perspective is meaningful if the acquisition of linguistic competence in the domain of tense proceeds under the same general poverty of stimulus conditions that characterize the acquisition of syntactic or phonological competence. Is it reasonable to think that this is the case?

It can hardly be doubted that speakers often misspeak, or that the information they wish to convey is often waylaid by performance factors. This is as true for the interpretation of tense as for any other area of linguistics. Thus, it is reasonable to assume that the data available to the child for mastering the tense system of its particular natural language are somewhat degenerate.

It is also the case that a mature native speaker has the capacity to deal with tensed sentences never before encountered. A mature native speaker can produce and comprehend an unboundedly large number of tensed sentences. By assumption, many of these must be novel. This feature of tense competence parallels what we observe in the domain of syntax.

The last point is somewhat more difficult to establish. It is not a straightforward matter to show that there are principles operating in the tense grammar of a mature native speaker for which little or no evidence exists in the primary linguistic data used in the course of acquiring the tense system. Demonstrating that this is the case involves (1) showing that certain principles are in fact operating in the tense grammar of the native speaker and (2) showing that there is little evidence capable of grounding these principles of tense grammar in the primary linguistic data. In the body of this book, I will argue that there are a number of abstract principles and conditions operative in the tense grammar of English which, it is reasonable to suppose, could not have been acquired on the basis of the available primary linguistic data. Therefore, these features, of the tense grammar of English must be innate.

The above remarks are meant to convey the broad theoretical perspective that I will be taking for granted. I will assume that the theory of tense should be evaluated in the same way as any other linguistic proposal. There are two indices of success: data coverage and some account of the logical problem of language acquisition. Thus, the concerns of explanatory adequacy loom large in what follows. To my knowledge, this makes the approach to tense developed here rather different from most other accounts.

There is an additional respect in which the story told below diverges from the mainstream and cleaves more closely to traditional concerns. The account that I present has a pungent syntactic aroma. My claim is that within the domain of tense, just as in other parts of natural language, semantic interpretation underdetermines syntactic structure. Consequently, it is imperative to discover the nature of the syntactic representations that mediate the sound-meaning mapping in the domain of tense. These syntactic structures allow the subsequent rules of semantic interpretation to be simplified and the grammar of tense to be constrained. As in other areas of grammatical study, "going syntactic" in the domain of tense permits the elaboration of theories that have some claim to explanatory adequacy, or so I will argue below.

The exploitation of syntactic methods is the distinctive hallmark of theoretical work in generative grammar since *Syntactic Structures.* Indeed, I would argue that the substitution of syntactic notions and methods for semantic ones has been one of the major factors in the success of the generative program. This, of course, is not to say that issues of semantic interpretation are unimportant, or that the interpretive properties of sentences is an improper topic of study. However, the syntactic turn within grammatical theory has tended to emphasize two oft-neglected facts: semantic notions are terribly obscure, and theories incorporating them often inherit this lack of clarity; and there is a real cost to premature interpretation. Descriptive semantics often proceeds oblivious to issues of explanatory adequacy.4

The syntactic character of the present work is manifested in the indirect character of the mapping between tense morphemes and temporal interpretations. Within the theory outlined below, natural-language grammars do not go directly from tense morphemes to temporal interpretation. Rather, the sound-meaning relationship in the domain of tense is mediated by an autonomous syntactic component. The syntax is autonomous in that its primitives and principles of organization are not definable in terms of semantic notions relating to the temporal interpretation of the sentence. This is not to say that the syntax of tense has no effect on semantic interpretation. Clearly, syntax and semantics interact, just as in other parts of the grammar. However, the fact that there is interaction does not belie the independent status of the syntactic primitives and principles or the central explanatory role that these primitives and principles play.

The mapping from a given tense to a temporal interpretation is indirect in two senses. First, only tenses that meet a variety of syntactic

well-formedness conditions receive semantic interpretations at all. Second, rules of semantic/temporal interpretation are defined over these syntactic tense configurations to yield a temporal interpretation for a given tensed sentence. The syntactic representation of the tense structure does not, by itself, suffice to yield a temporal interpretation, though it does crucially contribute to this end.

The syntax of tense, therefore, serves two functions: It acts to filter out ill-formed tense configurations, and the well-formed structures it outputs are input to the rules of semantic interpretation. The properties of this syntactic level constitute a major focus of the present study. It is a central contention of this work that linguistic theory requires an additional level of linguistic representation with its own distinctive properties.

The theory outlined below is syntactic in another sense as well: I argue that at least one of central structural relations of grammatical theory—government—is also important for understanding how the tense system operates. Similarly, the principle of full interpretation plays an important role in the grammar of the tense system. Thus, relations and principles familiar from other areas of grammatical theory prove to regulate the grammar of tense as well.

What are the formal features of this syntactic theory of tense? My central claim is that a somewhat revised version of Reichenbach's theory of tense enjoys broad empirical support and meets the desiderata outlined above. In particular, I argue in chapter 3, Reichenbach's theory of tense structure provides an answer to the question "What is a possible tense?"

In chapter 1, I will propose that a syntactic version of Reichenbach's theory can be extended in natural ways to explain the properties of complex tense configurations in English. I will examine how tense interacts with simple temporal adverbs, such as *yesterday, now, yesterday,* and *at 6 o'clock*. I will propose two conditions on the manipulation of tense structures that account for the tense + adverb configurations that we find.

I will then show, in chapter 2, how the tense restrictions apparent in complex temporal adverbs such as 'John left *after Bill came' can* be explained by the same generalizations developed for the simple case.

Next, I will propose an account of sequence of tense phenomena. I will show in chapter 4 that the dependence among tenses in subordinate clauses is tightly restricted. In chapter 5 I will suggest that the nature of the restriction can be deduced from independently motivated assump-

tions concerning the organization of semantic interpretation within the grammar.

In addition, I will show how a Reichenbachian view of tenses yields a natural account of a striking phenomenon apparent in complex embedded tense structures. It appears that an arbitrarily deeply embedded finite clause can always be semantically evaluated relative to the moment of speech. The Reichenbachian theory I develop will yield a natural explanation of this fact.

The discussion of sequence of tense phenomena points to the surprising conclusion that tenses are not so much operators as they are modifiers. Tenses are more like adjectives or adverbs than they are like quantifiers or Wh-elements. Their scope, for example, is very restricted, and the elements they interact with are the elements they govern. This is very similar to what we find with adjectival/adverbial modifiers, and very different from the properties of quantifiers. One natural conclusion to draw from this is that tenses are not operators at all. The contrary view has been sustained by some data that, I will argue in chapters 4 and 5, have been misanalyzed.

These are some of the substantive issues that I will deal with in the book. However, before swamping you with the empirical flora and fauna, let me add one more reason for pursuing these topics. It is my firm belief that the very general questions that Chomsky has taught us to ask concerning the structure of natural language are of the utmost importance. To many philosophers and linguists, however, these concerns seem to be of merely technical interest. The logic of the enterprise and the fecundity of the approach are liable to be buried beneath technical concerns. How formal decisions reflect the broad theoretical commitments outlined at the outset can be obscure. This is unfortunate. It gives the impression that the philosophically fascinating prolegomenon plays a merely ornamental role in relation to the specific theories developed. Nothing could be further from the truth. By looking at tense, we should be able to see how the logic of the enterprise plays itself out within the confines of a very simple formal system. The technical demands made below are not great. My hope is that this will allow the larger logic to shine through.

Chapter 1
The Basic Tenses

In English, clauses come in two types: finite and infinitival. Finite sentences carry overt tense markers. For finite clauses, the semantic evaluation of the event that the sentence mentions is relative to some specific time. This "event time" is determined, in the usual case, in relation to the moment of speech. To make matters concrete, consider the sentences in (1).

(1) a. John kissed Mary
    b. John is kissing Mary
    c. John will kiss Mary

We understand (la) as placing the event of John's kissing Mary in the past relative to the moment of speech. This contrasts with (lb) and (lc), which place that event as concurrent with the utterance time of the sentence and in the future relative to the moment of speech, respectively. Thus, the three sentences share a common content but evaluate it relative to different points in time. All three allude to the same event (John's kissing Mary), but each gives it a different temporal location relative to the moment of utterance. In English, this time specification is accomplished via morphemes in the verbal system. Not all natural languages express the time dependence of sentential contents in this way. Some simply use adverbs, with no specific morphemic marking on the verb or in the verb phrase to indicate tense . [1] Some rely on context to specify the temporal dependence of the event expressed by the sentence. In English, as in many other languages, this temporal dependence is grammaticized and realized in a set of morphemes, which constitute the tense system. The aim of this book is to elucidate the structure of the English tense system and to use it to throw light on tense systems within natural lauguages more generally.

One caveat before I proceed: I will avoid discussing aspect. Tense and aspect are no doubt intimately related, and interact quite extensively. However, I will assume that they form separate modules rather than a single inclusive system. Tenses, in the core case, locate the events that sentences represent in time. This is to be contrasted with the internal "temporal contour" of the event, which is specified within the aspectual system.[2] Assuming that this widely respected distinction between tense and aspect is tenable, I will concentrate on the former.

My discussion will be organized around five sets of questions:

- What is the fine structure of tenses in natural language? How are tenses in English to be represented? What kinds of tenses do natural languages make available that are not exemplified in English? Is there a typological distinction between simple tenses (such as past, present, and future) and compound tenses (such as past and future perfect)? What is a linguistically possible tense within a natural language?
- How do tenses combine with other temporal specifiers, such as temporal adverbs and other tenses in multiclausal constructions? What are the principles of combination, and how do these explain the restricted patterns of combination that we find exemplified in English? How do these complex tense structures convey the temporal information that native speakers understand these complex configurations to convey? What are the combinatorics of temporal interpretation?
- How do the actual morphemes that carry tense information map onto the tense structures of the tense system? This is a particularly important issue if the two systems are not identical. The neo-Reichenbachian theory I outline below treats tenses as more abstract than the morphemes that encode them in English. It is a central tenet of this study that the tense system constitutes an independent linguistic level, with its own set of primitives, its own syntactic rules of combination, and its own rules of interpretation. Furthermore, the mappings from tense morphemes to temporal interpretations respect the formal constraints imposed by this level. Thus, it is important to specify the relationship between this linguistic level and the others—especially those aspects that involve the overt morphemes that signal tense information and the primitives of the tense system that represent it.
- What is the relationship between the temporal interpretation of tenses and their formal structure? Is the formal structure of a given tense a perfect reflection of the semantic information that it conveys, or are some elements of its structure independent of the semantic function it

serves? There is another way of putting this question: **In** the domain of tense, is the syntax of tense logically perfect? As the brief remarks in the introduction make clear, the position taken here is that interpretation underdetermines syntactic form within the tense system. (There is a practical reflex to this claim. Much of the interest in the system lies in the formal constraints of the model. Focusing on the observable temporal interpretation of a sentence does not suffice, since many properties of tensed sentences are here traced to the restrictions imposed by an abstract syntax. Thus, we must trudge through the derivational details of the formal system to appreciate it.)

• What kind of logico-grammatical element is a tense? Most logicians treat tenses as sentential operators. [3] However, syntactically, they seem quite different from standard operators such as quantifiers. Is the behavior of tenses analogous to that of standard operators, such as quantifiers? Note that this question is quite different from the one concerning the fine structure of tenses. Tenses might well be sentential operators and still have the fine structure Reichenbach suggested. As was noted above, I will argue against the claim that tenses are operators.

1.1 A Reichenbachian Theory of Tense

Consider once again the sentences in (1). In each case, we specify the temporal location of the event by its relationship to the moment of speech. Let us designate the event time by E and the moment of speech by S. The past tense says that E is before S, the present that E is at S, and the future that E is after S. Let us represent this information by arraying the E and S points along a time line. If one point is interpreted as earlier than another point, then it lies to the left of that point, separated from it by a line. If a point is interpreted as contemporaneous with another, it is placed in an adjacent position, separated from it by a comma. The three tenses in (1) can then be represented as in (2), which represents the relative temporal positions of the event time E and the moment of speech S of the sentences in (1).

(2) a. E___S

b. S,E

c. S__E

S is a deictic element that typically designates the moment of speech. It is anchored by the utterance time. Functionally, it is similar to pro-

nouns such as *I* and *here,* which also get interpreted deictically, referring to the speaker and the utterance venue respectively.

In Reichenbach's system, the context-dependent nature of the interpretation of finite sentences is traced back to the presence of the S point in the tense representation. All accounts of tense make interpretation sensitive to the moment of speech. However, it is a distinctive property of Reichenbach's theory that the deictic dependency is keyed to a syntactically overt primitive: the S point.

Viewed abstractly, the S point actually plays two different roles. Its general role is that of a deictic element that is interpretively anchored within the speech situation. A second, more specific role of the S point is to anchor the temporal specification of the event point E relative to the moment of speech. These two roles are clearly different, though in the typical case it is unnecessary to prise them apart. Nonetheless, it is important to keep these two characteristics conceptually distinct. There are circumstances in which tenses, though still deictic, are not evaluated relative to the moment of speech. We will see instances of this when we examine the interaction of tenses in multi-clausal subordinate constructions in chapter 4.

The distinction between these two roles is also exemplified in simple sentences used in extended narratives, as in (3).

(3) It was 1812, just before the Battle of Borodino. The anticipation of the coming struggle is palpable. Napoleon has just woken. He is getting ready to inspect the troops and see that they are ready for the battle that will determine the fate of Europe.

This narrative establishes a date that then acts as the anchor for the interpretation of the tenses used. The time of Napoleon's inspection of the troops is the day of the Battle of Borodino, in 1812. The battle discussed, though in the future relative to the time of the narrative, is in the past relative to the moment of speech.

Distinguishing between the deictic nature of S and its specific reference to the moment of speech provides a straightforward way of accounting for the use of tenses in narratives. The S point can anchor to moments other than the time of utterance. These temporal anchors must be salient in the speech situation, which is why the speech time is so ready an anchor. However, other temporal moments can be exploited under the right circumstances, as is indicated by the use of tenses in historical narratives such as (3).

I will assume that an S point must be anchored *within the discourse.* The moment of speech is always available as a default value for this purpose. However, S can be anchored in other ways as well, as (3) indicates.

What about E? It too is a syntactically explicit formative in Reichenbach's theory. It designates the event time. I will generally treat E as designating a punctual event, one without much temporal extension. However, this is clearly incorrect. Events do have "temporal contour." I assume that characterizing this is properly the study of aspect. Reichenbach himself included some diacritic marking on the E point that hinted at its internal contour. An arrow over the E point indicated that the designated event was not punctual but spread out over time. (In English, this is indicated by the progressive.) Dots over the E marked habitual or recurring events. I will dispense with these marks, and will simply focus on tense. The present progressive and the simple present are, tense-wise, indistinguishable for present purposes.

There is a third element that Reichenbach introduced in his representation of tenses. It is the most distinctive feature of Reichenbach's theory. Reichenbach assumed that the relationship between S and E was mediated via another temporal primitive: the reference point R. For Reichenbach, it is the relationship between S and R that constitutes the primary tense relation. R is then related to E. The link between S and E is derivative, depending on the relation between these other two links.

The introduction of the R point, which mediates the relationship between S and E, has only lately found favor with logicians. Unlike S and E, the interpretive effects of the R point are not really "visible" in many tenses. Consider the simple past, represented as (4).

(4) **E,R_S**

The mediating function of R seems superfluous, as it is interpreted as contemporaneous with E. Both are interpreted as temporally earlier than S. However, the presence of R in (4) does not have a visible effect on the temporal specification of the event time. With or without the R point, the temporal relationship between S and E remains the same.

Reichenbach argued that the interpretive effects of R could be seen in more complex tenses. For example, consider the future perfect, as in (5).

(5) John will have left at 3 o'clock

The natural interpretation of (5) places E (John's leaving the office) some time in the future relative to the moment of speech but before 3 o'clock. In other words, E is located relative to *two* points. The second point, specified by the modifier 3 *o'clock,* is R. The tense structure of (5) can be represented as in (6), which explicitly places E between the moment of speech S and a reference point R, in accord with the natural interpretation of (5).

(6) S__E__R

Reichenbach noted that similar effects could be observed in the past perfect and even the present perfect. I will discuss the present perfect later at some length. However, Reichenbach is surely correct about the former case.

The natural interpretation of (7) locates John's leaving the office before 3 P.M., which is itself before the moment of speech.

(7) At 3 P.M., John had left the office

The tense structure of the past perfect is shown in (8), where—in contrast with (3)—the temporal specification of E relies on the temporal specification of R.

(8) E_ R _S

What characterizes the perfect tenses is that R and E are not interpreted as contemporaneous. Thus, introducing R is not superfluous to specifying the location of E. However, Reichenbach hypothesized that R is part of *every* tense representation, not merely the complex perfect tenses. Even where R has no apparent interpretive reflex, it still is part of the tense representation. This is a very important claim with extremely interesting empirical consequences. Implicit in Reichenbach's position is a distinction between the syntax of tense structures and their temporal interpretations. The R point is not merely introduced to facilitate the interpretation of complex tenses; rather, it is one term in a syntactic relation that obtains even when not semantically visible. It is a perennial part of the syntax of tense structures even when interpretively superfluous. In short, implicit in Reichenbach's treatment of tense is the hypothesis that the temporal interpretation of tenses underdetermines their syntactic forms. What Reichenbach does not demonstrate adequately *is* that this distinction between the syntax of tense and its interpretation is empirically motivated. Part of the project that follows is to show that Reichenbach's implicit claim is empirically well founded.

With the introduction of R, we are now in a position to say, at least in a preliminary fashion, what a Reichenbach tense is. It is a complex of three points (S, R, and E), temporally ordered with respect to one another. One of the points, S, is a deictic element anchored within the discourse situation, often to the moment of speech. The primary tense relationship is between S and R, a reference point. E, the event point, is located through its relationship to R.

My development of Reichenbach's theory goes a step further than this. I will assume that tenses are ordered linearly as well as interpretively. What I mean by this is that the syntactic representation of a tense has linear structure above and beyond what is required for the temporal interpretation of the tense. An example will make my intention clear.

Consider the simple past, represented as in (9).

(9) E,R_S

R and E are interpreted as contemporaneous. Within Reichenbach's own theory, (9) and (10) are variants of the same tense although the linear order of R and E is different in each.

(10) **R,E_S**

This amounts to the claim that the syntax leaves R and E *freely* ordered if they are interpreted as contemporaneous. Another possibility, the one that I adopt and will argue in favor of in chapter 3, is that (9) and (10) are different tenses even though they are interpreted as temporally identical. In other words, tenses are to be individuated syntactically.

This principle of individuation for tenses takes very seriously the claim that tenses represent time by arraying specific points on a time *line.* This presupposes that these elements must be *linearly* ordered even when interpreted as contemporaneous. This linear structure is not a semantic necessity in the case of simple tenses such as (9), any more than is the explicit representation of the R point for the interpretation of these simple tenses. However, it is a *syntactic* characteristic of tenses in natural languages that the primitive tense features are linearly ordered, or so I will argue. If the claim is made that tenses must be individuated in terms of the linear order of the SRE points that constitute them even in cases (such as (9) and (10)) in which these ordering assumptions are interpretively inert, then linear order is another way in which temporal interpretation underdetermines the syntactic structure of the tense system.

For now, let us assume that a tense is a linearly ordered complex made up of three points: S, R, and E. [4] In addition, let us assume that the points can be separated by a line or by a comma. If two points are separated by a line, the leftmost point is interpreted as temporally earlier than the other. Points separated by a *comma—associated* points—are interpreted as contemporaneous.

English has six basic tenses, the structures of which are given in (11).5

(11) **S,R,E** present
E,R_S past
S_R,E future
E_S,R present perfect
E_R_S past perfect
S_E_R future perfect

1.2 Tenses and Adverbs

The structures in (11) constitute the basic tense structures (BTSs) for English. One way in which complex tense structures arise is through modification by temporal adverbs. There is a constraint on the derivation of complex tense structures. Derivations of complex structures must preserve certain aspects of basic tense structure. Defining these constraints on the reordering of basic tense structures to yield complex derived tense structures (DTSs) requires the definitions in (12)–(14).

(12) X associates with Y = $_{def}$ X is separated from Y by a comma.

(13) BTSs preserved iff

a. No points are associated in DTS that are not associated in BTS.
b. The linear order of points in DTS is the same as that in BTS.

(14) **Constraint on DTS (CDTS):** DTS must preserve BTS.

Derived tense structures arise in various ways. Adverbs can combine with a basic tense to yield a complex tense configuration. Time adverbs can be mapped onto the R and/or E points of a basic tense. [6] Moreover, any temporal adverb must map onto at least one of these points. The latter requirement is similar to the prohibition against vacuous quantifiers in natural languages. A linguistic element cannot occur vacuously in a sentence. It must be interpreted. If a quantifier is present, it must bind some variable. If a modifier occurs, it must modify something. A predicate must be predicated of some argument. Chomsky (1986)

dubbed this prohibition against vacuously occurring elements the *principle of full interpretation (PFI).* The prohibition against vacuously occurring temporal adverbs (i.e., temporal adverbs that modify neither an R nor an E point) is another instance of this same principle.

The CDTS limits the manipulation of SRE points that can occur. A sentence retains a temporal interpretation only if it honors the constraint. Temporal adverbs can be pictured as altering BTS by moving R and E around. Certain modifications are permitted, but many others are not. The complex DTS will have a temporal interpretation only if the underlying BTS is preserved. Otherwise, the sentence will have no reading at all, or a deviant nontemporal reading will be registered.

In conjunction with some anodyne assumptions concerning the meaning of the adverbs *right now, tomorrow,* and *yesterday,* the CDTS explains the pattern of acceptability judgments listed in (15)–(17). *Right now* refers to the moment of speech, *yesterday* refers to a time before the moment of speech, and *tomorrow* designates a time later than the moment of speech. Formally, adverbial modification is a process that linearly rearranges R and E points in accordance with the meaning of the particular adverbs. For example, *now* will move the points onto which it is mapped to a position associated with S. The deictic aspect of these adverbial locutions—the fact that their interpretations are relative to the moment of speech—is formally mirrored by having them move R and E points around S and to it.'

(15) a. John left yesterday

b. *John left at this very moment/right now

c. *John left tomorrow

(16) a. John is leaving at this very moment/right now

b. John is leaving tomorrow8

c. *John is leaving yesterday

(17) a. John will leave tomorrow

b. *John will leave at this very moment/right now9

c. *John will leave yesterday

Consider the tense structures of these various examples. The BTS of the examples in (15) is (18) (compare (10)).

(18)

Adverbial modification maps an adverb onto R or E. For (15), this yields the DTSs shown in (19).10

(19) a. **E,R_S** $\overset{\text{yesterday}}{>}$ E,R_S

yesterday

b. E,R_S ---$\overset{\text{now}}{>}$ E,R,S

now

c. E,R_S _____$\overset{\text{tomorrow}}{>}$ S_R,E

tomorrow

The effect of modifying the BTS in (18) with *now* is to shift the R and E point to S. The derived structure (19b) violates the first part of the CDTS by associating points in DTS that were not associated in BTS. Thus, in (19b) the DTS to the right of the arrow associates the E and R points with S. As they are not associated with S in BTS, the structure to the left of the arrow, BTS is not preserved in the derivation of the complex tense structure. In particular, the first part of the CDTS is violated. In the case of (19c), the adverb *tomorrow* shifts the R or E points to the right of S in DTS. The linear order of the SRE points in BTS is not preserved in DTS. This violates the second part of the CDTS and yields an ill-formed derived structure. In (19a), *yesterday can* modify E or R and not violate either part of the CDTS. Modification of either point leaves BTS intact. Thus, we get a well-formed DTS.

The interpretation of (15a) can be read from (19a). Whether *yesterday* modifies E or R is immaterial to the interpretation, as the two points are associated and hence are interpreted as temporally contemporaneous. (19a) "says" that the event, John's leaving, took place in the past relative to the moment of speech, and that this anterior moment was yesterday. (15b) and (15c) do not have temporal interpretations at all, because their DTSs are ill formed, violating the CDTS.

A similar explanation extends to the sentence in (17), the BTS of which is (20).

(20) S_**R,E**

Adverbial modification yields the derived structures shown in (21).

(21) a. **S_R,E** $\overset{\text{tomorrow}}{\_\_\_\_\_>}$ S_R,E

tomorrow

b. S_R,E $\overset{\text{now}}{\text{---}>}$ S,R,E

now

c. S_R,E $\overset{\text{yesterday}}{\_\_\_\_\_}$ R,E_S

yesterday

The DTS of (21a) is well formed, obeying both parts of the CDTS. It should be clear how to read the interpretation of (17a) from the DTS in (21a).

The DTS given in (21c) is ill formed, violating the second part of the principle. The R and E points in the DTS of (21c) are not the same as those of the BTS (19). The linear order of the SRE points in the DTS on the right has been altered from the BTS order shown on the left.

At first blush, (21b) constitutes a counterexample. According to the CDTS, the sentence should be unacceptable. *Now* moves R and E to S, thereby associating points in DTS that are not associated in BTS. The apparent problem lies with the fact that (17b) is not an unacceptable English sentence. However, though not unacceptable, (17b) does not carry a normal temporal interpretation. Rather, it is understood as a command: John, leave! This atemporal reading is what violation of the CDTS leads us to expect.

An additional question arises: Why, in this case, is the nontemporal interpretation an imperative? We will examine this question more fully below. Note that *will* is not only a tense marker in English but a modal as well. Indeed, it is standardly assumed to underlie imperatives in English, and it appears in tags adjoined to imperatives, as in (22).

(22) Leave, won't you

Let us assume that the imperatival *will* can be modified by *now*. This accounts for why the reading we get for (17b) has the evident imperatival flavor.

This explanation is further supported by certain facts from French, a language in which the future tense is not expressed by an ambiguous morpheme. Because the regular future cannot be used imperatively, one would predict that sentences analogous to (17b) should be ill formed in French. This is indeed the case. The sentences in (23) are simply unacceptable, as the CDTS predicts.11

(23) a. *Jean se couchera maintenant

b. *Jean partira maintenant

I will return to the issues raised by these interpretations later in this chapter.

The examples in (16) fall in with the CDTS on the assumption that the simple present has the BTS S,R,E. Modification by *now,* and *tomorrow,* will then alter the BTS in ways compatible with the CDTS. The DTS of (24a) does not alter the BTS order of the SRE points. The DTS of (24b) dissociates R and E from S, but the CDTS permits this. This contrasts with (24c), where modification by *yesterday* will destroy BTS by destroying linear order.12

(24) a. S,R,E $\xrightarrow{\text{now}}$ S,R,E

b. S,R,E $\xrightarrow[\text{now}]{\text{tomorrow}}$ S_R,E

c. S,R,E $\xrightarrow[\text{tomorrow}]{\text{yesterday}}$ E,R_S

yesterday

The same logic carries over to the perfect tenses in English, though the interaction of adverbs and tense in this case has richer empirical consequences; see (25)–(27).

(25) a. John had eaten the cake yesterday

b. *John had left right now/at this very moment

c. *John had left tomorrow

(26) a. John has eaten breakfast earlier this morning/recently13

b. John has finished typing this very moment/now14

c. *John has come home tomorrow

(27) a. *John will have left the office yesterday

b. *John will have left the office right now/at this very moment

c. John will have left the office tomorrow

The BTS of the past perfect is (28).

(28) **E_R_S**

The structure underlying (25b) and (25c) violate the CDTS. In the former case, *right now* is mapped onto R or E. In either case, the modified point moves to a position associated with S. This is illustrated by the DTSs in (29).

(29) a. E_R_S $\xrightarrow{\text{right now}}$ E_R,S

b. E_R_S $\xrightarrow{\text{right now}}$ R_E,S

(29a) is ill formed because it associates R with S in DTS though they were not so positioned in BTS. (29b) associates E with S, in violation of the first part of the CDTS, and also violates the second part of the condition by altering the linear order of R and E. The upshot is that DTS is permuted in impermissible ways in both instances.

The unacceptability of (25c) can be explained in similar fashion. The two possible DTSs are shown in (30). *Tomorrow* moves either E or R to the right of S, thus violating the second part of the CDTS.

(30) a. E_R_S $\xrightarrow{\text{tomorrow}}$ R_S_E

tomorrow

b. E_R_S $\xrightarrow{\text{tomorrow}}$ E_S_R

tomorrow

Example (25a) is somewhat more interesting. It too has two different derived structures; however, in this case both are well formed.

(31) a. E_R_S $\xrightarrow{\text{yesterday}}$ E_R_S

yesterday

b. E_R_S $\xrightarrow{\text{yesterday}}$ E_R_S

yesterday

The two DTSs in (31) represent the two readings that (25a) in fact possesses. (31a) underlies the reading in which John's eating of the cake occurred yesterday; (31b) represents the interpretation in which the eating of the cake had already taken place yesterday (that is, the eating was prior to yesterday). Allowing adverbs to map onto R or E, in conjunction with the underlying BTS (28), results in a straightforward account for the ambiguity of these past-perfect-plus-adverb constructions. Below, I will discuss how this Reichenbachian account compares with analyses that postulate higher verbs or iterated tenses.

The ambiguity of (27a) is accounted for in the same way. The BTS of the future perfect is (32).

(32) S_E_R

If *tomorrow* maps onto R, then the DTS represents John's leaving of the office as in the future from the moment of speech, but in the past of tomorrow. In other words, the natural interpretation of the sentence is that John will leave the office later today. If *tomorrow* maps onto E, then we obtain the DTS in which the office-leaving occurs tomorrow. The two DTSs are given in (33).

(33) a. S_E_R $\xrightarrow{\text{tomorrow}}$ S_E_R

tomorrow

b. S_E_R $\overset{\text{tomorrow}}{>}$ S_E_R

tomorrow

Sentence (27a) is unacceptable with a temporal interpretation.[15] However, it does carry a modal interpretation in which *will have* means roughly *must have.* This modal interpretation comes out more clearly in sentences such as those in (34).

(34) a. John will have eaten the cake already

b. John will have written a letter to Mary recently

Both (34a) and (34b) can be paraphrased roughly with *must have* in place of *will have.* (27c) does not have a similar modal interpretation and cannot be similarly paraphrased. In the discussion of modals and tenses below, I will offer an explanation for why this is so.

Sentence (27b) carries neither a temporal nor a modal interpretation.[16] The reason for the absence of the latter interpretation of (27b) will be provided below. The nonexistence of a temporal reading follows from the fact that the DTS fails to comply with the CDTS.

(35) a. S_E_R $\overset{\text{right now}}{>}$ S,E_R

right now

b. S_E_R $\overset{\text{right now}}{>}$ S,R_E

right now

(35a) and (35b) are the two possible DTSs. The former violates the restriction against associating points not associated in BTS (in this case, S and E).[17] (35b) violates both parts of the CDTS. The linear order of R and E is different than in BTS, and R is associated with S in DTS but not in BTS. Thus, both derived tense structures are ill formed.

The acceptable examples in (26) are easy to account for within the present system. The present perfect is represented as (36).

(36) E_S,R

Both the E point and the R point are open to modification. If the appropriate adverb is mapped onto either, the DTS will be grammatical.[18] The DTSs of (26a) and (26b) are given in (36).

(36) a. **E___S,R** —earlier this morning/recently→ **E_S,R**

earlier this morning/recently

b. —now/this very moment→ E_S,R

now/this very moment

The adverbs *recently* and *earlier this morning* pick out moments of time that are temporally earlier than the moment of speech. Thus, they can modify E with little difficulty. Similarly, *now* and *this very moment* pick out the speech time and can modify R, which is associated with S (the moment of speech).19

Example (26c) is decidedly odd. Its DTS is given in (37).

(37) E___S,R —tomorrow→ **E_S_R**

tomorrow

Example (37) violates neither of the conditions on derived tense structures. How, then, is the unacceptability of (26c) to be explained? There are two possibilities that seem reasonable.

First, there is a Gricean explanation. The temporal interpretation is pragmatically misleading. Its unacceptability is not traceable to the tense system; in this case, it is traceable to the uninformativeness of specifying R. In the other perfect tenses, the specification of R contributes to the location of the event time, E. In this case, explicitly modifying R does not contribute to the specification of E. S intervenes between the two, and the interpretation of S is anchored to the moment of speech regardless of whether R is tomorrow or not. Similarly, E is before S and can be interpreted as before S irrespective of the interpretation of R. When the present perfect is used in simple sentences, specification of the R point seems to be informationally redundant.

Another possible explanation centers on the interpretation of the present perfect. One currently fashionable approach treats the temporal

interpretation of the present perfect as setting up a sort of "extended present" stretching from the event time E to the moment of speech S, with which R is associated. [20] It is clear that the use of the present perfect in simple clauses suggests the present relevance of the past event. Let us suppose that this is correct and that this interpretation is tied to the association of R and S. [21] If so, R and S cannot be dissociated, as would happen if *tomorrow* were mapped onto R. Observe that this does not explain why the present cannot be extended into the future. This suggestion takes it as a brute fact about the present perfect that this cannot be done. Neither I nor the wisdom that I borrow from liberally can explain why the "extended present" must be bounded on one end by the moment of speech.

I will assume that one of these avenues leads to an account of the unacceptability of (26c). In chapter 2, we will examine some data that indicate that DTSs analogous to (37) are well formed in certain embedded clauses. This suggests that the unacceptability of (26c) should not be traced to the intrinsic ungrammaticality of the derived tense structures.

1.3 Multiple Adverbs

Let us now consider some sentences that contain multiple temporal adverbs. Sentences with multiple adverbs provide evidence that all tenses have an R point, not just the perfect tenses.

Consider how temporal adverbs act to modify the reference point R and the event point E. Left/right placement of an adverb in a sentence affects its mapping onto the R or E point. In (38), with the adverb in pre-sentential position, the preferred reading has John leaving before 3 P.M.

(38) At 3 P.M., John had left the store

The same sentence with the adverb in post-verbal position has a preferred reading in which John's leaving is at 3 P.M., not before.

(39) John had left the store at 3 P.M.

It appears that pre-sentential adverbs associate with R more readily than with E, and that post-verbal adverbs map onto E preferentially. Given these correlations, let us investigate (40)–(44), which are simple sentences each with two time adverbs, one pre-sentential and one post-verbal.

(40) a. John left a week ago yesterday
b. Yesterday, John left a week ago
c. *A week ago, John left yesterday

(41) a. John had left a week ago yesterday
b. Yesterday, John had left a week ago
c. *A week ago, John left yesterday

(42) a. *John is leaving a week ago yesterday
b. *Yesterday, John is leaving a week ago
c. *A week ago, John is leaving yesterday

(43) a. John is leaving tomorrow in a week
b. Tomorrow, John is leaving in a week
c. *In a week, John is leaving tomorrow

(44) a. John will leave tomorrow in a week
b. Tomorrow, John will leave in a week
c. *In a week, John will leave tomorrow

Each of the (a) sentences in (40)–(44) acts like a normal sentence that has one temporal adverbial. The fact that the temporal adverb is complex does not affect the DTS.

Groups of temporal adverbs can combine to yield more and more exact temporal specifications of R and E. In (45), *on Friday, in the afternoon, after lunch, at 3 P.M.* acts like a single adverbial phrase, modifying R or E.

(45) John left on Friday, in the afternoon, after lunch, at 3 P.M.

In this case, by modifying either, it modifies both, given the BTS of the simple past. However, the same effects obtain in the case of the past perfect. Consider (46).

(46) John had left on Friday, in the afternoon, after lunch, at 3 P.M.

Although (46) is ambiguous, the preferred interpretation has the E point modified by the complex adverbial. However, it is clear that the sentence is only two ways ambiguous. The adverbs all modify either **E** or R. They cannot split up, some mapping onto one and some onto the other. Thus, (46) cannot carry the interpretation, represented in

(47), in which John's leaving was prior to Friday afternoon's lunch and at 3 P.M.

(47) E_R_S

\

3 P.M. Friday afternoon after lunch

It appears that the mapping of the adverbs onto R and E is sensitive to the arrangement of the adverbs at a level of representation akin to S-structure.[22] For present purposes, I will simply assume that "bunched" adverbs act like single adverbials. What is interesting is what happens when the adverbs are separated. Consider the (b) and (c) sentences in (40)–(44). The (b) sentences carry roughly the same temporal interpretations as the corresponding (a) sentences. The BTS of (40b) is E,R_S. By assumption, the pre-sentential adverb maps onto R, and the post-verbal adverbs onto E. The DTS of (40b) is (48).

(48) E_R_S

| \

a week ago yesterday

Adverbial modification in (48) preserves underlying BTS. Thus, the structure is well formed and (40b) is judged acceptable. (40c), in contrast, is unacceptable. As (49) shows, its DTS places E between R and S, **thereby rearranging the linear order of the BTS.**

(49) R_E_S

| \

a week ago yesterday

The same considerations apply to (41). The BTS of the past perfect is E_R_S. The DTSs of (41b) and (41c) are (50a) and (50b), respectively.

(50) a. E_R_S

| \

a week ago yesterday

b. R_E_S
N

a week ago yesterday

Once again, *yesterday* would shift E to between R and S. This violates the second part of the CDTS.

All three of the examples in (42) accord with the present theory. The BTS of the present tense is S,R,E. The proposed adverbial modification will violate the linearity constraint by rearranging the BTS linear order of the SRE points in DTS. The past adverbials *yesterday* and *a week ago* will shift R and E points to the left of S.

Future adverbials will not similarly destroy BTS. The examples in (43) illustrate this. (43b) is acceptable; the DTS is (51).

(51) S_R_E

tomorrow in a week

(43c), on the other hand, violates the second part of the CDTS, the linearity constraint; its DTS is (52).

(52) S_E_R
I

tomorrow in a week

The future examples in (44) similarly conform to the theory. The BTS of the future tense is S_R,E. The adverbs act to dissociate the R and E points. The DTS of (44b), (53a), conforms to the CDTS, whereas the tense structure underlying (44c) violates the second part, as shown in (53b).

(53) a. S_R_E

tomorrow in a week

b. S_E_R
/

tomorrow in a week

Though the situation is more complex, the same reasoning applies to the present perfect and the future perfect. See (54) and (55).

(54) a. John will have left (in) a week (from) tomorrow

b. *(From) Tomorrow, John will have left in a week

c. *In a week, John will have left (from) tomorrow

(55) a. *In the past, John has hiked three times at present

b. ?At present, John has hiked three times in the past

Consider first the examples in (55). The BTS of the present perfect is E_S,R. The DTS of (55a) is given in (56).

(56) R_E,S

in the past at present

In the past, as it is in pre-sentential position, maps onto R. This results in R shifting to the left of S. *At present* maps onto E and moves it to a position associated with S. Thus, (56) violates both parts of the CDTS. It associates E and S, which are not associated in the BTS, and it linearly reorders R and S. This accounts for the unacceptability of (55a).

Though slightly odd, (55b) is clearly better than (55a). Its DTS, shown in (57), is well formed.

(57) E___S,R

in the past at present

There is, however, a case where the CDTS is honored but the sentence is decidedly odd. Consider (58).

(58) *Tomorrow, John has hiked three times in the past.

Tomorrow dissociates R from S and moves it to the left, as in (59).

(59) E_S_R

in the past tomorrow

(59) violates neither part of the CDTS. However, as in (37), the present perfect resists dissociating S and R, at least in these sorts of cases. Either of the two explanations sketched above to account for the oddness of (37) will extend to rule out (59) as well.

Consider now the sentences in (54). The future perfect has the BTS S_E_R. (54b) has the DTS (60), which is ungrammatical as the linear order of R and E is reversed from what it is in BTS.

(60) S_R_E

tomorrow in a week

The DTS of (54c) is (61), which is well formed.

(61) S_E_R

tomorrow in a week

What, then, accounts for the unacceptability of (54c)? I have no real explanation for this, though the following observation seems relevant. The sentence *John will have left tomorrow* implies (54c). It is hard to see what *in a week* adds to the temporal specification of E. It might be that (54c) should be ruled out for pragmatic reasons. This suggests that if the specification of R was required to fix E, we would have an acceptable sentence. Consider (62) and its DTS, given in (63).

(62) Tomorrow, John will have left for Paris a week ago

(63) E_S_R

a week ago tomorrow

The interpretation of (62) locates the event time of John's leaving six days prior to the utterance time. E is temporally located by reference to R. (62) is far better than (54c), as we would predict. There is an apparent problem with (63), however: Doesn't it violate the prohibition against linearly reordering SRE points? The short answer is No. Why it does not will be explained in chapter 3. [23] For the time being, let us assume that the structure is well formed. If it is, this buttresses the explanation for the ill-formedness of (54c).

1.4 Adverbs as Modifiers

The CDTS correctly filters out the unacceptable sentences in the cases discussed in section 1.3. Just as interesting, however, is the fact that the well-formed DTSs offer reasonable representations of the temporal interpretations of the acceptable sentences. For an illustration consider (53a), which is repeated here:

S_R_E

tomorrow in a week

In (44b)— *Tomorrow, John will leave in a* week—John's leaving *is* interpreted as occurring eight days after the moment of speech. (53a) represents this interpretation given certain assumptions about temporal adverbs.

Adverbs come in two varieties: deictic and anaphoric. Deictic adverbs are S-oriented in the sense that their temporal interpretations are determined relative to the moment of speech, S. *Now* is temporally interpreted as "at the moment of speech,". *Tomorrow* and *yesterday* are interpreted as "the day after the moment of speech" and "the day before the moment of speech", respectively.[24] These temporal interpretations orient the adverb by reference to the utterance time.

Other adverbs can orient themselves to times other than the utterance time. *A week ago* and *in a week* are examples of this second kind of adverb. With adverbs of this kind, we can get the effects of scope dependency in DTSs. In (53a), the temporal interpretation of *in a week* is dependent on the temporal interpretation of *tomorrow*. This is what yields the interpretation in which the event time E is eight days from the moment of speech. The interpretation of E, in this case, is determined by that of R, which is, in turn, determined by that of S.

The anaphoric adverbs can also orient themselves by relating directly to S. Consider (64).

(64) a. A week ago, John had left

b. E_R_S

a week ago

In (64b), R is interpreted as seven days before the utterance time. E is some unspecified time before that.

Now consider (65). In (65a), E is seven days before S. R still obtains, but its temporal value is unspecified.

(65) a. John had left a week ago

b. E_R_S

a week ago

However, when R is specified and E is modified by an anaphoric adverb, E's temporal interpretation is determined in relation to that of R. E cannot orient itself directly to S. Thus, (44b) can only bear the interpretation in which E is eight days after the utterance time. It cannot be interpreted as stating that John's departure is seven days from the moment of speech. In other words, the orientation of anaphoric adverbs is strictly local. They become temporally anchored by linking up to the most local temporally specified element. Deictic adverbs, in contrast, always orient themselves with respect to the utterance time.

Furthermore, within the Reichenbachian system developed here the temporal adverbs really are modifiers rather than operators. They are truly modificational in that they specify values for R and E. In this regard they are more akin to adjectives than to quantificational expressions.

This is of some interest, for the previously mentioned principle of full interpretation suggests that the distribution of temporal adverbs should be related to the availability of E and R points to modify. [25] In this so?

We have seen that S-structure position helps determine the mapping of adverbial clusters onto R and E points. There are many possible positions for temporal adverbs at S-structure. (66) indicates that temporal adverbs can occur in at least three positions in a clause. This is true even if there are multiple adverbs.

(66) a. Yesterday, John left for Paris

b. John, yesterday, left for Paris

c. John left for Paris yesterday

The temporal interpretations of (67a) and (67b) are essentially the same.

(67) a. Yesterday, John left for Paris a week ago

b. John, yesterday, left for Paris a week ago

What happens if we fill all three of the possible adverb slots? Consider (68).

(68) a. *Yesterday, John, at 6 o'clock, left for Paris a week ago
b. *Tomorrow, John, in a week, will leave for Paris in a month
c. Yesterday at 6 o'clock, John left for Paris a week ago
d. A week tomorrow, John will leave for Paris in a month
e. Tomorrow, John, luckily, will leave for Paris in a week

The contrast of (68a) and (68b) versus the other three examples provides some support for the position that temporal adverbs are essentially modifiers. First, note that the relative unacceptability of (68a) and (68b) cannot be traced to interpretive restrictions. (68c) and (68d) are better than (68a) and (68b); in fact, they are paraphrases of them. (68a) and (68b) are not incomprehensible; they are just not very good. (68e) rules out the possibility that there are just too many adverbs. (68e) is also better than either (68a) or (68b), yet it too contains three adverbials. The problem, then, seems to be that (68a) and (68b) have too many *temporal* adverbs. This follows if we assume that something like the principle of full interpretation holds for adverbials. (See note 25 below.)

In (68a), *yesterday* has mapped onto R and *a week ago,* has mapped onto E. This leaves nothing for *at 6 o'clock* to modify. As every adverb must modify something, we can explain the unacceptability of the example. A similar account explains the unacceptability of (68b).

This explanation highlights an important point that will be discussed more extensively below: The unacceptability of (68a) and (68c) is not traceable to the interpretation of tenses. After all, (68c) and (68d) indicate that adverbial complexes can combine to modify an R point or an E point. However, it appears that there cannot be a many-to-one relationship between modifying complexes and points modified. This is a restriction on the *syntax* of the system, not on its temporal interpretation.

Consider one more bit of relevant data. Both sentence-initial adverbs and those in the immediate post-subject position preferentially map onto R, as in (69).

(69) a. A week ago, John had left for Paris
b. John, a week ago, had left for Paris
c. Tomorrow, John will have left for Paris
d. John, tomorrow, will have left for Paris

This predicts that the sentences in (70) should be rather unacceptable.

(70) a. *Yesterday, John, a week ago, left for Paris

b. *Tomorrow, John, in a week, is leaving for Paris

c. *Tomorrow, John, in a week, will leave for Paris

Though these judgments are subtle, the prediction seems to have been borne out. Contrast the sentences in (70) with the corresponding ones in (71).

(71) a. Yesterday, John left for Paris a week ago

b. Tomorrow, John is leaving for Paris in a week

c. Tomorrow, John will leave for Paris in a week

Thus, the explanation for the unacceptability of (68a) and (68b) extends directly to these cases. If both adverbial positions map onto R, then one will be left stranded, modifying nothing. These cases strike me as less unacceptable than the starred cases in (68). This is probably traceable to the mere preference for the mapping onto R of adverbs not in postverbal position. This notwithstanding, the contrast in the relative acceptability of the sentences in (70) and (71) is quite clear.

1.5 The Tense of Modals

In earlier sections, we encountered sentences that failed to have a temporal interpretation but, nonetheless, carried a modal interpretation. They lacked a temporal interpretation because the tense + adverb combinations violated the CDTS. I would like to account for the nontemporal modal interpretations of many of these sentences by extending tenses to modals. My claim is that modals also have Reichenbachian tense structures which constrain their interaction with other tensed constructions and limit the range of their acceptable adverbial modifiers. With this in mind, consider the sentences in (72).

(72) a. That will be Max at the door now

b. George will leave now

c. Suzie will go to sleep now

d. John could[26]/should/might/may/can/must go to school now/tomorrow/*yesterday

e. Go to school now/tomorow/*yesterday

This pattern of data can be explained if we assume that modals can be tensed and that the BTS underlying the modals in (72) is S,R,E (i.e., the present tense). In (72d), the BTS should be modifiable with either *now* or *tomorrow*, *in* analogy with the nonmodal present-tensed sentence (73).

(73) John is leaving now/tomorrow/*yesterday

Modifying the present-tense BTS with these three adverbs yields the DTS in (74).

(74) a. S,R,E $\xrightarrow{1\pm3IN}$ S,R,E

now

b. S,R,E $\xrightarrow{\text{tomorrow}}$ S_R,E

tomorrow

c. S,R,E $\xrightarrow{\text{yesterday}}$ *E,R___S

yesterday

The derivations illustrated in (74a) and (74b) are both well formed. Neither associates points in DTS not previously associated in BTS, and neither alters the linear order of points in DTS from what it was in BTS. The DTS in (74c) is ill formed, for it alters the linear order of S with respect to E and R. Hence the unacceptability of the examples in (72d) and (73) with *yesterday*.

The assumption that the imperative has an underlying *will* which is a present-tense modal explains the data in (72e). Evidence for this assumption has been presented above. Recall that *will* does appear in the tags of imperatives—Leave, *won't you*. If the imperative modal carries the present tense, then (72e) falls in with the account already outlined.

In addition, we can account for the modal interpretations of (72a)–(72c). (72a) means something like "that must be Max at the door". This is quite different in meaning from *Max is at the door now*. One can use the latter sentence while peering at Max through a keyhole, but not the former.[27] The normal temporal future reading is unavailable.28

These facts conform to the theory. The normal temporal interpretation cannot be obtained, for the DTS of (72a) violates the CDTS, as the derivation in (75) illustrates.

(75) S_R,E $\overset{\text{now}}{}$ S,R,E

now

In (75), R and E are associated with S in DTS but not in BTS. However, (72a) has a reading, because *will* can be treated as a modal in addition to being a future tense marker. In (72a), *will* can be glossed as a present-tense modal. This permits modification by *now*. The tense structure is the same as in (74a). As was noted above, this is not possible in languages that form the future without the aid of a morpheme that is ambiguously a future-tense marker and a modal. Thus, (76), the future version of (72b) in French, is unacceptable.

(76) *George donnera la conference maintenant

A similar phenomena obtains with the past progressive, as (77) shows.

(77) a. John was playing baseball now

b. John was playing baseball tomorrow

c. John was playing baseball yesterday

In (77a) and (77b) there are readings available with *now* and *tomorrow*. However, they are quite different from the temporal interpretation we find in (77c), in which the sentence is modified by *yesterday*. In the latter case, we have an event—John's playing baseball—temporally located prior to the utterance time. In the first two instances, on the other hand, we get sentences roughly paraphraseable as (78).

(78) John was supposed to be playing baseball now/tomorrow

If we assume that *was -ing,* like *will,* doubles as a present-tense form of a modal, then we obtain a source for the non-purely-temporal interpretation that we find in (77a) and (77b).

I have proposed that modals can bear tense and that the distribution of adverbs is tied to the tenses that they carry. In addition to having a present-tense form, modals also have a past-tense realization. Consider (79) and (80).

(79) a. John must have arrived yesterday
b. *John must have arrived right now
c. *John must have arrived tomorrow

(80) a. George can't have arrived yesterday
b. *George can't have arrived right now
c. *George can't have arrived tomorrow.

If we construe the modal + *have* structure as the realization of the past tense of these modals, then the paradigm *is* easily accounted for using the CDTS. The BTS of the modals in (80) and (81) is E,R_S. The derived tense structures of the two sets of examples are given in (81).

(81) a. $E,R\_S \xrightarrow{\text{yesterday}} E,R\_S$

b. $E,R\_S \overset{\text{right now}}{\underset{\text{yesterday}}{}} E,R,S$

c. $E,R\_S \xrightarrow[\text{tomorrow}]{\text{right now}} S\_R,E$

The DTSs in (81b) and (81c) are ill formed, as they violate the CDTS. In the first case, E and R are associated with S in DTS but not in BTS. In the second instance, the CDTS is violated because linearity is not preserved. The ungrammaticality of these tense structures accounts for the unacceptability of the starred sentences in (79) and (80).

Furthermore, by treating "modal + have" as past-tense forms we can provide a source for the nontemporal reading of (82).

(82) John will have come home yesterday

(82) has an interpretation that is roughly paraphraseable as *John must have come home yesterday*. We have already seen in (72a)–(72c) that *will* can carry a modal as well as a temporal interpretation. The source of the modal interpretation of (82) is simply the past tense of this same *will. Yesterday* is an unexceptionable modifier for the past tense, and so

we get the modal interpretation associated with (82) when *will have* is modified by *yesterday*.

The modals *must have* and *can have* behave exactly as the theory predicts.

More subtle support comes from cases in which the CDTS is violated in modals. The cases that we have discussed carry interpretations of temporal events and assign them various degrees of probability. However, the events are always within the realm of the possible. In other words, a well-formed modal + tense + adverb combination always yields a possible temporally located event with a certain degree of probability associated with its realization. What if we violate the CDTS with modal tenses? Consider (83).

(83) a. George should have arrived tomorrow

b. George would have arrived tomorrow

c. George could have arrived tomorrow

d. George ought to have arrived tomorrow

Each of the sentences in (83) violates the CDTS. These are past-tense modals modified by a future adverbial. In each case the linearity constraint is violated by the derived tense structure, as is shown in (84).

(84) **E,R_S** $\xrightarrow{\text{tomorrow}}$ S_R,E

tomorrow

Observe that each of the sentences in (83) receives an irrealis interpretation. In each case, it is presupposed that George will *not* arrive tomorrow. To get the flavor of this, contrast these cases with sentences that are well formed, such as those in (85).

(85) a. John should have arrived yesterday

b. John could have arrived yesterday

The sentences in (85) can be sensibly extended by adding *and I believe that in fact he did.* However, the sentences in (83) cannot be similarly continued. It is decidedly odd to say (86).

(86) George should have arrived tomorrow and I believe he actually will

In other words, violating the tense constraints in modal tense constructions results in interpretations that place sentences outside the domain of realizable events. E has no *possible* temporal location. These data lend subtle support to the Reichenbachian tense system and the constraints on their manipulation elaborated here. Violating the CDTS in the case of modals yields the irrealis interpretation, the ultimate in nonteporal interpretations.

1.6 The Future Tense and Higher Verbs

The material examined above has some interesting implications for other analyses.

First, the various readings of *will,* I have argued, indicate that it is an ambiguous morpheme in English. In one of its guises, it is a future-tense marker. In addition, it is a modal that underlies the imperative. In this latter role, it is roughly translatable as *must.* As we saw above, which *wills* have which interpretation can be explained by the theory developed above. Why is this important? It indicates that English has a future tense and that *will* is the morpheme that marks it. Many linguists have challenged this claim. There have been many attempts to assimilate the future tense in English to a modal. However, as we have seen, *will* as future tense acts quite differently from modal *will.* The latter, but not the former, is modifiable by a present-tense adverb such as *now—see* (72a)–(72c), (76), and note 28.

In addition, the future perfect *will have* acts very differently from the modal of the same name. The former has the tense structure (87a), whereas the latter has the tense structure (87b).

(87) a.

b. E,R_S

In section 1.2, we observed that the future perfect is ambiguous when modified by an adverb. The reason for this is that the adverb can modify R or E. Because the two points are not idterpreted as contemporaneous, two temporal readings result. The same is not true for (87b). Here R and E are associated. If an adverb modifies one, it will also modify the other. No ambiguity results. Indeed, this is true for all the modal + *have* constructions. These have BTSs identical to (87b). This predicts that examples such as (88) should be unambiguous, which is in fact correct.

(88) a. John must have eaten at 3 P.M.

b. John should have eaten at 3 P.M.

c. At 3 P.M., John must have eaten

d. At 3 P.M., John should have eaten

In this regard, these examples are quite different from the superficially similar future-perfect construction. The sentences in (89) can be interpreted with John's leaving either at or before 3 P.M.

(89) a. John will have left the office at 3 P.M.

b. At 3 P.M., John will have left the office

The sentences in (88) are not similarly ambiguous. The sentences in which *will have* carries the modal reading, as in (90), pattern like the examples in (88).

(90) John will have finished his thesis yesterday

This is what we expect if the tense configurations underlying the modal *will have* is similar to the simple past rather than the past perfect or the future perfect. However, this requires separating the future-tense *will* from the modal *will.*

The present analysis also bears on earlier accounts of the ambiguities that characterize past-perfect and future-perfect constructions. Consider the case of the past perfect, illustrated by (91).

(91) a. The secretary had eaten at 3 P.M.

b. The secretary ate at 3 P.M.

(91a) is ambiguous and can be rendered as (92a) or (92b).

(92) a. The time at which the secretary ate was 3 P.M.

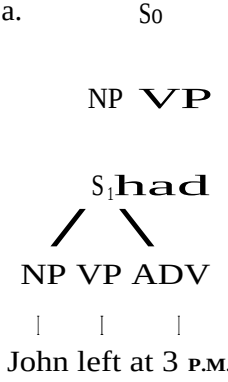
b. The secretary had already eaten by the time 3 P.M. rolled around

(91b) has only (92a) as a paraphrase.

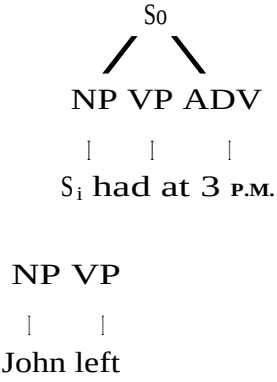
These facts have been accounted for in the literature in several ways.[29] One way is to postulate a higher verb *have.* This auxiliary, as well as other auxiliary elements such as *be* and *must,* hangs from a higher sentence and so can have a sentential adverb modifying it. The adverb *at 3 P.M.* in (91a) can be generated in the higher clause, in which case it gives us the interpretation parallel to (92b), or can be generated

in the lower clause, in which case it gives the interpretation parallel to (92a). These alternatives are displayed in (93).

(93) a.



b.



(91b), on the other hand, is unambiguous because there is no higher clause, given that there *is* no higher *have*. Consequently, there is only one position for the adverb to hang from, and so there is only one interpretation for the sentence.

This sort of account runs into considerable difficulties. We would expect a parallel story for French, where the simple past is represented by two morphemes. Consider (94).

(94) a. La secretaire avait mange a trois heures

b. La secretaire a mange a trois heures

(94a) carries the same ambiguity we noted for its English counterpart, (91a). (94b) is unambiguous, as is its English translation, (91b). However, in both French examples the tense form is complex. Presumably both are realized using a higher *avoir* form. However, only the former allows an adverb to hang from it. This could be blocked in *ad hoc* ways, but that would detract from the explanatory value of the account advanced for the English examples.

The same problem arises in English when we consider the modal cases. The sentences in (88) are not ambiguous despite their compound form. Why they are not ambiguous is unclear, in view of their superficial similarity to past-perfect cases. What prevents the adverb from ambiguously hanging from the higher or embedded clauses in these cases, as it does in the past-perfect sentences?

The Reichenbachian theory we have pursued here does not rely on higher verbs to represent the noted ambiguities. As these devices raise serious technical difficulties, this is all to the good.

1.7 Conclusion

In this chapter, I have outlined a theory of English tense. It has two major components. First, there is a Reichenbachian theory of basic tenses. These basic tenses are syntactic constructs. They are congeries of SRE points ordered by two relations: linearity and associativity. These syntactic objects have transparent temporal interpretations. Associated points are interpreted as contemporaneous. A point linearly ordered to the left of another point is interpreted as temporally earlier. The three points also have straightforward interpretations in these simple cases. S is the utterance time. E is the event time. R is a reference time. The inclusion of R as an integral part of BTSs is what makes this approach distinctively Reichenbachian. In this chapter, I have not discussed how BTSs are obtained in the first place. This will be discussed below. In addition, slight revisions will be made to the approach developed in this chapter. However, the elaboration of the theory in what follows will not forgo the distinction between the syntax of BTSs and their interpretations.

The second major part of the theory is the constraint on derived tense structures. I have shown how the CDTS acts to exclude unacceptable "adverb + tense" constructions. The CDTS will prove to be empirically useful in more complex multi-tensed adverbial constructions as well. This is the topic of the next chapter.

Chapter 2

Some Complex Tense Structures

In the first chapter, I introduced a Reichenbachian theory of basic tense structures (BTSs) coupled with a restriction on the manipulation of these basic tenses in the course of forming derived tense structures (DTSs). The constraint on derived tense structures (CDTS) permitted adverb modification to alter BTS, but only in ways that (i) preserved the BTS linear order of SRE points in DTS and (ii) did not associate in DTS points not previously associated in BTS. In this chapter, I will show that the CDTS extends to more complex cases of temporal modification.

The data divide up into two parts. First, I will show how temporal adjuncts headed by temporal connectives such as *when, while, after, before, as, until,* and *since* interact with the tense of the matrix clause. I will examine both structural and interpretive properties of these constructions. There are rather specific tense-concord restrictions that obtain between the tense of the matrix clause and the tense of the modifying clause. These restrictions can be largely accounted for structurally in terms of the CDTS and the rule that combines these clauses into complex tense structures. I will also consider how these structures are temporally interpreted. More specifically, I will ask how the various E points are temporally located relative to one another and how the whole complex tense structure is interpreted in relation to the utterance time.

In the second section of this chapter I will discuss the conditional. My remarks draw heavily on earlier important work by Victor Dudman. I will argue that the tense restrictions he observes to obtain in conditional sentences comport with the CDTS.

2.1 Temporal Connectives

Clauses can be modified by sentential adjuncts. Each of the sentences in (1) contains two tensed clauses: a matrix clause and an adjunct clause headed by a preposition.

(1) a. John played well after Harry grounded out

b. John will play well when Harry has hit a homer

c. *John will play well after he moved to third

d. John would hate it if Harry were to leave

e. *John would hate it if Harry had left

The event times specified by the adjunct clauses in (la) and (lb) serve to temporally locate the event times specified by the matrix sentences. In (la), the matrix verb *played* is in the past tense, and so is *grounded out in* the adjunct clause headed by *after.* The interpretation of (la) has the matrix event temporally after the event specified in the adjunct, and has both these events in the past relative to the moment of speech.

As (lb) indicates, the tense in the adjunct need not be identical with the tense in the matrix for the sentence to be well formed. [1] However, as (lc) indicates, restrictions obtain that prevent the arbitrary coupling of matrix and adjunct tenses.

Furthermore, the restrictions on tense consortia extend to multi-tensed sentences in which the tenses fail to receive a temporal interpretation, as, for example, under the counterfactual reading of (1d). (le) indicates that in these tensed but not temporally interpreted constructions, restrictions obtain that prevent certain tenses from occurring with others. What are these restrictions, and how are they to be explained?

The restrictions fall out from the CDTS in conjunction with a rule that combines tenses into multi-tense complexes. The rule, given in (3), applies to syntactic configurations such as (2).

(2) [s . . . TNS_1 . . [adjunct TC [S . . TNS_2 . 1], where TC is a temporal connective *e.g. when* or *after.*

(3) *RTC* **(rule for temporal connectives):** In (2), write the BTS of TNS2 under the BTS of TNS_1. Associate the S points. Associate the R points by moving R_2 to R_1, placing E_2 accordingly.

The movement of R_2 to a position associated with R_1 must obey the CDTS. Consider some illustrative examples.

If TNS_1 is S_R,E and TNS_2 is S,R,E, then (3) forms the complex tense structure (CTS) illustrated in (4).

(4) K....12_1,E_1 S_R1,E1

RTC

S,R_2,E2 S_R2,E2

In (4), it is possible to apply the RTC without violating the CDTS. If, however, TNS_2 is E,R_S, then we would have an ungrammatical derived structure if the RTC were applied; see (5).

(5) S_R1,E1 RTC S_R1,E1

x ≥1

E2,R2_S

Moving R2 to associate with R_1 leads to a violation of the CDTS as the linear order of R2 in the DTS changes with respect to S from its order in the BTS. Thus, the DTS is ill formed.

Before considering the empirical effects of these assumptions, let me point out some of the motivation for the RTC and highlight some of its properties.

First, the RTC is rather reminiscent of Reichenbach's requirement (1947, p. 293) that sentences share reference points. (Reichenbach referred to "the permanence of the reference point.") One way of looking at the RTC is that it requires a sentence that modifies another sentence to share its S point and its R point. This seems natural enough when one considers that what one is doing in structures such as (1) is temporally locating one event point, E_1, by situating it relative to another point, E2. To do this, it is necessary to hold everything else constant. This is what the RTC accomplishes by requiring the S and R points to associate.2

Second, I have provided no interpretation, as yet, for these structures. How to interpret these complex tense structures (CTSs), and how an embedded point linked to another "higher" point should be interpreted, are open questions. Whether a given CTS meets the requirements of the CDTS is a *formal* question; it obtains regardless of how the structure as a whole is interpreted. In other words, the CDTS is a formal restriction on the manipulation of tense structures, not on the temporal interpretation of tensed sentences. This is of some importance, for I

argue that these restrictions hold even if the CTS as a whole does not have a temporal interpretation.

The autonomy of the syntax of the tense system is highlighted in the discussion of conditionals below. Conditionals, as Victor Dudman has carefully documented, use tenses to signal various interpretations. However, though tenses are so exploited, not all conditionals have temporal interpretations. Nonetheless, the CTSs of conditionals adhere to the CDTS. This highlights the empirical utility of the conceptual distinction between the syntax of tense and the temporal interpretation afforded a particular tensed construction. Unless one assumes (as I do not) that the syntax of the tense system must perfectly mirror its interpretive properties, the syntactic properties of tenses cannot simply be reduced to features of a sentence's temporal interpretation.

Last of all, it is important to observe that the RTC orders the multiple tenses found in complex constructions in a specific way: The modifying tense is represented as subordinate to the modified tense. This naturally raises two questions. (i) Is this subordination assumption crucial? We shall see that it is. (ii) Can the hierarchical properties of a CTS be derived from more basic assumptions? It appears that the subordination relations among tenses in a CTS mirrors the government relations among the interacting tense elements. If A governs B, then B is placed under A.[3] Why should this be so? We will return to this question in chapter 5.

2.2 The RTC and the CDTS

Let us consider some empirical details to flesh out the abstract discussion above.

The relative acceptability of the sentences in (6) can be accounted for by the assumptions of section 2.1.

(6) a. John came as Harry arrived
b. *John came as Harry arrives
c. John came after Harry arrived
d. John came after Harry had arrived
e. John had come before Harry had arrived
f . John had come after Harry had arrived
g. *John had come when Harry arrives

The structures of (6a) and (6b) are schematized in (7).

(7) a.

b.

In (7a), the RTC can apply to associate the points S_2 and R2 to S_i and R_1 without violating the CDTS. The same is not true of (7b); there, moving the point R2 to R_1 leads to a violation of linearity. Observe that the ill-formed nature of (7b) is independent of the particular tense connective employed. Regardless of the tense connective, the structure violates the CDTS linearity restriction. This correctly predicts the unacceptability of (8).

(8) * John came as/before/after/when/while/now that/since Harry arrives

As (8) indicates, a matrix clause in the past tense cannot be modified by an adjunct in the present tense headed by any temporal connective. In other words, the CDTS disregards the specific interpretive injunctions made by a given temporal connective. This is what we should expect if the CDTS is a condition on syntactic well-formedness, as is assumed here. However, it should be quite surprising otherwise.

If the temporal interpretive properties of a multi-tensed sentence are alone responsible for the acceptability of sentences like (8), then why do *before* and *after* both fail to yield acceptable sentences? If the unacceptability of the *after* sentence is due to the fact that the times specified by the tenses in (8) are incompatible with the temporal requirements of the connective (or vice versa), why does replacing *after* with *before* not ameliorate the acceptability of the sentence? After all, these connectives have opposite temporal requirements, so one of them should be compatible with the temporal specifications of the given tenses.

Observe also that nontemporal adjuncts do not observe the restrictions imposed by the CDTS. Thus, it seems clear that the CDTS is a restriction on tenses rather than a restriction on adjunction more generally.

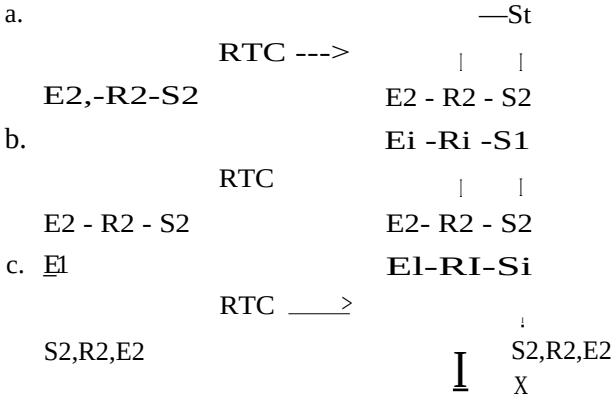
In (9), the matrix verb *played* is in the past tense and the adjunct's main verb, *lives,* is in the present tense.

(9) John played baseball where Yogi Berra lives

Sentence (6c) differs from (6a) only in the choice of a temporal connective.[4] The structure (7a) adequately schematizes this sentence's CTS. As it obeys the CDTS, its tense structure is well formed and hence the sentence is acceptable.

Sentences (6d)–(6g) illustrate that the same apparatus accounts for sentences involving the past perfect. The structures of these sentences are illustrated in (10).

(10) a.



(10a), the CTS for (6d), is well formed. Application of the RTC conforms to the CDTS, and so the sentence is acceptable.

The structure shown in (10b) underlies both (6e) and (6f). Clearly the interpretations of (6e) and (6f) are rather different. This can be traced to the different tense connectives that link the matrix clause with the adjunct. The interpretive rules for complex tense structures must be sensitive to the meaning of the tense connectives involved (see section 2.5). However, irrespective of the content of the connectives, the RTC obeys the CDTS in (10b), and an acceptable pair of sentences results: (6e) and (6f).

The same cannot be said for (10c), which represents the DTS of (6g). Here the RTC applies and moves R2 across S2, yielding a violation of linearity. Hence, the CTS is ungrammatical and (6g) is judged unacceptable.

The identical account extends to CTSs involving the future tense. Consider (11).

(11) a. John will sing as we leave the hotel

b. John will sing while we are leaving the hotel

c. *John will come when we arrived

d. *John will come now that we had arrived

e. John will come after we have arrived

The acceptable sentences (11a) and (11b), both of which conform to the CDTS, are diagrammed in (12).

(12) Si_Ri,Ei

RTC -->

$S_{2,R2}$9E2 S2_R2,E2

The embedded adjunct clauses are both in the present tense. They differ aspectually, however; (11b) is in the present progressive. Tense-wise they are identical, sharing the structure shown in (12). The application of the RTC moves R2 from its BTS position, associating it with R1. However, this movement, in contrast to the one illustrated in (10c), does not violate the CDTS. Linearity is preserved, and R2 is not associated with anything in the DTS beyond what it is associated with in the BTS.5

Sentences (11c) and (11d) have the complex tense structures shown in (13a) and (13b), respectively.

(13) a. Si_Ri,Ei S_i—Ri,Ei

RTC x > !I

E2,R2 - S2 E2 R2 ____ S2

b. S_1---R1 ,E1

RTC x > A

E2 R2-- S2 S2

X

In both CTSs, the R2 point is moved by the RTC to the right of S2, hence violating the linearity restriction of the CDTS.

Sentence (lie) is an interesting case. Recall that the structure of the present perfect is **E_S,R.** This means that if we embed a present perfect under a future we should be able to apply the RTC and still conform with the CDTS, as illustrated in (14).

(14)

The RTC moves R2 to under R_1, but this does not violate the CDTS in any way.

2.3 **An Interpretive Interlude**

The derived structure of (14) poses some difficulty for the simple theory of interpretation sketched in chapter 1. That theory treats associated points as contemporaneous, and treats a point A in a structure `A—B' as earlier than B. Given this, it appears that E2 is temporally prior to the moment of speech in (14) after application of the RTC. This is not the only interpretation for sentences with such CTSs, however. How we interpret the CTS in (12) depends on the connective at hand. Consider the sentences in (15).

(15) a. John will leave now that Harry has arrived
b. John will leave after Harry has arrived
c. John will leave when Harry has arrived

In (15a), Harry's arrival is interpreted as in the past of the moment of speech and John's departure as in the future from the moment of speech. In (15b), there is a strong suggestion that Harry has yet to arrive. Similarly in (15c), though in this instance the invited interpretation is weaker. In any case, in neither (15b) nor (15c) must Harry's arrival be in the past. E2 can be interpreted as in the future relative to the utterance time, though a speaker who knows that Harry has already arrived cannot use either sentence. [6] How is the fact that E2 can be read as before or after S read off of (14)?

We have been assuming, to this point, that tenses are congeries of SRE points ordered by linearity and associativity. Thus, a tense is fully determined by three relations: the S/R relation, the R/E relation, and the S/E relation. However, there is another way of thinking of tenses, a way that is more consonant with Reichenbach's original ideas.

For Reichenbach, tenses comprised two separate relations: the SR relation and the RE relation. In the normal case, if we compose these two relations we are able to determine an SE relationship as well. So, for example, if we assume that the past perfect (E_R_S) is made up

of R_S and **E_R,** then we can deduce from the interpretation of — (hereafter called the *line)* that the event time is before the utterance time. Because the line is transitive, if and C___13 then C_A. Similarly, if the future tense is composed of S_R and R,E, then from the interpretation of the line and the comma we can deduce that S is temporally prior to E.

However, in some instances these deductions will not go through. Consider the future perfect, which has been represented as in (16).

(16) **S_E_R**

If we decompose (14) as we did the past perfect in the paragraph above, we get two relations: S_R and E_R. From these, and from the interpretation of the line, we cannot deduce anything concerning the temporal relationship of S to E. The relationship between S and E is simply indeterminate. E can be earlier, later, or simultaneous with S if all we are given is the indicated relationship between S/R and R/E. What has been tacitly assumed up to this point is that even when the S/E relationship is not deducible from the **S/R** and R/E relations, it is nonetheless determinate within a given tense. However, whether this is an appropriate stance to take is an empirical issue, in no way prejudiced by a commitment to a Reichenbachian theory of tense.

To recap: There are at least two ways to construe a Reichenbachian tense. One way treats it as determined by three relations encoded within an SRE structure: an S/R, an **R/E,** and an S/E relationship. The other construes the Reichenbachian tense as composed of only the first two relations, with the third indeterminate where it is not deducible from the other two.

In addition, there are two ways to interpret the second position. On one interpretation, it is the tense itself that leaves the S/E relation indeterminate. On this interpretation, the BTSs in (17) are all equivalent syntactically.

(17) E_S_R
S_E_R
S,E_R

Thus, the BTS should not be read as determining the relative position of S and E except derivatively. [?] The CDTS should be seen as prohibiting the alteration of linearity relations and associativity relations within the **structures S/R** and R/E. The CDTS does not apply, except derivatively, to S and E.

An alternate interpretation treats the syntax of tenses as having a determinate S/E relation but treats the temporal interpretation of these structures as nontransparent. Interpretation rules exploit only the **S/R and R/E** relations. Thus, the BTSs in (17) would be syntactically distinct but interpretively identical; S/E temporal interpretations are only derivatively obtained from **S/R** and R/E relations rather than directly reflecting all aspects of the syntactic representation. In other words, the syntax would not directly mirror the interpretation of the tenses.8

I will not try to decide between these two interpretations here. I will return to the issues raised here in chapter 3.

Both of the above-mentioned construals of tense structure have nice empirical consequences when one is dealing with the future perfect and with complex structures such as (14). Comrie (1985, p. 71) points out that (18) is an acceptable sentence under certain pragmatic conditions.

(18) John will have finished his manuscript by tomorrow

If, for example, a speaker does not know whether or not John has already finished his manuscript, then it is felicitous for that speaker to utter (18). Moreover, (18) leaves the temporal location of the event time quite undetermined. If we interpret Reichenbachian tense structures via the pair of temporal relations S/R and R/E, then we can leave the temporal location of S and E indeterminate in (18).

Similarly in (14). The CTS after the RTC has been applied yields (19a).

(19) a. S1_R1,E1

b. E2-S2,R2

If we interpret these structures as we did the future perfect, then we must interpret (19a) by breaking it up into its two subparts: **S/R** and R/E. Consider the second tier of the CTS. Here, R2 is in the future relative to S2, and E2 is in the past relative to R2. This leaves the relative position of S2 and E2 indeterminate. In other words, the temporal location of E2 is indeterminate relative to the moment of speech on the basis of the CTS alone. But this allows E2 to be interpreted before the utterance time if that is the more pragmatically suitable interpretation.9

Observe also that it is crucial for the proper temporal interpretation of these constructions that it is the derived tense structure that feeds temporal interpretation. In the derived structure (19a), R2 is dissociated from S_2. In the BTS, (19b), it is not. The temporal interpretation of E2 with respect to S2 is derivable from the relation of **S/R** and R/E in (19b), the BTS of (11e) prior to application of the RTC. E_2 must be prior to S2, as S2 = R2 and R2 > E2. However, as has been noted, this is not the most natural interpretation of the present-perfect tense in (11e).

In the derived structure (19a), however, the temporal location of S_2 and E2 is indeterminate. From the facts that R2 > S_2 and R_2 > E2, nothing follows concerning the relative temporal position of S_2 and E2. Thus, we can let pragmatic factors determine the actual temporal relationship of E_2 and the utterance time; however, to obtain this desired result, it is crucial that we use the DTS (19a) as input to temporal interpretation procedures.1°

The two alternate interpretations of tense discussed above accommodate the observed interpretations by treating the S/E relationship as derivative of the other two. The two approaches differ in how transparent they construe the mapping to be between tense and temporal interpretation. Which approach should be adopted is a question that we will return to below.

2.4 More Examples of the CDTS

I have illustrated how the RTC interacts with the CDTS in future and past cases. In this section, I will expand the data base to include cases of the present tense and tensed modal structures.

The present tense has the BTS S,R,E. The RTC and the CDTS together imply that it cannot be modified by a temporal adjunct in the past or the future.

The structures in (20) violate linearity and associativity, respectively.

(20) a. S,R1,E S,R1,E

RTC —x-->

E E,R2_S

x

b. S,R1,E

RTC —x–>

S <)(R2,E

In (20a), the RTC moves R_2 across S to link it with R_1 as required. In (20b), R_2 is associated with S when RTC links it up with As both these sorts of movements are prohibited by the CDTS, we expect these sorts of sentences to be ill formed. This turns out to be correct. The sentences in (21) all violate the CDTS.

(21) a. *John is singing while Harry played the piano

b. *John sings when Harry played the piano

c. *John is batting well since he will come up from the minors

d. *John is singing when Harry will play the piano

(21a) and (21b) instantiate the schema in (20a). (21c) and (21d) are represented by (20b).

Sentence (20b) is of particular interest, as the ill-formed nature of the structure relies crucially on the fact that the present-tense structure is on the upper tier. If we reversed the two sentences, we would get a well-formed CTS, as shown by (22).

(22) $S_{i\text{—}Ri,Ei}$ Si

RTC -->

S2,R2,E2 S2_R2,E2

In fact, as (23) shows, sentences that instantiate (22) are acceptable.

(23) a. John will leave when/after Frank arrives

b. John will play third bas while/as Frank is warming up

These data are of substantial interest, for they confirm that the CDTS is a restriction on the *syntactic* manipulation of tenses, not their temporal interpretations. There is no apparent semantic reason for the acceptability of (23) and the unacceptability of (21c) and (21d). [11]

The present perfect shows a similar pattern. Consider (24).

(24) a. John will bat well when/after he has practiced

b. * John has practiced when/after he will play well

(25) gives the tense structures of these two sentences.

(25) a. S_Ri,E

RTC

R2

b. E_S,Ri

RTC —x–>

S_R2,E S< x —R2,E

(25b) violates the CDTS by associating R2 with S in DTS. In (25a), we do not have a similar problem. R2, though moved, is not associated with any novel point in the DTS.

When the RTC can apply and obey the CDTS, we obtain acceptable complex sentences with both the present and the present perfect. Not all of the sentences in (26) have temporal interpretations.

(26) a. John is moving his arms as he is skating

b. John is singing while he beats a drum

c. John is leaving when Harry arrives

d. John plays well when he has warmed up

e. John has played well after he has warmed up

f. (Recently), John has taken his medicine after/before he becomes ill

g. *(Recently), John has taken medicine after he became ill

For example, (26d) is interpreted generically. Nonetheless, regardless of how a tense is interpreted (and the present tense has many functions in English), the structures it appears in must conform to the CDTS. (27) is unacceptable even when interpreted as a generic.12

(27) * John plays well when he warmed up

The other sentences in (26) receive conventional temporal interpretations. Observe the contrast between (26f) and (26g). [13] The latter violates the CDTS; the former does not.

(28) a.

RTC --> | |

S2,R2,E2 S2,R2,E2

b.

RTC x>

E2,R2—S2 E2,R2_82

x

In (28a), the RTC can link R2 with R_1 without violating the CDTS. This is impossible in (28b). Thus, we can trace the unacceptability of (26g) to its ungrammaticality; it violates the CDTS.

Modals conform to these restrictions as well. Recall that in section 1.5 modals were seen to be tensed. Modals such as *might, can,* and *may* have S,R,E form; modals such as *might have, could have,* and *may have* **have E,R_S** form. I argued that these assumptions lead to a smooth account of modal + adverb constructions. The same assumptions carry over to these more complex cases as well.

The sentences in (29), all of which conform to the present theory, have the tense structures shown in (30).

(29) a. John might leave after Harry comes

b. *John can leave after Harry came

c. John cannot have left after Harry came

d. John may leave when Harry has sung

e. *John could have left before Harry has sung

f. John should have left after Harry had sung

(30) a. S,R_1,E — RTC — S,R1,E H S,R_2,E S,R2,E

b. **S,R_1**,E — RTC x > — S,R1,E I 1 E,R_2_S — E,R2_S x

c. E,R_1_S — RTC — E,R1_S | |

d. S,R_i,E — RTC ---> — S,R1,E I I E_S,R_2 E___S,R2

e. E,R_i_S — RTC --x—> — E,R1_S E_S,R2 x

f. E,R_i_S E,Ri_S

RTC | |

E_R_2_S E_R2_S

The ill-formed structures in (30) underlie the unacceptable sentences in (29). The well-formed structures schematize the acceptable sentences. The present perfect combines with a present modal, but not with a past one. (29e) is unacceptable, as the underlying CTS violates linearity. If we change the tense of the embedded clause from present perfect to simple past, we get an acceptable sentence, (31), as the theory predicts.

(31) John could have left before Harry sang

The modals in matrix clauses pattern as one would expect from the assumptions concerning their BTSs made in chapter 1.

In adjunct clauses it is considerably more difficult to find modals, presumably because of their specific interpretative properties in conjunction with the interpretations of adjuncts. [14] Nonetheless, where modals can occur, they pattern as expected. Consider the sentences in (32).

(32) a. John will leave before he can eat

b. John called before he could have left the opera

c. *John will leave before he could have eaten

d. *John left before he can eat

e. John is leaving after he can get in touch with Mary

f . *John is leaving after he could have gotten in touch with Mary

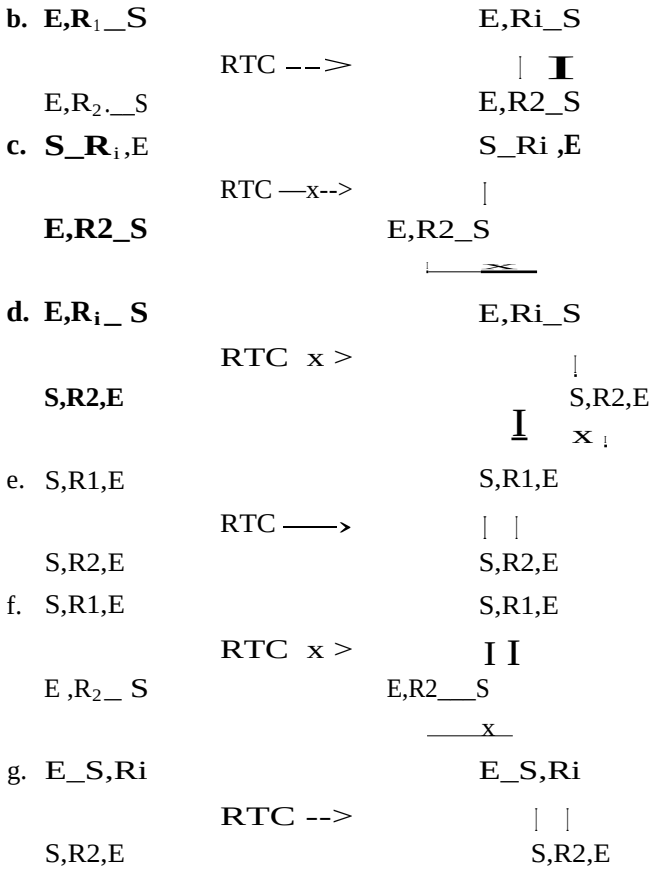
g. (Recently), John has eaten well when Harry can cook

We expect to find simple modals in temporal adjuncts under present-tense clauses, as in (32e) and (32g), and future-tense clauses, as in (32a). They will not consort with matrix clauses in the past tense; see (32d). The complex modals, modal + *have,* will occur in temporal adjuncts under past-tense matrix clauses (as in (32b)) but not under future- or present-tense sentences (see (32c) and (32f)). The structures underlying (32) are given in (33).

(33) a. S_Ri,E S_Ri,E

RTC | |

S,R2,E S_R2,E



As the structures in (33) indicate, the modals act as the theory predicts they should. The acceptable sentences have complex tense structures that comply with the CDTS. The structures that violate the CDTS underlie unacceptable sentences.

2.5 Interpreting Complex Tense Structures

To this point, the theory has placed limitations on what can be done. We cannot violate the CDTS in combining basic tense structures into a single complex tense structure. However, not much has been said about how to interpret the complex tense configurations that issue from successful applications of the RTC. Sentence interpretation depends on both the structure of the CTS after the RTC has been applied and the particular temporal connective that heads the adjunct. *After means* something

different from *before,* and each is different from *when* or *as* or *while.* A full theory of interpretation must confront the subtle differences that distinguish these various connectives. However, it is possible to get a good feel for the requisite interpretive theory by concentrating on a few of these connectives in some detail. This is what I will do here. My aim is to sketch out how tenses interact with temporal connectives to yield full interpretations. However, my interest is not in the lexical semantics of temporal connectives but in the tense structures that they interrelate. My aim is to show that the Reichenbachian system outlined above combines smoothly with natural interpretive principles to yield appropriate interpretations for the acceptable sentences.15

First we will take a look at *when, as,* and *while,* which are fairly straightforward to describe. Then we will examine *before—a* rather complicated connective, in that it has both a factual and a counterfactual interpretation. The theory presented here makes it possible to pin down the tense requirements on the two kinds of interpretations quite closely. These requirements will prove to be of interest when we discuss conditionals.

Consider the sentences in (34).

(34) a. John scored when Frank left the goal crease

b. John built his sailboat when Bill wrote a novel

c. John scored when Frank had left the goal crease

d. John had built his sailboat when Frank wrote his novel

e. John had scored when Frank left the goal crease

In a structure of the form S_1 *when* S_2, the events expressed in the two sentences can be sequentially ordered or simultaneous. In (34b), John's building of his sailboat can be simultaneous with Bill's literary pursuits. However, I believe that the preferred reading has Bill's writing prior to John's boatbuilding. This is even clearer in cases such as (34a). Here, Frank's leaving the goal crease is temporally prior to John's goal. If one wishes to convey the fact that the events occurred simultaneously, it is far better to use the temporal connective *while* or *as.* Indeed, it might well be because there are other ways to specify the time as unambiguously contemporaneous that a use of *when* invites an interpretation in which the E points are temporally sequential, as in (35).

(35) a. John built his sailboat while/as Frank wrote a novel

b. John scored as/while Frank left the goal creasel6

Failure to use either *while* or *as* suggests that the events occurred sequentially. The CTS of (34a,b) and (35a,b) is illustrated in (36).

(36) Ei,Ri

|

E2,R2_S

The two S points and the two R points are linked as a result of the RTC. Note that the E points coincide. For *when,* coincident E points are preferably interpreted with E2 temporally prior to El.

What happens if the E points do not coincide? The structure of (34c) is given in (37a), and that of (34d) and (34e) in (37b).

(37) a. Ei,R_S

| |

E2,R_S

b. E/

E_2,R S

In (37a), E2 is separated from R while E_1 is associated with it. If we assume a transparent temporal interpretation of this structure (one in which linked and associated elements are interpreted as contemporaneous and the line indicates temporal priority), we will temporally locate E2 prior to E_1. This, in fact, is how (34c) is interpreted.

The same principles of interpretation applied to (37b) lead to the reading in which E_1 is temporally prior to E2. This is more interesting than the first case, especially as regards (34e). Here, the pragmatically more natural interpretation has John's scoring after Bill's leaving the crease; however, this is not an available reading given these tenses, as becomes especially clear if (34e) is contrasted with (34a).

The same temporal priority of E_1 over E2 is visible in (34d). It is clear that, with these tenses, Frank's literary pursuits are temporally later than John's nautical ones.

Thus, it seems that when the E points are not coincident, the temporal location of the events transparently mirrors their relative syntactic relations in CTS.

How about the relation of the events to the moment of speech in (37)? Here the interpretation is once again straightforward. Both E points lie to the left of S and are interpreted as prior to the utterance time.

On the basis of these data we can see that the temporal interpretation of a CTS is fully transparent in *when* constructions if the E points do not coincide. However, when they are associated, E2 is preferentially interpreted as prior to E_1. This preferred reading may be due to the availability of other connectives which clearly signal temporal simultaneity. Let us assume that in CTSs in which E points coincide, the favored noncontemporaneous interpretation is due to pragmatic factors, which may be overridden where appropriate. Thus, the fact that in the examples cited above E2 is interpreted as prior to E_1 is not specifically due to the lexical meaning of *when.*

When stands in contrast to *while* or *as,* which require the events they interrelate to be interpreted as simultaneous (i.e., $E_1 = E_2$). This, in turn, accounts for why complex sentences that mix the past and the past perfect using these connectives are decidedly odd. Consider the sentences in (38).

(38) a. *John had arrived as Mary left

b. John arrived as Mary entered

c. *John had arrived while Mary entered

d. John arrived while Mary entered

e. *John arrived as Mary had entered

f . *John arrived while Mary had entered

Sentences a, c, e, and f are considerably less acceptable than sentences b and d. The former are considerably less felicitous than the same sentences with *when in* place of *as* or *while.* If we assume that *as* and *while* require that the E points be interpreted as contemporaneous, then these judgments are readily accounted for.17

The CTS of (38a) and (38c) is illustrated in (39).

(39) E_i R S

E2, R S

The natural interpretation of (39) places E_1 prior to E2. Note that the R points are linked and hence contemporaneous. E2 is associated with an R point. Thus, E2 is interpreted as contemporaneous with R. However, E_1 is separated from R by a line. Therefore, it is interpreted as earlier than R. By transitivity, E_1 is prior to E2. But this is a temporal inter-

pretation lexically excluded by *as* or *while.* The combined effect is to render (38a) and (38c) unacceptable.

The same account explains the unacceptability of (38e) and (38f). The relevant CTS is shown in (40).

(40) $E_i, R\ S$

E_1 is interpreted as contemporaneous with R. R is later than E_2. So El does not equal E_2. This temporal relationship between the two events is forbidden by *as/while.*

In contrast to these cases, the acceptable sentences (38b) and (38d) provide a CTS that is compatible with the lexical interpretive requirements of *as* or *while—see (41).*

(41) Ei, R_S

$E_2, R\ S$

The E points in (41) are both associated with the R points, which are linked to one another. Hence, E_1 is contemporaneous with E_2, as required by *as* and *while.*

Corroboration for this analysis of *when, as,* and *while* comes from considering the interaction of *already* with these connectives.

In (42), the event in the clause modified by *already* is interpreted as occurring prior to the event in the other clause.[18]

(42) a. John already built a sailboat when Bill wrote a novel

b. John built a sailboat when Bill already wrote a novel

c. *John already built a sailboat as/while Harry wrote a novel

d. *John built a sailboat as/while Harry already wrote a novel

(42a) has the temporal interpretation in which John's sailboat-building is prior to Bill's novel-writing. In (42b), these temporal relations are reversed. *Already* cannot occur with *as* or *while,* because it forces the sequential interpretation of events. However, *as* and *while* requires that the E points be interpreted as contemporaneous. This leads to an interpretive contradiction, and so the sentences are unacceptable. [19] This

property of *already* interacts with the above account to explain the data in (43).

(43) a . John had already built a boat when Bill wrote a novel

b. John built a boat when Bill had already written a novel

c. *John had built a boat when Bill already wrote a novel

d. *John already built a boat when Bill had written a novel

The CTS of (43a) and (43c) is illustrated in (44).

(44) Ei_R_S

| |

E2,R_S

Here E_1 is interpreted as temporally prior to E2. *Already in (43a)* requires that E_1 be interpreted as temporally prior to E2. (44) requires these temporal relationships as well, and so (43a) is fully acceptable with this interpretation.

Sentence (43c), on the other hand, runs into contradiction. The CTS yields the interpretation that E_1 is prior to E_2. *Already,* being in the adjunct clause, forces the interpretation that E2 is prior to E_1. This pair of requirements leads to an interpretive impasse, to which we can trace the unacceptability of (43c).

The same account extends to explain the difference between (43b) and (43d). The CTS of both sentences is shown in (45).

(45) E1,R_S

| |

E2_R_S

(45) places E2 prior to E_1. This is compatible with the interpretation of *already* in (43b), but not with that in (43d). The adverb *already* interacts with the interpretation of a CTS to provide a complete temporal interpretation for the structure.

Let us consider one more such case of the interaction of an adverb and a clausal adverbial adjunct, exemplified by (46).

(46) John left when Harry arrived at 3 P.M.

We can conclude from this sentence that John left at 3 P.M. From the CTS of this sentence, (47), we can conclude that E_1 is located at 3 P.M.

(47) Ei,R_S

| |

E2,R_S

3 P.M.

Here 3 *P.M.* modifies E_2. E_2 is contemporaneous with R. E_1 is as well. Hence, by transitivity, E_1 is temporally located at 3 P.M.

A similar but more interesting case obtains in (48).

(48) John had left when Bill walked in at 3 P.M.

Recall that the past perfect has an ambiguous interpretation when it interacts with a simple adverb, as in (49).

(49) John had left at 3 P.M.

What is interesting about (48) is that it is not at all ambiguous. Given (48), we can conclude that John departed sometime before 3 P.M. (48) cannot have the interpretation in which John's departure and Bill's arrival are both at 3 P.M. The CTS of (48) is shown in (50).

(50) E_1_ R_I S

| |

3 P.M.

Here *3 P.M.* modifies E2. E2 is associated with R2, which in turn is linked to R_1. This makes all three points contemporaneous—i.e., they are all located at 3 P.M. El is temporally prior to R_1. Hence, John's departure, E_1, is temporally prior to 3 P.M., the time of Bill's arrival (E2).

Up to this point, we have considered only CTSs with E points interpreted as prior to the utterance time, S. What of the present and the future?[20] Consider (51).

(51) a. John will leave when Harry arrives

b. John will leave as/while Harry sings

c. John will be leaving when Harry is arriving

d. Nero will be fiddling as/while Rome burns/is burning

e. John will leave when Harry has arrived

f . John is leaving when Harry has arrived

Sentences (51a)–(51d) have the CTS (52), in which E_1 coincides with E2.

(52) S_R,Ei

| |

S_R,E2

With *when,* if the E points coincide, then we interpret them as contemporaneous or, more preferably, with E2 preceding E_1. In addition, E1 and E2 are interpreted as occurring after the utterance time. They are contemporaneous with R. R is to the right of S, separated by a line. Thus, R is interpreted as later than S. Similarly for the E points. This accurately reflects the interpretation of (51a).

As and *while* require the E points to be contemporaneous. Thus, they must coincide in the CTS, as in (52). The actual interpretation of (51b) treats John's departure and Harry's singing as simultaneous and places them after the utterance time.

Sentence (51e) has the CTS shown in (53).

(53) S_R,Ei

|

E2_S_R

This structure was discussed at length in section 2.3. Recall that in cases such as this the temporal relationship between S and E cannot be obtained by simple inspection of the CTS. From (53), we deduce that E2 temporally precedes E_1. E_1 is contemporaneous with R. E2 is earlier than R. As S/E relations are derivatively determined on the basis of S/R and R/E relations, we cannot conclude from (53) that E2 precedes S. We are only entitled to deduce that both E2 and S are earlier than R. How E2 relates to S is indeterminate.

However, in (51e), we prefer to locate E2 in the future relative to S. Following Comrie (1985), I have attributed this to pragmatic factors. If E2 is really prior to S or contemporaneous with it, then it is more informative to locate E_1 with regard to the utterance time than to locate it with regard to E2. The former is more determinate and so more informative. Thus, a speaker will not felicitously use (51e) if he or she

knows that Harry has already arrived. This explains why E2 carries the implicature that it is later than the utterance time.

This same set of pragmatic factors also underlies the interpretation of (51f),[21] the CTS of which is illustrated in (54).

(54) S,R,E1

|

E2_S,R

It follows from (54) that E_1 is later than E2. This much clearly holds of (51f), the sentence represented by (54). However, (54) also puts El contemporaneous with the utterance time. Therefore, E_2 must be prior to the moment of speech. However, we have seen that there are reasonable pragmatic grounds for why E2 will not be so interpreted. Why specify E2 relative to some past moment when it can be located more easily relative to the utterance time, a rather salient moment in a speech situation? Thus, for pragmatic reasons, E2 is interpreted as after the moment of utterance. However, E_1 is after E2, and thus it too must be temporally located in the future.

In sum: I am arguing that the temporal location of E_1 and E_2 relative to the utterance time S is determined in this case by additional pragmatic factors. I am suggesting that what the adverb *tomorrow* does in the CTS of (55), pragmatic factors can do in (510.22

(55) John is leaving tomorrow when Harry has arrived

(56) tomorrow

S_R,Ei

Let me briefly recap the claims of this section. I have argued that, at least for complex tense structures involving *when, as,* and *while, a* very simple and natural theory of interpretation can be provided. I have added three ingredients to the interpretive theory presented in Chapter 1: First, I have claimed that linked points are interpreted as contemporaneous. Second, I have proposed that S/E temporal interpretation is derivative of **S/R** and R/E interpretation, and that it is not read off of the CTS directly. Third, I have shown that when E points coincide, the

temporal location of these points relative to one another is determined by the lexical content of the temporal connective linking the two clauses.

The first of these three claims seems entirely unobjectionable. It simply extends to complex constructions the natural interpretive principles that a Reichenbachian theory invokes for simple clauses.

The second claim, under one of the interpretations in section 2.3, introduces an opacity between the syntax of the system and its temporal interpretation. This will be discussed in greater detail in chapter 3.

The third claim states that the relationship between the syntax of tense and its temporal interpretation is not perfectly transparent. In other words, temporal interpretation is underdetermined by syntactic structure within this domain. This position is clearly coherent. It is an endorsement of a position analogous to the autonomy-of-syntax thesis for the domain of tense.

Whether it is appropriate to hold the autonomy-of-syntax thesis for tense is an empirical issue. I have argued that there is considerable empirical motivation for it, and that the interpretive rules required to bridge the gap between the syntax of a tensed sentence and the temporal interpretation it receives are simple and natural. Indeed, the gap appears only when E and R points are linked in CTSs. In these situations, the specific temporal interpretation that arises is sensitive to both pragmatic factors of the discourse situation and the specific lexical meanings of the connectives involved. The fact that identical tense structures combine with the different connectives to yield very different temporal interpretations—consider the discussion of *when* versus *while! as* sentences above—strongly suggests that the variation in temporal interpretation should be traced to specific properties of the connectives. In effect, it is the lexical properties of these connectives that determine what it means to say that two events are contemporaneous. Events that occur at the same time might, nonetheless, have some temporal order with respect to each other.

This is not as paradoxical as it might sound. What counts as the moment of speech involves virtually the same considerations. Events that all occur in the present often have a temporal order, and that order depends on how expansively one interprets the utterance time.

There is another way to make this same point: We have interpreted the comma as meaning "contemporaneous", and `A—B' as meaning that A is before B or B is after A. One might conclude from the above that the comma is more properly interpreted as not specifying a before/

after ordering—i.e., that `A,B' means neither A _B nor B_A. In effect, the tense system does not concern itself with contemporaneousness, only with before-and-after relations. This permits other semantic and pragmatic factors to fix an ordering in cases where the tense system leaves temporal relations unspecified as in cases where tense points are associated. Of course, most often, if A is not before B or after B it is interpreted as contemporaneous with B. However, just what this entails will be sensitive to the semantic contributions of other temporal elements, as well as to pragmatic factors. What is important for present purposes is that the account above clearly distinguishes between the contributions to temporal interpretation made by the tense system and other semantic and pragmatic factors that might influence how a sentence is temporally interpreted.

2.6 Before *and* After

When, as, and *while* are relatively simple temporal connectives. Although it is possible to use them as atemporal conjunctives analogous to *and,* this usage is quite forced. Consequently, if the sentences in which they occur violate the CDTS or yield contradictory temporal interpretations, we get unacceptable sentences, such as (38e), (38f), (42c), and (42d). However, this is not characteristic of all "strange" CTSs (i.e., ones in which the meaning of the connective requires one thing but the CTS seems to provide another). *Before* behaves quite differently. When the temporal interpretation provided by the CTS clashes with *before's* temporal requirements, we get counterfactual interpretations rather than strict unacceptability. Consider (57).

(57) a. John left before he hit someone

b. Sue telephoned Sol before he came over

c. Sue walked in before Peter left

In (57a)–(57c) we find *before* carrying both a temporal and a counterfactual interpretation. Depending on the set of pragmatically determined background assumptions, John either did or did not hit someone in (57a), Sol did or did not come over in (57b), and Peter did or didn't leave in (57c).

Before can have either a counterfactual or a temporal interpretation. The temporal interpretation of *before* requires the event of the matrix clause to be temporally prior to the event in the adjunct *before* clause.

The nontemporal interpretation of *before* assigns the E point of the matrix clause a temporal location but assigns none to the E point of the *before* clause. The latter is interpreted counterfactually. The event expressed by the *before* clause is assumed not to have taken place.

As noted, (57a)–(57c) ambiguously carry the temporal or the counterfactual interpretation. The CTS of these sentences is illustrated in (58).

(58)

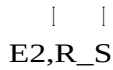
Here $E_1 = E_2$, so the interpretive rule for *before* adjuncts must allow coincident E points to have an interpretation in which either E_1 temporally precedes E_2 or else E2 is interpreted counterfactually. However, the ambiguity lapses if the E points do not coincide. Consider the sentences in (59), the CTS of which is illustrated in (60).

(59) a. John had left the party before the hit someone

b. Sue had telephoned Sol before he came over

c . Sue had walked in before Peter left

(60)



In these structures, E_1 precedes E2, as it is prior to R. E2 coincides with R. For these sentences, only the temporal reading is available. It seems that if E_1 precedes E2 in the CTS, the whole structure yields the temporal interpretation of *before.*

Corroboration of this comes from considering other instances of this configuration, as in (61).

(61) a. (All year), John has telephoned Mary before she comes

b. (All year), John has telephoned Mary before she has come

c. I will take cyanide before I see you again

d. I will have taken cyanide before I see you again

e. I'll face a pride of hungry lions before I marry you

f. I'll have faced a pride of hungry lions before I marry you

Sentence (61a) carries the interpretation that Mary in fact comes after being telephoned more flelicitously than sentence (61b).

The same is true for the other two pairs of sentences in (61). Sentence d, in contrast to sentence c, requires my taking cyanide. Sentence f is interpreted not as a declaration that the speaker will never marry the addressee but as a statement concerning some upcoming rite of initiation. In sentences a, d, and f, the E_2 point is to the left of the El point. In sentences b, c, and e, the two points coincide. For example, sentences c and d have the structures illustrated in (62a) and (62b), respectively.

(62) a. S_R,Ei

| |

S_R,E2

b. S_E1_R

S_____R,E2

In (62a), E_1 and E_2 coincide in CTS. Hence, (61c) can be interpreted either counterfactually or temporally. In (62b), however, E_1 precedes E_2, and so the structure has only the temporal interpretation.

The data in (59) and (61) indicate that if E_1 precedes E_2, then *before* is interpreted temporally. This makes sense in that the lexical meaning of temporal *before* requires that the event in the *before* clause follow the event in the matrix. The CTSs that underlie the unambiguous temporal readings in (61) also place E_1 prior to E_2. Thus, a CTS such as (62) is compatible with the lexical semantics of temporal *before.* The temporal interpretation of a CTS such as (62b) is compatible with the semantic requirements of *before's* temporal interpretation. However, the interpretation of the CTS in (62a) does not require E_1 to be contemporaneous with E_2. When the E points in a CTS coincide, then the temporal relationship of these points is determined by the lexical meaning of the connective. Indeed, the temporal interpretation fails to mirror the natural interpretation of the CTS. In (61c), cyanide-ingestion precedes visitation. In other words, despite the fact that in (61a) E_1 and E_2 coincide, they are not interpreted as contemporaneous. [23] In these complex tense structures, where the E points coincide, temporal interpretation is determined by properties of the temporal connective *before,* just as was the case above with CTSs involving *when.* (See (34a) and (34b).)

This seems to be a general feature of the interaction of the CTSs and the lexical semantics of temporal connectives. When E points in a CTS coincide, no temporal relationship between the points is established. Coincident E points assume a temporal relationship on the basis of the lexical semantics of the connective. If, however, E points do not coincide, then the temporal relationship of the interpreted CTS must match the lexical requirements of the connective. A clear illustration of this comes from considering *after.*

After inverts the temporal relations established by temporal *before.* S_1-after-S_2 places E2 temporally prior to E_1. When E points coincide, then, their relative temporal positions are determined by the meaning of *after.* In (63), as the tenses are the same, the E points coincide.

(63) John left after Harry arrived

The fact that we understand (63) to place Harry's arrival prior to John's departure is due to the lexical meaning of *after.* In (64), the E points do not coincide.

(64) a. John left after Harry had arrived
b. *John had left after Harry arrived

The CTSs of (64) are shown in (65).

(65) a. EI,R-S
|
E2_R—S

b. Ei_R_S
| |
E_2,11_ S

In (65a), E_1 is later than E2. E_1 is coincident with R whereas E2 is earlier than R. Hence, E_1 is later than E2. In (65b) the opposite obtains: *After* requires E2 to precede E_1. In (65a) this configuration holds; in (65b) it does not. Hence, (Ma) is acceptable whereas (64b) is not.

We have seen that the temporal interpretation of *before* is forced in a CTS in which E_1 precedes E2. What happens if E2 precedes E_1? We find that the counterfactual reading of *before* is forced. Consider the sentences in (66).

(66) a. John escaped before he served his term

b. John escaped before he had served his term

c. John will escape before he serves his term

d. John will escape before he has served his term

(66a) and (66c) are genuinely ambiguous and can be interpreted either temporally or counterfactually. (66b) and (66d) carry only the interpretation in which John does not serve out his prison term. The CTSs of the latter two sentences are given in (67).

(67) a. E_1,R_S
| |
E2_R_S

b. S_R,E1
| |

Note that in both (67a) and (67b) E_2 precedes E_1. This clashes with the requirements of temporal *before*. However, rather than getting unacceptable sentences, as in the case with *after in* (64b), we find the *before* sentences carrying a counterfactual reading.24

In sum: If E_1 precedes E_2, then *before* acquires a temporal interpretation. If E_2 precedes E_1, then *before* receives a counterfactual interpretation. If E_1 and E_2 coincide, then either interpretation is available.

Heinamakki (1972) uses modal and negative contexts to disambiguate these two *before*. She analyzes the temporal reading as a case of presupposition and the counterfactual one as a case of entailment. Thus, in temporal *before* sentences the truth of the adjunct clause is presupposed by the sentence as whole, but in counterfactual *before* clauses the truth of the adjunct is merely an entailment of the sentence as a whole. Heinamakki points out that modal and negative contexts disambiguate the two instances, as presupposition is not canceled in these contexts but entailment is. This means that if we place a counterfactual *before* in one of these contexts, then the counterfactual reading of E_2 will be canceled whereas a temporal reading of E_2 will not be. This coincides with what the theory presented here predicts.

In (68a) John does not steal the silverware, whereas in (68b) he does.

(68) a. John left the party before he had stolen the silverware

b. John had left the party before he stole the silverware

c. It's possible that John left the party before he had stolen the silverware

d. It's possible that John had left the party before he stole the silverware

(68a) has the counterfactual *before;* (68b) has the temporal one. Under *it's possible that*, John's thievery is retained in (68d). In (68c), it is left indeterminate; maybe he stole the silverware and maybe he didn't. In the CTS of (68a), E2 precedes E_1, as illustrated in (69a); in the CTS of (68b) the reverse is true, as (69b) shows.

(69) a. Ei,R_S

| |

E2_R_S

b. E_1_11 _S

| |

E2,R_S

Similar observations hold for the sentences in (70).

(70) a. George will leave before he has seen Sam

b. George won't leave before he has seen Sam

c. George had eaten cake before Harry left

d. George hadn't eaten cake before Harry left

In (70a), George does not seen Sam. In (70b), whether he sees Sam is undetermined. In (70c) and (70b), Harry departs. In other words, the entailment relationship characteristic of counterfactual *before* is canceled in (70b) by the negation. The CTS of (70a) and (70b) has E2 preceding E_1. However, the presupposition relationship characteristic of temporal *before in* (70c) is unaffected by the negative context in (70d). The CTS of these last two sentences has E_1 preceding E2. The CTSs of (70a) and (70c) are given in (71a) and (71b).25

(71) a. S_R,E1

| |

b. Ei_R_S

| |

E2,R_S

One last set of cases[26] is given in (72).

(72) Harry
a. put
b. had put
c. will have put
d. will put
money in the parking meter

before the cop
a. gave
b. gave
c. gives
d. has given
him a ticket

(72a) is ambiguous; Harry may or may not have gotten a ticket. (72b) and (72c) suggest that Harry got a ticket despite his depositing his quarter in the meter. (72d) suggests that he did not receive a ticket. This is what the theory requires. It is borne out by what happens when we embed these sentences in modal contexts. For example, contrast (73a) and (73b).

(73) a. It's possible that Harry had put money in the meter before the cop gave him a ticket

b. It's possible that Harry will put money in the meter before the cop has given him a ticket

In (73a) Harry is ticketed; in (73b) his fate is unknown.

2.7 **Conditionals**

In semantically evaluating a sentence with a temporal adjunct, we must establish two relations to obtain an interpretation: We must fix the relative temporal positions of the E points, and we must determine the temporal location of the E points, with respect to the utterance time. The proposed lexical semantics of the specific temporal connectives and the rules for interpreting CTSs interact to provide a temporal interpretation for complex tensed sentences by fixing this pair of relations. In this section, we shall see that the rules for conditional sentences also exploit tense relations in the course of fixing semantic interpretation. This relationship has been investigated extensively by Victor Dudman in a series of papers on tenses and conditionals. I rely heavily on his work in the discussion that follows.27

Dudman identifies three kinds of conditionals. In the first kind, two sentences, each of which can stand alone, are conjoined. (these sen-

tences are typically used in illustration of *modus ponens* reasoning.) Examples of this type are provided in (74).

(74) a. If she returned the tickets last Monday her refund was posted this morning

b. If Harry is leaving for Paris tomorrow he will miss the Super Bowl broadcast

Dudman calls the second kind of conditional, illustrated in (75), *generalizations.28*

(75) a. Nowadays if Grannie misses the last bus she usually walks/will often walk home

b. In those days, if Grannie missed the last bus she walked home

c. Until that fateful night, if Grannie had missed the last bus she had usually walked home

d. If Winston teases Grannie she spits at him

In these cases, the *if* clause functions adverbially. The sentence in the *if* clause is most naturally understood not as picking out a unitary past event but as describing a series of events. For example, in (75d), *Winston teases Grannie* adverts to Grannie's habit of spitting at Winston whenever he teases her. The sentence specified in the *if* clause specifies a condition, and the conditional as a whole is a generalization about occasions of this condition's satisfaction. As Dudman points out, these conditionals manifest a special tense pattern. The formal tenses in both clauses register the time of the generalization's validity: present, past, or past perfect.

The third kind of conditional, like the second, treats the *if* clause as an adverbial modifier. The tense relations are more complex than those displayed in generalizations. Examples of this third kind of conditional are given in (76).

(76) a. If Grannie misses the last bus she will walk home

b. If Grannie were to miss the last bus tomorrow she would walk home

c. If Grannie had missed the last bus on Friday she would have walked home

In these cases, the *if* clause specifies a condition and the matrix "hazards an outcome of the satisfaction of that condition" (Dudman 1983, p. 35).

The interpretation of such conditionals involves imagining the satisfaction of some condition and locating a change over point C onward from which imagination takes over. The speaker who affirms (76b), for example, does not lay claim to a deduction. Rather, he announces the result of a piece of imaginative speculation about the future. He imagines a certain condition satisfied at some time tomorrow (Grannie missing the last bus) and then imagines the consequences (Grannie's walking home).[29] The change over point C is the moment onward from which imagination takes over from history. This point is encoded into the verb cluster by the tenses of the two sentences.

In what follows, I will discuss Dudman's observations in the context of the theory of tense outlined above.

Dudman identifies the first type of conditional as having a conjunctive structure. The present theory imposes no tense-concord requirements on the conjuncts. This comports with Dudman's observations. There does not appear to be any kind of tense relation between the *if* clause and the matrix. I will not discuss these cases any further.39

On Dudman's analysis, in the other two kinds of conditionals the *if* clause is an adverbial modifier of the matrix. This makes them structurally analogous to the temporal adjuncts discussed above. Like these earlier sentences, these sorts of conditionals place rather strict restrictions on the tenses in the two clauses. These restrictions conform to the principles outlined above.

My interests in these conditionals are purely formal. How they are interpreted is a subtle and important question. Dudman has discussed these issues at length, and the interested reader is referred to his papers. I am concerned with the tense relations that obtain, and with how they conform to the restrictions motivated above for more straightforward complex tensed constructions.

First, consider generalization conditionals. What is the tense restriction that obtains between the two clauses? It is sufficient that the two tenses are the same, as the examples in (75) indicate. However, this is not necessary, as the sentences in (77) show.

(77) a. Nowadays Grannie usually calls if she's been arrested

b. Nowadays Grannie will usually call if she's arrested

c. Nowadays Grannie will usually call if she's been arrested

Rather, the structures are subject to the RTC and must conform to the CDTS. This requirement is met by the sentences in (77) as well as those

in (75). The CTSs of the sentences in (77) after the RTC hs applied are given in (78). I assume that the if clause functions like the temporal adjunct and so is on the second tier.

(78) a. S,R1,E

| |

E_S,R2

b. S_R1,E

| |

S_R2,E

c. S_R1,E

|

E,S_ R2

The theory also predicts that certain general conditional configurations will not be well formed. For example, all the sentences in (79) violate the CDTS.

(79) a. *Recently, Grannie has usually called if she will come home late

b. *Nowadays, Grannie usually calls if she will come late

c. *Nowadays, Grannie usually calls if she came home late

The structures of these sentences are illustrated in (80).

(80) a. E_S,R$_i$ E___S,Ri

RTC --x–>

S_R$_2$,E S<-4(—R2,E

b. S,R$_1$,E S,R1,E

RTC |

S_R$_2$,E S<-4(-R2,E

c. S,R$_1$,E S,R1,E

RTC x >

E,R$_2$_S E,R2—S

| x

In both (80a) and (80b), R2 is associated with S in DTS though it is not so related to S in BTS. The corresponding sentences, (79a) and (79b), are considerably less acceptable than the same tenses with the present tense replacing the future, as in (81).

(81) a. Recently, Grannie has usually called if she comes home late

b. Nowadays, Grannie usually calls if she comes home late

Replacing the future with the present allows the CTS to conform with the CDTS.

The structure shown in (80c) is a violation of linearity. As (79c) indicates, it is unacceptable with the general interpretation.

There are further restrictions on these structures than just the CDTS. For example, as (82) illustrates, it is difficult to get the present progressive in the matrix clause.

(82) ??Nowadays, Grannie is usually calling if she is arrested

However, it appears that meeting the CDTS is a necessary condition on the acceptability of these conditional constructions.31

Similar restrictions hold on the third type of conditional that Dudman identifies.[32] Consider the sentences in (83).

(83) a. Grannie will walk home if she misses the last bus tonight

b. Grannie would walk home if she were to miss the last bus33

c. Grannie would have walked home if she had missed the last bus on Friday

All these sentences meet the CDTS on the assumption that simple modals are in the present tense, whereas *modal + have* are past-tense forms. This makes *would* and *were to* present-tense forms and *would have a* past-tense form.

These assumptions explain why it is that certain forms of adverbial modification lead to unacceptability.

The unacceptability of (84a) is accounted for if *would* and *were to + V* are present-tense forms.

(84) a. *Yesterday, Grannie would walk home if she were to miss the last bus

b. Yesterday, Grannie would have walked home had she missed the last bus

c. Tomorrow, Grannie would walk home were she to miss the last bus

d. Right now, Grannie would walk home were she to miss the last bus

The acceptability of (84c) and (84d) follow as well. If *would have* is a past-tense form, then the acceptability of (84b) is similarly accounted for. These assumptions are the ones justified in the discussion of modal tenses in chapter 1.

The tense structures of (83a)–(83c) also conform to the CDTS. The tenses in (83b) are idiential (simple past); thus, they trivially conform to the CDTS. (83a) and (83c) meet the CDTS as wel1. [34] The derivations are outlined in (85).

(85) a. S_R_1,E RTC ⟶ S_RI,E ; S,R_2,E ; S_R2,E

b. E,R_i_S RTC ⟶ E,Ri_S ; $E\_R_2\_S$; E_R2_S

Thus, it appears that the tense-concord restrictions that hold for these sorts of conditionals conform to the requirements of the CDTS.

The requirement to conform to the CDTS is corroborated by observing what happens if it is violated. In cases such as (84a), the CDTS is violated. The present-tensed matrix structure is modified by a past adverbial. Unacceptability results. However, this is not the only possible outcome if the CDTS is violated. Compare (86a) and (86b).

(86) a. Yesterday, if Grannie had gone to the reception she would have insulted the president

b. Tomorrow, if Grannie had gone to the reception she would have insulted the president.

Both these sentences are acceptable. Howeve, they differ in meaning. (86a) leaves the truth of the *if* clause undetermined. Dudman argues at length that it is just plain incorrect to suppose that the *if* clause must be false. He points out that we can use sentences such as (86a) suppositionally and conclude that the antecedent is true. Suppose that Grannie is missing. We think that she might have gone to the president's recep-

tion. We know Grannie's temper and say (86a), knowing that news of the scandal would have made headlines. We peruse the *Times* and find out that, lo and behold, Grannie let the president have it. And we conclude that Grannie did go to the reception. Thus, (86a) leaves the truth of the *if* clause undetermined. The same is not true for (86b). If the conditional is modified by *tomorrow*, we can assume that the *if* clause is false. Grannie will not be going to the reception. In this case, the CDTS is violated. A future adverbial is modifying a past-tensed clause. The result is a structure in which the adjunct must be interpreted as counterfactual.[35] Obeying the CDTS appears to be a requirement for sentences having the interpretations that Dudman describes as characteristic of these constructions. If the CDTS is violated, either unacceptability or a deviant interpretation results.

Furthermore, we can account for why certain clausal couplings are unacceptable. Consider the CTSs of (87), schematized in (88).

(87) a. *Grannie would walk if she had missed the bus
b. *Grannie would have walked if she were to miss the bus

Their violation of the CDTS plausibly accounts for their unacceptability.

(88) a. S,R_1,E S,Ri,E

RTC -->

b. E,R_1_S E,Ri_S

RTC

S,R_2,E S,R2,E

2.8 Conclusion

In this chapter, the CDTS was extended to account for the unacceptability of complex tensed sentences involving adverbial clausal adjuncts. In addition, an interpretation procedure for CTSs was provided. This procedure combines the lexical properties of temporal connectives with the CTSs obtained after the RTC applies to yield temporal interpretations for these multiclausal sentences. The interpretation procedures crucially

make use of both the lexical semantics of the specific tense connectives and the general interpretation of the CTSs. The rules break down into two classes. When the E points in a CTS coincide, the temporal interpretation of the E points depends primarily on the particular connective. When the E points do not coincide, however, the lexical semantics of the connective cannot override the temporal order of the E points. Therefore, the syntactic structure of CTSs underdetermines temporal interpretation when the E points coincide.

Last of all, we saw that the restrictions motivated for temporal connectives extend to conditionals as well. The CDTS is a well-formedness condition on tenses irrespective of whether they are interpreted temporally or not. Counterfactual *before, as* well as the two types of conditionals identified by Dudman, obeys, the CDTS.

The value of the syntactic approach to tense outlined above comes more clearly into focus in the context of the data of this chapter. I have argued that the CDTS holds even in cases where tenses do not result in temporal interpretations, as in the conditional cases identified by Dudman. This is not surprising once it is observed that the CDTS is a well-formedness condition that applies to temporal adjunct constructions without apparent regard for the specific temporal connective involved. This is what we expect from a syntactic condition. The fact that conditionals obey it as well simply corroborates the claim that the syntax of tense should not be identified with the temporal interpretations tenses normally carry.

In addition, the utility of the Reichenbachian tense structures is evident in the discussion of *before.* The two readings that this connective carries can be disambiguated quite exactly on the basis of the tense it connects. Indeed, the system neatly highlights the specific contributions that the various temporal elements make to yielding an overall temporal interpretation. The syntactic CTSs prove to be semantically useful as well.

Chapter 3

A Reichenbachian Answer to Plato's Problem

In chapters 1 and 2, I sketched out an augmented Reichenbachian theory of tense. I argued that theories of this kind enjoyed reasonable empirical support if appropriately constrained by principles such as the Constraint on Derived Tense Structure. In this chapter I will focus on the fine structure of the theory, concentrating on two themes: First, does a Reichenbachian theory of this sort contribute anything to answering the acquisition concerns outlined in the introduction? And if it does, what is the nature of this contribution? Second, are any of the assumptions we have made about the structure of the tense theory dispensable? To attempt to answer this last question, I will review some of the data discussed in chapters 1 and 2 from the perspective of the theory. This involves empirically annotating the theoretical apparatus and thereby indicating the specific cost in data coverage that would result from giving up one or another specific assumption. This should enable the reader to see the precise motivations for the particular theoretical assumptions adopted and so should make it easier to revise the theory when revisions are called for. In addition, I will contrast the approach developed here with others that have been proposed.

The specific structure of this chapter will be as follows. First, I will review the details of "the logical problem of language acquisition," with particular emphasis on the implications of this problem for a theory of tense. Next, I will focus on the distinctive characteristics of a Reichenbachian theory. What does the postulation of a reference point R as a component of all basic tenses buy us, and what are the empirical and theoretical motivations for it? What is most distinctive in a Reichenbachian theory of tense is highlighted by focusing on the proposition that every tense has an SRE configuration and by contrasting this sort of account with other approaches that do not give basic tenses an ana-

logous fine structure. Third, I will discuss some of the characteristics of the extended Reichenbachian theory developed here. Reichenbach's assumptions yield a family of possible tense theories. I have argued in favor of one specific version that incorporates principles not found in Reichenbach's work. This is not surprising, as we have considered a wider range of data than Reichenbach considered. The theory developed above is compatible with and draws substantial inspiration from Reichenbach's ideas. However, though Reichenbachian, the theory is not Reichenbach's. In what follows, I will contrast this specific augmented Reichenbachian account with other possible versions of such a theory and with other possible general approaches to tense, and will evaluate their relative merits.

Two points are of special significance. First, the theory developed above incorporates a linearity assumption. Basic tenses differ if the SRE points are linearly distinct even if interpreted as contemporaneous. This is not a necessary assumption. Indeed, Reichenbach himself did not assume it. I will show why a linearity assumption has been adopted here. Second, in focusing on the question whether a basic tense is a unitary SRE structure or a complex one composed from two separate functions, one of which determines SR relations and another RE relations, I have adverted to some evidence (first highlighted by Comrie) that the second view is more adequate than the first. This issue will be taken up in some detail in the present chapter. In particular, I will begin to address the question of how the primitives of the tense system—the SRE points, the line, and the comma—are related to the overt morphemes that represent them. SRE information is realized by specific morphemes in any given natural language. How is this done? We wil investigate this question for English.

3.1 Tenses and the Logical Problem of Language Acquisition

In the introduction, I outlined the structure of the "logical problem of language acquisition": How is it that children come to master their native languages with such speed, ease, and uniformity despite the multifaceted poverty of the lingusitic stimulus? The linguistic input is inadequate in at least three ways.

First, the raw data are sentential utterances, not well-formed sentences. Utterances often suffer performance defects and thus are imperfect reflections of sentential structure. Clearly, this complicates the child's task of constructing a sentence grammar of its language.

Second, although the linguistic input is finite, the capacity attained by the child extends to an infinite domain of sentences, for all practical purposes. This fact creates two problems. In the first place, it indicates that the mature native speaker's competence extends to novel sentential configurations. Multi-embedded sentences have many properties that are qualitatively different from simplex sentences. How could the input data shape the development of the attained capacity? In the second place, the fact that the mature capacity extends across an infinite domain indicates that what is acquired is a grammar (i.e. , a rule system). The products of these grammars are sentences. What is acquired in the course to language acquistion are the rules that generate these sentences. In this sense, what is acquired (the grammar) is qualitatively different from what the child has access to in the course of acquisition (uttered sentences). In short, the fact that linguistic competence pertains to an infinite domain of sentences makes the evidence to which the child has access doubly remote from the capacity attained. The child must go from a finite subset of sentences to an infinite superset, and from sentences to grammars.

The third problem is the most serious. The capacity attained manifests the operation of grammatical principles whose products are scarcely attested, if attested at all, in the primary linguistic data available to the child. On the reasonable assumption that a child uses simple well-formed sentences in constructing the grammar of its native language, fixing the structure of these principles is inductively impossible.' The relevant data simply do not exist in the primary linguistic data, the inductive set available to the child. The assumption that the child uses simple well-formed sentences excludes "negative" evidence (i.e., information that a certain sentence is ill formed) and direct evidence from embedded clauses as evidence available to the child. Like the other inductive impediments noted above, this third type of stimulus poverty strongly points to the existence of a rich innate structure that underlies and channels the language-acquisition process.

The acquisition of tense competence is afflicted by the same sort of poverty of stimulus difficulties. It is beyond reasonable doubt that an utterance's tense information is occasionally distorted by performance factors. A speaker may misspeak and utter a past tense where a present perfect was called for. As in the case of sentential structure in general, tense structures are obscured to some degree by the utterances that embody them.

It is also clear that the second variety of stimulus poverty discussed above obtains in the domain of tense. A mature native speaker has the ability to use and understand tensed sentences not previously encountered in the course of acquisition. Furthermore, native speakers consistently converge on their judgments concerning the acceptability or deviance of novel tensed sentences. On the assumption that negative data are not available to the child, these convergent judgments alone stretch the plausibility of an inductive scenario for the acquisition of tense competence.

The number of tensed sentences is unbounded. In chapters 3 and 4, we will consider sequence-of-tense phenomena that illustrate this fact quite straightforwardly. As in the case of standard recursion, we can generate an unbounded set of relevant constructions. In (1), the temporal interpretation of the tense of an embedded verb is dependent on the temporal interpretation of the verbs that dominate it.

(1) John said that Harry had heard that Bill would say that Frank is thinking that Harry should leave.

We could elaborate this sentence indefinitely by choosing appropriate verbs to extend the embeding. In short, recursion is a property of the tense system, just as it is a property of the phrase structure of a language.2

The recursive property that begets infinity also pops up in the sentential adverbial constructions we discussed in chapters 1 and 2. Consider sentence (2).

(2) John wil leave Harry after Mary plays "Stardust" while Harry sings along before Sheila serves supper.

Here sentential adverbs are successively embedded within other sentential adverbs to yield a complex tense structure.

We could further complicate tense structure by combining the two processes exemplicate in (1) and (2), as in (3).

(3) John will say after Sue has left that Bill had claimed when Mary was eating that Frank would be leaving soon.

This sentence combines complex adverbial modification with sequence of tense. It is clearly possible to continue this embedding process further to yield even more complex tense configurations.

The point of these examples should be clear: Tense competence covers a practically infinite domain of tensed sentences, and a native

speaker's competence in this domain can be accounted for only by postulating mastery of a grammar of tense. Thus, in accounting for the unbounded nature of a native speaker's tense capacity, we are faced with the same sort of puzzle that we find in more familiar instances of linguistic knowledge.

The third degree of stimulus poverty is somewhat more difficult to establish. In order to establish the deficiency of the primary linguistic data in fixing the principles operative in the mature native speaker's competence, one must first describe the principles of the tense grammar that are operative. In other words, one must develop a theory of the mature native speaker's tense capacities. Only then can one argue that the primary linguistic data do not suffice to guide the acquisition of these principles.

The constraint on derived tense structure (CDTS) is such a principle. The requirement that the linear relations of basic tense structures (BTSs) be preserved in derived tense structure (DTS) and that SRE points cannot be associated in DTS that are not associated in BTS cannot be fixed purely on the basis of well-formed simple sentences. It requires, at the very minimum, "negative data": the fact that certain adverb-plus-tense combinations are illicit. Furthermore, the fact that this requirement extends to structures involving tense connectives is completely underdetermined by the properties of simple sentences, acceptable or not. How does the status of (4c) follow from that of (4a) and (4b) without adverting to the CDTS?

(4) a. *John will leave yesterday

b. John will leave tomorrow

c. *John will leave after Harry came

Another indication that the same acquisition problems accrue in the domain of tense as are exhibited elsewhere in the grammar is the fact that embedded constructions have properties different from those manifested in main clauses. We have already witnessed some of these differences. For example, we saw in chapter 2 that it is easier to move the R point of an embedded present perfect (by the RTC) than to move the R point of a matrix clause (by adverbial modification). The sentences in (5) illustrate this.

(5) a. ??Tomorrow, John has climbed Mt. Olympus

b. John will leave after he has climbed Mt. Olympus

In both (5a) and (5b) the R point of the present perfect is dissociated from S and moved to the right. However, the embedded instance of this movement in the DTS of (5b) yields a much better sentence than does this movement in (5a).

The difference between tense properties in matrix tenses and those in embedded clauses is also manifest in sequence-of-tense phenomena. Consider two illustrations of the problem. In section 4.5 we will examine the tense properties of infinitival constructions. It is impossible to induce the properties of embedded infinitival sentences from the properties of main-clause infinitival sentences, as there are no matrix infinitival sentences. Main clauses are always finite. Thus, whatever tense properties infinitival sentences possess cannot be traced to the properties of simple sentences in the input data. A similar point arises for cases of sequence of tense involving embedded finite clauses, as in (6).

(6) John will think that Mary is pregnant

There is a reading of (6) in which the temporal interpretation of the embedded clause is not the moment of utterance but a future point in time. In effect, the temporal interpretation of the embedded event point E is anchored to that of the matrix E point. Thus, a present tense in embedded position need not denote the utterance time, as it does in matrix clauses. The details of this will be discussed in chapters 4 and 5; what is important here is that this phenomenon can be manifested only in embedded clauses. Main clauses do not have sequence-of-tense properties. Thus, it is impossible to fix the properties of embedded tenses from their properties in matrix clauses, since embedded tenses can enter into sequence-of-tense constructions in embedded but not matrix clauses.

It seems, then, that the "logical problem of language acquisition" does pertain to the domain of tense. A theory of natural-language tenses must try to explain how the acquisition of tense competence is possible despite the degenerate and deficient nature of the primary linguistic data that fuel the process. This implies that a particular native speaker's tense competence will decompose into two parts: a set of universal innate principles, which constrain the form of language-particular tense grammars, and adventitious language-particular properties, which are fixed as part of the specific tense grammar on the basis of the primary linguistic data. The more highly articulated the universal features, the fewer the options a child must consider in constructing its tense grammar. The fewer the options, the less need there is for a robust data base

to guide the child's construction of a grammar of tense. **In** other words, the greater the innate endowment, the smaller the burden on the child of the poverty of the stimulus in acquiring mastery of the tense system of its native language.

Consider the augmented Reichenbachian system presented above in light of these considerations. One of the central virtues of this system is that it directly addresses these sorts of concerns. It does so in two ways.

A Reichenbachian theory can be interpreted as offering a rather restrictive theory of substantive universals. It provides an answer to the question "What is a possible tense?" that is wide enough to be empirically adequate yet narrow enough to screen out a wide range of logically possible basic tenses. It is possible to tease out various empirical hypotheses concerning the structure of basic tenses from the Reichenbachian claim that natural-language tenses are congeries of SRE points. I will consider various versions of this position, each of which yields a slightly different theory. I will also contrast the virtues of these systems with those of non-Reichenbachian theories.

In addition, the theory presented above includes some specific structural universals. The CDTS acts to restrict the interaction of tense primitives by providing an answer to the question "What is a possible complex tense configuration?" Not surprisingly, the particular details of a given theory of structural universals influence a companion theory of substantive universals, and vice versa. I will argue that the particular form of each adopted here has broad empirical support.

3.2 What Is a Possible Tense?

Reichenbach's original theory construed natural-language tenses as having a fine structure. One specifiication of this view takes a tense as a set of three points (SRE) ordered by two relations (the comma and the line).[3] A tense is composed of these three points. The difference between the basic tenses is how these points are linearly ordered and which points associate with one another. This perspective yields the result that there is a finite number of possible basic tenses—at most 24 different tenses, to be precise. Each natural language selects it basic tenses from this finite inventory. The 24 possible tenses are listed in (7).

(7) Present: S,R,E S,E,R R,S,E R,E,S E,S,R E,R,S
Past: E,R_S R,E_S
Future: S_R,E S.E,R

Present perfect:	E_S,R E_R,S
Past perfect:	
Future perfect:	S,E_R E,S_R
Distant future:	S_R__E
Future in past:	R_S,E R_E,S R__S_E R_E_S
Proximate future:	S,R__E R,S __E

The size of the set of possible tenses in (7) is determined by the three factors listed in (8).

(8) a. the postulation of an R point

b. the individuation of tenses on the basis of linearity considerations

c. the claim that basic tenses are {S R E , } quintuples

Relaxing any of these assumptions can reduce the size of (7). [4] Consider (8a). If we assumed that a tense was composed of only two points, S and E, then the number of basic tenses (with the other two assumptions held constant) would be four, as listed in (9).

(9) S,E S__E E_S E,S

The theory exemplified in (9) rejects Reichenbach's central insight: the postulation of an additional point R as part of every tense. In effect, such a theory insists that a tense is simply a relation between the utterance time and the event time of the proposition expressed by the sentence. Traditional tense theories and earlier theories within the tradition of generative grammar took essentially this view.

Before arguing that this sort of approach is inadequate, I would like to point out one important feature that it has: It drastically restricts the number of possible tenses. The greater the number of basic tenses that a theory of substantive universals permits, the harder it is to explain how the child zeroes in on the tenses of its language. If the options are severely restricted, as they are in (9), the theory is better off, all things being equal. However, in this case all things are not equal, as we shall see momentarily.

Abandoning (8b), the linearity assumption, also reduces the number of possible tenses. SRE points can be intrinsically or extrinsically linear. Let's say that tenses are *intrinsically* linear if their linearity mirrors their temporal interpretation. Thus, in the simple past, the E point is intrinsi-

cally left linear to the S point (i.e., it lies to the left of the S point) as it is temporally prior to it. Points are linearly ordered *extrinsically* if they are linearly ordered even if temporally contemporaneous. In the simple past **(i.e., E,R_S),** the R point and the E point are not intrinsically ordered, though they could be extrinsically ordered. I will assume that all theories of tense that endorse extrinsic ordering also endorse intrinsic ordering. The question at hand is whether SRE points are linearly ordered irrespective of their temporal interpretation.

The terms 'intrinsic' and 'extrinsic' should not be misunderstood in the present context. A linear ordering is intrinsic if it mirrors the temporal interpretation of the elements; it is extrinsic if it is additional to the order imposed by temporal interpretation.

These same terms, used in earlier syntactic-rule-based theories of grammar, still have a role to play in standard phonological theories.[5] An intrinsic rule ordering is one imposed on the basis of principles of universal grammar; an extrinsic rule ordering is one determined by induction from the input data. Thus, the distinction between intrinsic and extrinsic marks a learning-theoretic distinction of great importance in these contexts.

In the present context, however, extrinsic ordering of SRE points in the BTS could be dictated by principles of universal grammar. Similarly, the intrinsic ordering of these points might be determined by primary linguistic data. Indeed, for intrinsically ordered points, temporal interpretation easily fixes linear order. On the assumption that the temporal interpretation of the utterance of a tensed sentence is part of the input data to the language-acquisition device (in analogy to the phonetic structure of an uttered sentence), intrinsic ordering of SRE points is determined by the primary linguistic data. In these cases, temporal interpretation fixes the linear characteristics of the syntax of tense.6

However, for extrinsic ordering of SRE points (should it exist), temporal interpretation will not suffice. Thus, if there is a specific ordering of SRE points in the BTS nonetheless, it must be fixed by innate universal principles. From the perspective of issues concerning the details of the principles of universal grammar, what is of interest is whether BTSs have extrinsic ordering.

The implicit theory underlying (7) treats tenses as distinct if they are not linearly equivalent *even when they have the same temporal interpretation.* For example, all the present tenses listed in (7) are distinct tenses even though all these tenses carry a temporal interpretation in

which S is contemporaneous with R, which is contemporaneous with E. If we were to assume that contemporaneous points were linearly unordered with respect to one another, we could reduce the number of basic tenses from 24 to 13. For starters, all the linearly different present-tense forms in (7) would represent a single BTS.

It would be desirable if we could reduce the number of BTSs in this way. I will suggest that this creates empirical difficulties; nonetheless, the aim of cutting down the number of BTSs is a reasonable one given the logical problem of language acquisition. I will suggest other ways of achieving this goal without abandoning the linearity condition.

The list of tenses in (7) treats BTSs as unanalyzable by adhering to (8c). If, however, we were to treat BTSs as themselves complex—as composed of an SR and an RE relation—we could cut down the number of BTSs from 24 to 16. I have argued in chapter 2 that so treating the future perfect yields nice results. Once again, for learnability reasons, such a position is to be preferred to the one in (7), all things being equal. I will suggest that in this case no adverse results are obtained, and that there is some empirical evidence to suggest that this complex analysis of BTSs is indeed correct.

In the following sections, I will examine each of the options listed in (8).

3.3 **The R Point**

In chapters 1 and 2 we encountered three reasons for postulating the existence of an R point:

1. There is the interpretive fact that the past perfect and the future perfect fix the temporal interpretation of the event point E relative to the utterance time S by way of some third point. This third point is Reichenbach's R point. Its temporal effects are particularly pronounced in tense + adverb constructions, as its presence results in temporally ambiguous structures.
2. The presence of the R point contributes to explaining why there is an upper limit of two temporal adverbs per sentence and why multiple temporal adverbs interact as they do. Either E or R can be modified, and nothing else can be. We account for the limit on temporal adverbials by assuming that a restriction like the principle of full interpretation or the theta criterion holds for the temporal interpretation of tense configurations.

3. Assuming the presence of an R point in BTSs is critical to explaining how complex tensed sentences are formed. An adverbial clause can combine with a tense just in case the rule for temporal connectives (RTC) can associate the R points of the various clauses without violating the CDTS.

Let us consider these three types of motivations for postulating an R point.

Sentences in the past perfect and the future perfect specify the event time not only relative to the moment of speech but also relative to another point. Consider the sentence in (10).

(10) a. John had left the office
b. John will have left the office
c. John left the office
d. John will leave the office

Contrasting the temporal interpretation of (10a) and (10c), for example, indicates that John's leaving the office in (10a) follows the moment of speech *and some other moment of time before the speech time but after the event time.* Similarly, in (10b) versus (10d), John's leaving the office is specified relative to a future moment of time in relation to which his departure is in the past. The contrast between these pairs of sentences emerges rather clearly when adverbs are appended, as in (11).

(11) a. John had left the office at 6 o'clock
b. John will have left the office at 6 o'clock
c. John left the office at 6 o'clock
d. John will leave the office at 6 o'clock

(11c) specifies John's departure time as 6 o'clock. (11a) carries this interpretation, but it enjoys another one as well: a departure prior to 6 o'clock. The Reichenbachian theory outlined in chapter 1 represented these two sentences as in (12).

(12) a. **E___R_S**

6 o'clock

b. **E_R_S**

6 o'clock

c. E,R_S

6 o'clock

(12a) and (12b) both underlie (11a). The adverb "at 6 o'clock" can modify either E or R. In (12c), "at 6 o'clock" can once again modify either R or E; however, as the two points are associated and thus interpreted as contemporaneous, no ambiguity of temporal interpretation results.

Such data are easily accommodated within a Reichenbachian framework. However, they can be accommodated in other ways as well. Consider a theory that eschews an R point, as in (9). Within this sort of account, tenses specify the relation of the went time relative to S directly, without the mediation of an intermediate R point. Such theories are very common. Standard approaches in tense logic and earlier theories developed within the tradition of generative semantics approached tense in this way.[7] How do these sorts of theories account for the data in (10) and (11)?

Such theories start from the assumption that there are essentially two tenses: past and future.[8] Tenses are sentential operators, and the non-basic tenses, such as the past perfect and the future perfect, are built up from the basic tenses by iteration of the primitive operators. Let us dub these sorts of theories *iterated-operator theories* (IOTs). IOTs represent the data in (10) and (11) as in (13).

(13) a. Past[John leave the office]

b. Past[Past[John leave the office]]

c. Fut[John leave the office]

d. Fut[Past[John leave the office]]

(13a) represents the past-tense reading. The past perfect is rendered by iterating the past-tense operator. By iterating the operator, we specify that John's leaving the office is to be semantically evaluated relative to an already specified point in the past. In other words, we interpret the operators from outside to inside, with the peeled-off operators offering

up time points in relation to which the more deeply embedded operators must be evaluated. For example, we interpret (13b) as saying that there is a point of time $\mathbf{p}^1$ at which Past[John leave the office] is true. We then interpret the second past-tense operator. This yields the interpretation that there is a point of time p^2 in the past of another point of the p^1 at which [John leave the office] is true. We interpret the future-perfect structure (13d) analogously, but with p^1 specified as a future point of time.

This approach to tense has been incorporated into a variety of grammatical theories. A particularly perspicuous one for our purposes is the one developed within generative semantics. A generative-semantics (GS) theory treats tenses as higher verbs[9]. The sentences tense logicians represent as in (13) are represented within this account as in (14).

(14) a. [sl[NP[s2 John leave the office]] [vp Past]]

b• [sl[NP[s2[NP[s3 John leave the office] [vp Past]] [vp Past]]]

c. [s_i[$_N$p[s_2 John leave the office] [vp Fut]]

d• [sl[NP[s2[NP[s3 John leave the office] [vp Past]] [vp Fut]]]

There is a clear relationship between these two types of representations: Less-embeded tense operators in (13) hang higher in the trees in (14). If an operator in (13) is dependent on another operator in (13), it is dominated by that operator in (14). The difference between the two accounts is entirely notational. Consequently, the same intuitive semantics sketched for (13) carries over to (14). This very rough sketch is all that is required for present purposes.

The main point is that the effects a Reichenbachian system achieves with the introduction of a reference point R are obtained in an IOT by embedding operators within the scope of other operators.[10] In addition, IOTs take simple tenses (past and future) to have no fine structure to speak of. In contrast, Reichenbachian theories treat all tenses as complexly configured, with a fine structure made up of SRE points in various configurations.

In other words, iterated-operator theories and Reichenbachian theories offer very different accounts of what constitutes a possible tense. In an IOT, something is a possible tense if it is basic tense (e.g., the simple past) or a complex tense derived by iterating the basic tenses (e.g., the past perfect). In contrast, the Reichenbachian approach takes

a tense to be a structured SRE configuration, and a possible tense is one of these possible configurations.

The GS theory treats tenses as "higher" verbs. The ambiguities characteristic of past-perfect and future-perfect sentences can be accounted for by positioning the temporal adverb appropriately. Consider (15).

(15) a. John had left the office at 6 o'clock

b. [sl[NP[s2 John leave the office] [vp Past at 6 o'clock]]] [VP Past]]

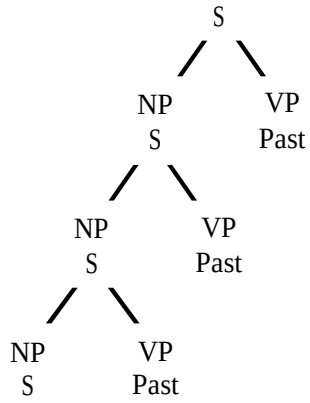
c. [si[NP[s2 John leave the office] [vp Past]]] [vp Past at six]]

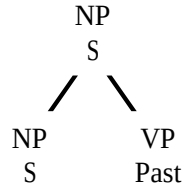
The ambiguity of (15a) is accounted for by the fact that there are at least two places from which the adverb "at 6 o'clock" can hang. If we treat it as an adjunct to the higher verb/tense in S2, as in (15b), we get the interpretation in which John's departure is at 6 o'clock; if we treat it as a modifier of the highest verb/tense in S_i, we obtain the reading in which John's departure precedes 6 o'clock. In effect, the adverb can combine with the tense to form a complex operator: "Past at 6 o'clock".[11] An analogous account extends to the future-perfect cases.

We have seen that both a neo-Reichenbachian theory and an iterated-operator theory can account for the facts cited in (10) and (11). Considering this alone, is there a rational basis for preferring one approach over the other? Given the considerations sketched in section 3.1, we ought to prefer the system that yields the most restrictive theory of substantive tense universals, as both approaches offer reasonable ways of handling the data. With this in mind, let us consider the two approaches once again.

IOTs treat the past perfect and the future perfect as complex structures of iterated operators. In the GS version of IOT, we iterate subject complementation to obtain the past-perfect and future-perfect structures. But this way of dealing with the past perfect and the future perfect carries the implication that there are an infinite number of possible tenses within natural language. How so? Because there is nothing to prevent the iteration of operators from continuing indefinitely. Thus, a structure in which a Past is embedded under a Future which is in turn embedded under two more Pasts is perfectly well formed.[12] However, it is evident that the temporal readings that correspond to such structures do not exist in English or any other language. Consider (16).

(16)





Put simply, there is no possible tense like the past future past past perfect. Adverb-plus-simple-tense configurations are at most two ways ambiguous, not indefinitely ambiguous. But why should this be so if the IOT is correct? Why are there no languages with N-way ambiguities (for arbitrarily large *N)* analogous to the ones we surveyed in English with the past perfect and the future perfect? Representing the adverb-plus-tense ambiguities characteristic of the past perfect and the future perfect in terms of iterated operators or successive subject complementation leaves IOTs incapable of explaining why an indefinite number of tenses and an indefinite number of adverb-plus-tense ambiguities *don't* occur.

A Reichenbachian theory is immune to this sort of reproach. On such a theory, complex tenses are not formed by recursion of primitive tenses. Rather, the full ordering of SRE points defines a space of possible tenses. The possibilities are the results of this exhaustive ordering of these three features. At most, we get 24 possible tenses, as listed in (7) above.

A Reichenbachian theory provides a finite set of alternative possible tenses. In addition, within a Reichenbachian theory there can be no tenses such as the past past past future past perfect, as there is no possible way to take the three SRE points and combine them with the comma and the line to yield a configuration that can be so interpreted. Consequently, this theory accounts for the nonexistence of indefinitely ambiguous tense-plus-adverb configurations. They don't exist bacause there is no way to construct an SRE structure with more than a two-way ambiguity.

There are several possible retorts to this argument in favor of a Reichenbachian theory.

One may claim that it is possible to modify an IOT so as to restrict the number of permissible embeddings of operators to some finite number—say, two. By so limiting the iteration of operators, one gets a theory that is just as restricted as a Reichenbachian one.

However, this modification of the IOT is suspect and raises a pressing question: Why N levels of embedding and not $N + 1$; why two permissible iterated operators but not three? This question develops more of an edge when it is observed that one of the most distinctive features of natural-language grammars is their recursive property. Thus, an *ad hoc* bound on the number of permissible embeddings of tense operators is very unnatural, as it strongly goes against the grammatical grain.

Moreover, recursive embedding is a virtual hallmark of natural languages; indeed, it is this property that yields the "infinite" size of natural languages.

Furthermore, grammars not having counting properties [13] means that neither grammatical rules nor grammatical principles are framed in terms of counting predicates (e.g., predicates such as "three levels of embedding from" or "two nodes higher than"). Therefore, it would decidedly odd to find a restriction on the iteration of tense oeprators that overtly invoked a numerical bound (e.g, generate at most two tense operators).

A bound on iteration of the kind suggested to restrict IOTs also presents a learnability problem. It is hard to see how this sort of bound on iteration could be acquired. There is no evidence that would allow it to be learned on the basis of primary linguistic data. Similarly, it is an odd candidate for an innate principle, since bounds on recursive embedding don't characterize other parts of the grammar.

An alternate way out of the dilemma IOTs present is to treat the past perfect and the future perfect as primitive tenses, neither resulting from

iterated simple tenses nor having an SRE fine structure. These tenses could be stipulated to have the interpretations that they display and the ambiguities they support. The problems with this solution are clear: First, it fails to offer any account for the phenomena at hand; it amounts to simple repetition of the facts. Second, the only theory of substantive universals it offers is a list. What is on the list, and why, is not addressed. All things being equal, this retreat from theory is to be avoided."

We have seen that IOTs have no natural way of limiting the iteration of operators. An analogous problem does not arise for a Reichenbachian theory. The reason is that the number of possible tenses is the number of possible SRE configurations *exhaustively* structured by the relevant relations. The bound on the possible ambiguities follows from the natural structure of the system. This provides a Reichenbachian theory with substantial explanatory power, for it closes off a question that naturally arises within any theory with a bound on embedding: Why is the bound what it is rather than something else?

3.4 Further Evidence for R

There are two additional kinds of direct evidence for the postulation of an R point. As these data have been discussed extensively in chapters 1 and 2, I will be brief.

Before exhuming the data, one point is worth reiterating: The major characteristic of a Reichenbachian theory is the claim that every tense has an R point, in addition to the temporally "observable" moment of utterance S and moment of the event E. The R point is present even when it has no apparent reflex in the temporal interpretation of the sentence. Evidence for the existence of an R point is evidence against any theory that fails to postulate its existence.

The first type of data involves sentence with multiple adverbs. [15] Two facts hold for these constructions. First, sentences appear to support at most two temporal adverbial clusters. Second, assuming the existence of an R point linearly ordered with respect to S and E allows for an account of why certain multiple temporal adverbial clusters cannot co-occur. Let us consider these two facts in turn.

Within the augmented Reichenbachian theory developed here, temporal adverbs are essentially modifiers of E and R. If this is correct, then the principle of full interpretation implies that the distribution of temporal adverbs should be related to the availability of "free" R and E

points. The reason is that this principle prevents a many-to-one mapping from modifiers to modifiees. The evidence suggests that a version of this prediction is correct. Adverbial clusters must conform to the principle.16

There are many positions for a temporal adverb in a sentence, three of which are illustrated in (17).

(17) a. Yesterday, John left the office
b. John, yesterday, left the office
c. John left the office yesterday

These positions can be occupied even if there are multiple adverbial clusters, as in (18).

(18) a. Yesterday, John left the office at 6 o'clock
b. John, yesterday, left the office at 6 o'clock

However, as the examples in (19) show, unacceptability is the result if we try to fill all three positions simultaneously.

(19) a. From yesterday at 6 o'clock, John left for Paris a week ago
b. *From yesterday, John, at 6 o'clock, left for Paris a week ago
c. *At 6 o'clock, John, from yesterday, left for Paris a week ago
d. A week from tomorrow, John will leave in a month
e. *From tomorrow, John, in a week, will leave in a month
f. *In a week, John, from tomorrow, will leave in a month

(19a) and (19b) demonstrate what is meant by adverbial clusters. *From yesterday at 6 o'clock* and *a week from tomorrow are* complex adverbs, but they form a single cluster. Similarly, *Thursday, in the afternoon, at 6 o'clock* is a single cluster. Note that (19b) and (19c) are much worse than (19a), and that (19d) is much worse than (19e) and (19f). This is fully explicable if we assume that there is a modifiable point R in addition to E and if we assume that the principle of full interpretation holds for the grammar of tense.

The examples in (20) rule out the possibility that the problem with the unacceptable sentences in (19) is that there are just too many adverbs.

(20) a. Unfortunately, John, (from) tomorrow, will leave for Paris in a week
b. Yesterday, John, sadly, left the office at 6 o'clock

Though (20a) and (20b) are encumbered with three adverbs, only two are temporal. This accounts for the greater acceptability of these sentences, in contrast to the unacceptable ones in (19).

There is a second type of evidence supporting the existence of an R point in every tense. This assumption combines with the CDTS to explain the pattern of acceptability illustrated in (21).

(21) a. Yesterday, John left for Paris a week ago

b. *A week ago, John left for Paris yesterday

c. Tomorrow, John is leaving in a week

d. *In a week, John is leaving tomorrow

Each sentence in (21) contains two adverbs. We can distinguish the acceptable ones from the unacceptable ones by observing that the tense configurations underlying the latter violate the CDTs. Consider (22).

(22) a. **E,R_S** —yesterday, a week ago→ **E_R_S**

a week ago yesterday

b. E,R_S —a week ago, yesterday→ ***R_E_S**

a week ago yesterday

c. S,R,E —tomorrow, in a week→ S_R_E

tomorrow in a week

d. **S,R,E** —in a week, tomorrow→ ***S_E_R**

tomorrow in a week

The derived structures in (22b) and (22d) are ill formed, as the linear order of R and E in the BTS is not preserved in the DTS.. What is important for present purposes is the observation that the account of the data in (22) presupposes the presence of an R point, in addition to an E point. It is their altered linear order that accounts for the data.

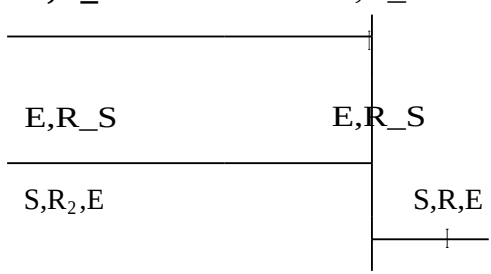
Essentially the same account extends to cover a second variety of data that also implicate the existence of an R point. In chapter 2, I showed

that the formation of sentences with multiple tenses, i.e., sentences with clausal adverbial adjuncts, had to associate R points while obeying the CDTS. Consider (23).

(23) a. John left before Harry came

b. * John left after Harry is coming

c. **E,R_S** E,R_S



d. E,R_S E,R_S

S,R_2,E S,R,E

The complex tense structures underlying (23a) and (23b) are illustrated in (23c) and (23d). Only (23c) obeys the CDTS; thus, only (23a) is acceptable. Once again, this explanation depends on there being an R point. It cannot be stated purely in terms of an S point and an E point. This fact comes out clearly when cases are considered which embed the present perfect under a future-tensed sentence. The present perfect locates an event in the past relative to the moment of speech. In (24), John's departure is history.

(24) John has left

This is reflected in the basic tense structure given to the present perfect: E_S,R. The association of S and R reflects the "present" relevance of the present perfect. At any rate, what is important for current purposes is that the E point be placed before S. Consider (25).

(25) a. John will leave after Harry has arrived

b. * John left after Harry has arrived

The data in (25) indicate that it is the R points that must be associated in complex clausal adverbial constructions. E points are inadequate surrogates. See the two diagrams in (26).

(26) a. S_Ri,E/ S R

E2_S,R2 E2 S R2

b. Ei,Ri_S _S

E2_Si,R2 E2_S,R2

The structure in (26a) is well formed. Observe that the E2 point of the second clause lies to the left of S, while the matrix E_1 point lies to the right. Therefore, associating E points in place of R points would result in a violation of the CDTs. However, the sentence is acceptable, as is predicted if we assume it is R points that associate. The converse case is illustrated in (26b). Here, associating the E points would not violate the CDTS. Thus, we predict that this complex tense structure should be fine. Its unacceptability is derivable if we assume that it is R points that must be associated. In this case, moving R2 to under R_1 would violate the CDTS.

The conclusion that it is R points and not E points that must be associated in these sorts of adverbial constructions is further corroborated by considering the interpretation of (27).

(27) John had left the office when Sam walked in at 3 o'clock

The temporal interpretation of this sentence unambiguously locates John's departure prior to 3 o'clock. The structure of this sentence is illustrated in (28).

(28) Ei_Ri_S RTC, at 3 o'clock E_i_RI S

E2,R2.-S E2,R2_ S

at 3 o'clock

Here, *at 3 o'clock* modifies E2. However, as E2 is associated with R2, which is in turn associated by the rule for tense connectives (RTC) with R_1, R_1 is temporally located at 3 o'clock. But in the DTS, R_1 is temporally after E_1. Thus, E_1 is interpreted as prior to 3 o'clock. This accounts for the unambiguous interpretation of (27).

We could not derive this result if we were to assume that E points had to be associated. If R points did not exist, and if it were E points that must be associated, the unambiguous temporal reading that (27) carries could not be derived. If the E points were associated, then E2 and El would be read as contemporaneous. *At 3 o'clock* would then modify E2,

and, by transitivity, E_1. This would yield the interpretation that John's departure was at 3 o'clock—an incorrect reading.

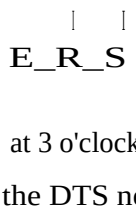
Without R points, E_2 would appear to violate the Principle of full interpretation; it would be both linked to E_1 and modified by *at 3 o'clock*.[17] If we assume that tenses have an R point and that it is the R points that must be associated by the RTC, then the principle of full interpretation can be maintained in its strongest form.

There is a further prediction: An R point within a temporal adverbial clause cannot be modified by an adverb in the clause. This seems to be correct as well. Consider (29).

(29) John left after Harry had departed at 3 o'clock

This sentence places Harry's departure at 3 o'clock, not before. The latter interpretation is ruled out because it would require the embedded R point both to be associated via the RTC and to be modified by *at 3 o'clock*. The two relevant DTSs are shown in (30).

(30) a.


b. *


(30b) is the DTS necessary to support the interpretation in which Harry's departure is before 3 o'clock. The principle of full interpretation disallows it, however. Thus, the indicated reading is not available.

Postulating that every tense has an R point underlies the explanations advanced in chapters 1 and 2. The crucial claim has been that it is not possible to make do with a theory of tense that eschews R points; an utterance time and an event time are just not enough. In section 3.3 I argued that the most one needs are three points, one of which is Reichenbach's R point. These two considerationsn support a strong

conclusion: Theories without R are at once too strong and too weak. Reichanbachian theories, on the other hand, are just right.

3.5 Linearity

The SRE points in basic tense structures can be linearly ordered in one of two ways, as was noted in section 3.3: intrinsically and extrinsically.

All Reichenbachian theories assume the intrinsic ordering of SRE points. If the event time is temporally prior to the moment of speech, then E is to the left of S, separated from it by a line. If an event is interpreted as in the past relative to a moment which is itself located after the utterance time, then the E point is left of the R point, separated from it by a line, and the R point is to the right of S, separated from it by a line. When the temporal values of SRE points are not interpreted as contemporaneous, it is easy to fix the linear location of the points syntactically. They simply mirror the relative temporal placement of these points on the time line.

Reichenbachian theories part company on issues relating to extrinsic ordering. In tenses in which the utterance time, the event time, and the reference time are interpreted as temporally contemporaneous, are S, R, and E nonetheless linearly ordered in BTS? Let us call a theory that answers this question negatively "weakly ordered," and one that answers it affirmatively "strongly ordered." A weakly ordered theory of BTS treats linear order of SRE points as derivative on their temporal interpretation. If they are contemporaneous, then they are freely ordered syntactically.

Both weakly ordered and strongly ordered theories accept intrinsic ordering. However, only strongly ordered theories accept extrinsic ordering. Thus, strongly ordered theories accept that basic tenses might have syntactic structure that does not reflect the temporal interpretation of the tense. In other words, strongly ordered theories assume that the autonomy-of-syntax thesis holds in the domain of tense.

One way of fixing what these two approaches come to so that we can explore the assumption of extrinsic ordering is to treat the comma as defining an equivalence class of basic tense structures. If two points in a basic tense are separated by a comma, then the BTSs that differ only in the linear order of the points separated by the comma are assumed to be equivalent. For example, given weak ordering, the BTS of the simple future is **S_R,E** or S_E,R. These are *equivalent representations of the very same tense.*

A theory that postulates that BTSs are strongly ordered treats these two representations of the simple future tense as distinct. Given strong ordering, there is more to linear order than temporal interpretation.

The theory presented in chapters 1 and 2 is a strongly ordered Reichenbachian theory. Here I will present some evidence in favor of this type of theory.

Some of the same evidence that testifies to the existence of an R point points to its being extrinsically linearly ordered with respect to E. Consider the sentences in (31), which involve multiple adverbs.

(31) a. Yesterday, John left for Paris a week ago

b. *A week ago, John left for Paris yesterday

c. Tomorrow, John will leave in a week

d. *In a week, John will leave tomorrow

The account for the difference in acceptability between (31a) and (31c) versus (31b) and (31d) involves an extrinsic-ordering assumption in conjuction with the CDTS.

The complex tense structures underlying (31a) and (31b) are diagrammed in (32).

(32) a. E,R_S —(a week ago, yesterday)→ E_R_S

| |

a week ago yesterday

b. —(a week ago, yesterday)→ *R_E_S

| |

a week ago yesterday

Observe that the BTS of the simple past is E,R_S. The E point and the R point are associated in BTS. If we assume weak ordering, then this structure is equivalent with R,E_S. If we substitute this structure into the derivations in (32), then (32b) will be well formed and (32a) will be illicit. This is illustrated in (33).

(33) a. R,E_S —(yesterday, a week ago)→ *E_R_S

| |

a week ago yesterday

b. **R,E_S** —a week ago, yesterday→

a week ago yesterday

In (33a), the linear order of (33a) fails to be preserved in DTS. This violates the CDTS, and thus the structure is ill formed. In (33b), on the other hand, the derived structure complies with the CDTS and so is well formed.

Here is the main point: If we assume a weakly ordered theory, we predict that there should be no contrast between (31a) and (31b). Both should be well formed, as both comply with the CDTS under some choice of tense representation for the simple past. If we assume that E,R_S underlies (31a) and **R,E_S** underlies (31b), we dervie a well-behaved DTS for each sentence. It is precisely this option that a weakly ordered theory makes available. Weak ordering does not distinguish these two instances of the simple past, whereas a strongly ordered theory that assumes extrinsic ordering does.

But this is a problem, for there is a clear difference between these two sentences. Thus, we have empirical grounds for assuming that the simple past has the structure E,R_S and that this is different from S. In other words, the past tense is strongly ordered.

A virtually identical argument holds for the future tense and the examples in (31c) and (31b). The relevant structures are given in (34).

(34) a. S___R,E —tomorrow, in a week→ S_R_E

tomorrow in a week

b. S_R,E —in a week, tomorrow→

tomorrow in a week

c. tomorrow, in a week *S_R_E

tomorrow in a week

d. S_E,R —(in a week, tomorrow)→ **S_E_R**

|

tomorrow in a week

Structures (34b) and (34c) violate the CDTS. Given weak ordering, the **BTSs S_R,E** and S_E,R are equivalent representations of the simple future. Thus, (31c) and (31d) should have at least one well-formed derviation each. This appears to yield the incorrect empirical prediction that (31c) and (31d) should not differ in acceptability.

The assumption that only S _R,E is the BTS representation of the future conforms more adequately with the data. However, this assumption endorses extrinsic ordering for BTSs.

A similar type of argument supports the claim that R and E are strongly ordered in the BTS of the present as well—see examples (21c) and (21d) above. The present also provides an argument for assuming that R and S are strongly ordered even when the reference time and the utterance time are interpreted as temporally contemporaneous.

The present tense is modifiable with present adverbs and future-oriented adverbs. It cannot be combined with a past adverb. Why not? Consider the sentences in (35).

(35) a. John sleeps/is sleeping in the attic right now

b. John sleeps/is sleeping in the attic tomorrow

c. *John sleeps/is sleeping in the attic yesterday

This asymmetry was explained above by assuming that the present tense has the structure S,R,E. The DTSs of (35a)–(35c) are represented in (36).

(36) a. S,R,E —(right now)→ S,R,E

b. S,R,E —(tomorrow)→ **S_R,E**

right now

tomorrow

c. S,R,E $\xrightarrow{\text{yesterday}}$ * R_ S,E or * E_S,R or * E,R_S

| | |

yesterday yesterday yesterday

What is vital here is that (36c) cannot bear an adverb such as *yesterday* without a rearrangement of the linear order of BTS in DTS. Each of the three structures to the right of the arrow in (36c) violates linearity. If we assume the CDTS, this explains the relative unacceptability of (35c). However, if we assume that basic tenses are only weakly ordered, this account of (35c) fails. There is a way of deriving (35c) and adhering to the CDTS, however: Simply assume that the underlying configuration of SRE points is E,R,S or R,E,S. Given only intrinsic ordering, these—along with S,R,E—are equivalent representations of the present tense.

As (37) illustrates, the same results obtain in the case of adverbial clauses.

(37) a. John will leave when Harry has come

b. John will leave when Harry comes

c. *John left when Harry has come

d. *John left when Harry comes

The relevant derivations are provided in (38).

(38) a. S_R_i,E S_Ri,E

RTC ---> | I

E_S,R_2 E ___ S ___ R2

b. S_Ri,E

RTC --> | I

S,R_2,E S_R2,E

c. E,Ri_S

RTC —> 1 I

E_S,R_2 E ___ S , R2

x !

d. E,R_i_S *E,Ri_S

RTC ----> 1 I

S,R_2,E S,R2,E

x

In (38a) and (38b), the DTSs are well formed and R2 can be associated with R_1 without violating the CDTS. This is not possible in (38c) and (38d), as the linear order of S and R2 must be altered to permit the association of the R points.18

However, it is impossible to force a violation of the CDTS if we assume that the present perfect can be represented as either E_R,S or E_R,S and that the present can be represented as either S,R,E or R,S,E. Under these assumptions, it is possible to associate the R points in (35c) and (35d) without violating the CDTS. (34c) and (34d) should then be no less acceptable that (34a) and (34b). In short, there are empirical reasons for assuming that SRE points are extrinsically ordered BTSs.

This conclusion is not entirely welcome. Recall that strong ordering increases the number of basic tenses from 13 to 24. It seems quite unlikely that there are six different forms of the present tense all of which are temporally identical in interpretation. What this suggests is that some principle of universal grammar acts to cut down the available configurational possibilities in those cases in which SRE points are not intrinsically ordered. In other words, where temporal information does not disambiguate order, an innate principle of the tense system does. This principle acts to uniquely determine the linear order of points in cases where they are interpreted as contemporaneous. I will suggest a specification of this principle after discussing whether BTSs are really basic of whether they are composed of two separate and more basic relations: an SR relation and an RE relation.

3.6 Composed BTSs

They are several reasons for assuming that BTSs are not primitive but rather are themselves composed of an SR relation and an RE relation. In this section I will discuss four arguments in favor of this position. A fifth will be presented in section 3.7.

In most cases, the information encoded in the SR and RE relations can be encoded as an ordered quintuple. However, there are basic and derived tense configurations that are best interpreted as leaving the SE relationship unspecified. Leaving the SE relationship unspecified cannot be accomplished if we assume that every tense is represented as a structured quintuple, for in every such configuration the relationship between S and E will be specified. The two points will be linearly ordered,

and they will either be associated or separted. However, there arise cases where the relationship between S and E is simply indeterminate. This can be accommodated by assuming that S and E are not directly related to one another. Any relationship that obtains between the two points holds in virtue of SR and RE relations that obtain independently.

One way of interpreting compositionality is that universal grammar prohibits the utterance time from directly specifying the event time. This requires SE relations to be indirect. The determination of the temporal value of E must be mediated by R. [19] We can explicitly represent this as follows: Take the symbol 0 to represent composition. The simple tenses can be treated as in (39).

(39) a. S,R,E = (S,R) 0 (R,E)
b. S_R,E = (S_R) 0 (R,E)
c. E,R_S = (R_S) 0 (R,E)

In most cases, nothing is sacrificed by dropping the more cumbersome notation on the right. The reason is that in most cases transitivity obtains, so that the SE relation is uniquely fixed by the SR and RE relations. However, there are several reasons for seeing BTSs as complex in certain cases.

The first reason is that it enables us to cut down the inventory of basic tenses from 24 to 16. If we assume that strong ordering obtains for SR and RE relations, then without the compositionality assumption we get the inventory of BTSs in (5) repeated here as (40).

(40) present: S,R,E S,E,R R,S,E R,E,S E,S,R E,R,S
past: E,R_S R,E_S
future: S_R,E S_E,R
present perfect: E_S,R E_R,S
past perfect: E_R_S
future perfect: S_E_R S,E_R E_S_R E,S_R
distant future: S_R_E
future in past: R_S,E R_E,S R_S_E R_E_S
proximate future: S,R_E R,S_E

If BTSs are composed, we can reduce the number of tenses to 16. There are four possible SR combinations and four RE sets, and this yields 16 possible composed tenses. By leaving SE relations indeterminate unless

they are derivable from SR and RE relations, we can equate the following tenses:

S,E,R = E,S,R,
R,E,S = **R,S,E,**
S_E_R = S,E_R = E_S_R = E,S_R,
R_S,E = **R_E,S = R_S_E,**
S,E_R = **E,S_R.**

In each set of equivalences the same SR and RE relationships obtain. **SR** and RE are either associated or separated (related by a comma or a line), and are strongly ordered linearly. However, S and E are not related to each other in these ways except derivatively. Nothing about SE relations can be deduced from the SR and RE relations in the above set of equivalences. Thus, S and E have no specified relationships to one another. S and E are unordered with respect to one another. [2°] Treating equivalences as representing the same tense cuts down the number of possible tenses to 16. This is reason enough to assume that BTSs are composed, given the persepctive adopted here. However, there are further reasons for making this assumption.

Second, Comrie (1981, 1985) has objected to Reichenbach's particular analysis of tenses on the ground that it postulates three distinct representations of the future perfect. Comrie cogently argues that this is a real problem[21]: "Reichenbach's account of the future perfect effectively claims that this form is three ways ambiguous, rather than vague. However, not only does English not provide any evidence for ambiguity here . . . but, as far as I am aware, neither does any other language. This suggests that the triple characterization is an artefact of the notation rather than a significant fact about language." (1981, p. 26) If we assume that BTSs are composed from SR and RE relations, we can avoid the problem that Comrie observes. There is only one BTS for the future perfect: **(S_R)** 0 (E_R). If we compose these two relations, then we get the four possible SE relationships listed in (40). On our assumptions, these all designate the same BTS. In other words, for the future perfect there is no determinate SE relation. In this case, the tense leaves the SE relation vague.

The third reason for treating tenses as composite is that it enables us to assign the correct temporal interpretation to complex constructions such as (41).

(41) a. John will leave after Harry has arrived

b. S_R,E RTC S_ R,E

E_2—S,R E2_S_R

In chapter 2 we saw that a naive interpretation of the DTS (41b), the tense structure for (41a), suggested that E2 was necessarily prior to the utterance time. This seems to be incorrect. Rather, the time of Harry's departure is indeterminate relative to the utterance time. If we assume that S and E are unordered unless this order is independently derivable, we can evade this conclusion. In (41b), the only conclusions the DTS supports is that E2 is prior to R and that R is after S. This leaves the temporal position of S and E_2 structurally indeterminate—the desired conclusion for (41).

There exists a fourth, rather abstract reason for treating BTSs as composite: In virtually every case in which a DTS must be deemed ill formed, it is possible to account for its ungrammaticality without adverting to SE relations. No structure is ever bad only in that in DTS the SE relations violate the CDTS; if a complex structure is bad and the relation of S and E in DTS violates the CDTS, then either the SR or RE relationship violates the CDTS as wel1.[22] This fact is incomprehensible if SE relations are constitutive of BTSs. However, it is just what we expect if SE relations are not part of the tense representation but are derived from the primary SR and RE relations that obtain.

3.7 Mapping from Morphemes to Tenses

The tense structures proposed here must be represented by specific morphemes in English. Given these morphemes, it is possible to construct a BTS for a given sentence. The nature of this mapping in English supports the claim that BTSs are composed of an SR relation and an RE relation.

In English, this mapping from overt morphemes to BTS is surprisingly regular. The tense morpheme determines the SR relation. The presence or absence of *have* fixes the RE relation.

The mapping rules listed in (42) underlie the morpheme/BTS correlations in English.

(42) a. i. present morpheme: associate S and R: S,R
ii. past morpheme: R removed to left of S: **R_S**
iii. future morpheme: R removed to right of S: S_ R

b. i. + *have:* E removed to left of E: E _R
ii. — *have:* E and R associated: E,R or R,E

Consider some examples. The past tense is signaled by (42aii) combined with (42bii). The future perfect is the combination of (42aiii) and (42bi).

The fact that these tense and morpheme relations hold quite generally is of some importance. It indicates that the mapping from morphemes to tense structure can be separated into an SR part and an RE part. But why should this be so unless BTSs are themselves composed of two separable relations? In other words, the two parts of the morpheme-to-tense mapping in (42) reveals the fact that the BTS is itself composed of two separable relations, information concerning which is carried by separate morphemes. Thus, the nature of the mapping of morphemes to tense structure supports the claim that BTSs are essentially compositional.

Note also that there is no specific morpheme that signals the association of R and E. R and E are associated unless information to the contrary is expressly provided. Thus, we must presume that the RE relation holds universally. It is a principle of universal grammer that an R point exists *even when its presence has no interpretive reflex*. As this point is of some importance, let me elaborate.

The arguments provided in section 3.4 for the presence of an R point in every tense are rather exotic. They rely on the relative acceptability of sentences with multiple adverbs in various combinations and the relative acceptability of multiclausal sentences (i.e., those with temporal clausal adverbial adjuncts). It seems inconceivable that a child's acquisition of the tense system requires exposure to linguistic data of this sort. Furthermore, the information that an R point is present in the simple present, past, and future is not explicitly carried by any morhpeme. In these tenses, the R point is not semantically visible, nor is it signaled by any morpheme. Nonetheless, it is present. How does the child conclude this?

There is only one possible answer: The child simply assumes that every tense must have an R point. In other words, it is part of universal grammar that the temporal location of an event time E cannot be provided by directly linking E to the utterance time S. All SE relations must be mediated by R. No overt evidence is needed to provide the child with this belief; it is an axiom of the innately provided language faculty, and thus the absence of overt indicators is no hindrance.

One problem still remains, however. The rules in (42) do not yet fully determine the mapping from morphemes to BTSs in English. The problem arises with associated points. Consider the BTS of the present tense as an example. I have argued that its structure is **S,R,E or (S,R)** 0 (R,E). How do we derive this structure rather than S,E,R or R,S,E or E,R,S? Furthermore, is there any principled reason for why both the present and the present perfect in English have the same SR relation (i.e., S,R) in both S,R,E and E_S,R?

I would like to suggest that some rather natural mapping principles innately constrain the morpheme to BTS mapping.

The principles in (43) act to the down the inventory of possible tenses by resolving potential linenar-order ambiguities.

(43) a. In a given BTS, if linear order is not intrinsically determined, assume that the linear order of RE is identical to the linear order of SR.23

b. Morphemes unambiguously determine unique mappings.24

Principle (43a) says that in cases in which the order of R and E is not intrinsically determined (i.e., R and E are associated), the linear order of R and E mimics the linear order of S and R. For example, if S is to the left of R, then R will be to the left of E. This has the consequence of reducing the number of BTSs for the simple future to one (viz., S_ R,E), the number for the simple past to one (viz., E,R_S), and the number for the simple present to two (viz., S,R,E and E,R,S). The other possibilities are excluded, as they involve SR/RE pairs of "mixed" order.25

Principle (43b) acts to prevent the same morpheme from determining one order in one BTS and another in a second BTS. In Engligh, *have* always fixes an E_R structure, whether it be in the past perfect, the future perfect, or the persent perfect.

More interestingly, (43b) establishes certain dependencies between tenses in a single language. For example, if a given language gives the simple present the form E,R,S, then, if it has a morpheme which is the mirror image of *have (i.e.,* a morpheme that determines the relation R_E), in that language R,S_E is a possible tense but S,R_E is not.

In English, the structural similarities between the simple present and the present perfect exemplify the influence of (43b). The simple present has the structure S,R,E. Thus, in English, the present-tense morpheme fixes an S,R structure in BTS. This implies that the present perfect has

the same SR structure, as it does: E_S,R. This implication is a welcome one, in my view, when one considers the status of the English present perfect from the perspective of the poverty of the stimulus. The present perfect is a rather idiosyncratic tense. Analogues in other languages are not easy to come by. The Romance languages seem not to have such a tense.[26] Moreover, many of its properties in complex constructions are quite surprising. To take one example, it occurs in adverbial clauses embedded under future-tense matrix clauses despite its semantic affinities to the simple past. In both the simple past and the present perfect, the event time is prior to the utterance time.

Many have noted the present perfect's many oddities. The logical problem of language acquisition demands that we regularize its behavior as much as possible, especially its behavior in complex constructions such as (44a).

(44) a. John will leave before he has eaten

b. *John will leave before he ate

Unless we do so, we will have to attribute mastery of this tense to the shaping effects of the primary linguistic data. But it is unlikely that multiclausal structures form part of the data available to the language-acquisition device. Better to make the properties of the present perfect in embedded positions fully derivable from general properties of universal grammar.

This is not to say that every idiosyncrasy of the present perfect should follow from universal grammar. Peculiarities that can be determined from the behavior of the present perfect in well-formed *simple* sentences need not be accounted for by principles of UG. However, a solution in terms of UG is called for where the present perfect's behavior in complex structures does not mimic its behavior in simple sentences.

The present perfect is arguably such a case. For example, in chapter 1 we saw that in simple clauses the present perfect resists dissociating S and R. Although (45b) is not ill formed according to the principles outlined above, (45a) is not a very acceptable sentence.

(45) a. *Tomorrow, John has left

b.

tomorrow

However, in embedded adjunct clauses the rule for temporal connectives has no difficulty moving the R point away from S, as in (44a). This asymmetry would be rather hard to account for inductively, as the complex structure (44a) appears to ignore how the present perfect behaves in simple sentences such as (45a).

3.8 Gerunds

The main point of the preceding section was to argue for the compositionality of BTSs on the basis of the rules on mapping from overt morphemes to SR RE configurations. The fact that the mapping rules in English seem to break down into two separate parts, one concerned with SR relations and the other with RE relations, lends support to the compositional view of BTSs. However, there is an even more direct route to the same conclusion. In gerunds, RE relations can appear in the absence of SR relations.

Gerunds do not appear to bear a tense morpheme. Nonetheless, they can appear with *have*. All the examples in (46) seem well formed.

(46) a. John whistled while working

b. John will leave after finishing the review

c. John left before eating

d. John left before having eaten

e. John will leave after having finished the review

Moreover, the examples in (46d) and (46e) seem to specify an **E___R** relation with the presence of *have*. We can account for these constructions by assuming that gerunds only specify an RE relation. In the next chapter I will argue that this holds true for infinitivals as well. Since many of the points I will make about infinitival clauses also carry over to gerunds, in this section I will restrict my discussion to sentences like (46).

The properties of the examples in (46) are fully accounted for if we assume that the RTC applies to associate the R points. In structures shown in (47), all of which are well formed, [27] the RTC applies to associate R_2 with R1.

(47) a. S,R_1,E S,R1,E

RTC

R_2,E R2,E

b. S_RI,E

RTC

R_2,E R2,E

c. E,12/_S

RTC

E,R_2 E, R2

d. E2,R1 S

RTC

E2 _ R2 E2 _ R2

e.

RTC

E_2_ R2 E2_ R2

This can be accomplished trivially without violation of the CDTS, as there is no fixed S point to worry about. Furthermore, the temporal interpretation of these structures comes out correct. Compare (46c) and (46d) in particular. The latter suggests that John did not eat; the former remains agnostic on this point. Recall that the interpretation rules for *before* forced the counterfactual reading if E2 preceded E_1 in DTS, but it allowed ambiguity in cases in which the E points coincided. These same interpretation rules account for the difference in interpretation between (46c) and (46d) regarding John's diet. The other structures similarly exploit the rules outlined in chapter 2 for tensed temporal adjuncts.

More interestingly, gerunds support earlier speculation concerning the principle of full interpretation. The gerund in (48) is unambiguous; it only has the interpretation in which John left the office at 3 o'clock.

(48) John met Fred after having left the office at 3 o'clock

The DTS underlying the unavailable interpretation requires *at 3 o'clock* to modify R2; however, this is forbidden by the principle of full interpretation.

The fact that (49) is ill formed accounts for the monoguity of (48). *At 3 o'clock can* only modify the E point if the DTS is to be well formed.

(49) E,R$_i$ ___S RTC, at 3 o'clock E,Ri___S

E_R2 E_R2

at 3 o'clock

These data indicate that gerunds function as we would expect if they had RE structures. The absence of a tense morpheme suggests that they do not have an SR specification. Thus, RE relations must be able to stand independent of SR relations.

3.9 Conclusion

In this chapter, I have tried to examine those properties of the particular Reichenbachian system developed in chapters 1 and 2 that have allowed it to be empirically interesting. The theory makes crucial use of an R point. It assumes that tense representations are strongly linear. And it assumes that BTSs are composed of more basic relations that determine SR and RE structure directly but determine SE relations only derivatively.

None of these assumptions are logically necessary. One could find theories that alter these assumptions in various ways and yield different theories of tense. My claim has been that those theories will be less adequate than the particular Reichenbachian theory I have advocated.

More important to me than the truth of this assertion, however, is the belief that natural-language tense theories must be responsive to considerations deriving from the logical problem of language acquisition. The theory I have urged assumes the presence of an R point and strong ordering. To cut down the inventory of possible tenses available to the child, I have assumed that tenses are composites and that a mapping principle such as (43) holds universally. These assumptions cut down the possible tenses available in any one language to eight. The total number of tenses in the inventory of possible tenses is eleven. What underlies the difference is that languages must choose some tenses in bunches because of (43b). The final inventory is given in (50). I have given both the SR RE form and the composed form where the latter is applicable.

(50) present: (S,R) 0 (R,E) = S,R E (i)28
(R,S) 0 (E,R) = E,R,S (ii)

past: (R_S) 0 (E,R) = E,R_S

future: (S_R) 0 (R,E) = S_R,E

present perfect: (S,R) 0 (E_R) = E_S,R (i)
(R,S) o (E_R) = E_R,S (ii)

future perfect: (S_R) o (E_R)

past perfect: (R_S) 0 (E_R) = E_R_S

future in past: (R_S) 0 (R_E)

proximate future: (S,R) 0 (R_E) = S,R_E (i)
(R,S) 0 (R_E) = R,S_E (ii)

Chapter 4

Sequence of Tense from a Reichenbachian Perspective

To this point, I have focused exclusively on the interaction of tenses with simple and complex temporal adverbs. In this chapter, I will move on to another phenomenon—sequence of tense (SOT)--and suggest a way of analyzing it in a manner consistent with earlier assumptions.

Sequence of tense is interesting for a variety of reasons. First, for present purposes, SOT structures are quite different from the adverbial ones discussed above. SOT relates the temporal interpretation of a sentential argument with that of its theta-assigning verb.' Integrating an account of SOT will require some theoretical additions to the augmented Reichenbachian theory developed in earlier chapters. Furthermore, an empirically adequate analysis of SOT requires structural restrictions on the interaction of tenses similar to, but not entirely identical with, those characteristic of clausal adverbials. Thus, SOT phenomena provide another window on the structural universals operative within the tense system. Second, SOT provides interesting support for a neo-Reichenbachian theory of basic tenses. We will see that embedded finite clauses can make use of the S point in one of two ways. The fact that embedded clauses need not have the sort of interpretation characteristic of SOT structures lends support to the Reichenbachian assumptions adopted here. Last of all, SOT phenomena bear directly on what the categorial status of tenses is in natural language. Tenses are standardly taken to be operators of various sorts. Thus, they are treated as akin to quantifiers. In the next chapter, I will argue that they should not be so analogized and that their semantic properties are very different from those of quantified expressions, the canonical examples of operators.

This chapter proceeds as follows: In section 4.1 I offer a description of sequence of tense phenomena and provide a preliminary sketch of their salient properties. In section 4.2 I show how these data can be inte-

grated within the theory developed in the earlier chapters. The key to the analysis is the recognition that the S point has two related yet logically distinct properties: (i) it is a deictic anchor and (ii) it has a default interpretation in which it is mapped onto the utterance time if not otherwise interpreted. Distinguishing these two properties of the S point permits the formulation of an SOT rule for embedded finite clauses. In this case, the rule associates an embedded point, S,,_1, with a higher point, E_n. This SOT rule interacts with the principle of full interpretation (PFI) in determining the range of temporal interpretations SOT provides.[2] Section 4.3 invokes a locality condition on the interaction of tenses: a structural universal limiting the range of possible interdependencies. Section 4.4 discusses this condition and considers the implications that its existence has for other approaches to the theory of tense.

Section 4.5 extends the discussion to include embedded infinitival and naked infinitival constructions. I argue that for the former kinds of clauses, the embedded R point can anchor to the matrix E point. Thus, SOT can associate the R point of a nonfinite clause with a higher E point. In the case of naked infinitival clauses, the SOT rule associates the embedded E point with the matrix E point. I suggest that the distinctive SOT properties of these nonfinite constructions can be traced to the requirements imposed on tenses by the principle of full interpretation.

4.1 Sequence of Tense: A Brief Description

When a finite sentence is embedded as a propositional argument under a finite verb, the temporal interpretation of the embedded clause is dependent on that of the embedding clause.[3] Contrast (la) with (lb), (1c) with (1d), (le) with (le , and (10 with (1g).

(1) a. John heard that Mary is pregnant
b. John heard that Mary was pregnant
c. John said that Harry is leaving
d. John said that Harry was leaving
e. John said that Harry will leave
f. John said that Harry would leave
g. John thought that Harry ran
h. John thought that Harry had run

The first sentence of each pair interprets the event time of the embedded clause temporally relative to the utterance time. This can be seen quite clearly by comparing each with the relevant contrast sentence. For example, with (la), what John heard was that Mary was with child *at the moment of utterance* of (la) as a whole. If John's information is accurate, then Mary is still pregnant. (ib), in contrast, is ambiguous. Mary might still be pregnant or might now be knee-deep in diapers. The two interpretations can be rendered as in (2).4

(2) a. John heard "Mary is pregnant"
b. John heard "Mary was pregnant"

The reading of (ib) corresponding to (2a) is an instance of the SOT phenomenon. The interpretation of the embedded present tense is temporally evaluated relative to the temporal evaluation of the matrix-event time. This event time is in the past, and so the present tense is also temporally evaluated as in the past. I will occasionally refer to this reading as the "shifted" interpretation.5

The same ambiguity of interpretation characterizes (id), which carries the shifted interpretation if interpreted as (3a) and the non-shifted reading if interpreted as (3b).

(3) a. John said "Harry is leaving"
b. John said "Harry was leaving"

In contrast, (1c) is unambiguous. It can only be read as temporally situating Harry's departure relative to the moment of speech rather than relative to the matrix-event time.

Analogous remarks hold for (le) and (if), though direct speech analogues are harder to come by. (le) places Harry's departure in the future relative to the moment of speech. If what John said is accurate. then Harry has not yet left. (1f) can also bear this temporal interpretation. However, it also can carry another: Harry's departure might have already occurred. This would correspond to (4), in which John's statement "Harry will leave" was uttered in the past and Harry left since the utterance.

(4) a. John said "Harry will leave"

The reading of (if) that is analogous to (4a) *is* the shifted SOT reading of the embedded clause.

(1g) and (lh) are slightly more complicated versions of the same SOT phenomenon. (lg) is ambiguous. It carries interpretations analogous to those represented in (2). The reading of (1g) given as (5b) is the shifted reading.

(5) a. John thought "Harry ran"

b. John thought "Harry runs"

(lh) also has two interpretations. The shifted reading has Harry's running as in the past relative to John's thinking about it. This is different from either interpretation one gets with the two readings of (1g) given in (5). If John thought that Harry ran, then Harry's running is not necessarily in the past relative to John's thinking. However, if John thought that Harry had run then, on the shifted reading, Harry's running is prior to John's thinking of it.

The examples given in (ib), (1d), (if), and (lh) are typical of SOT phenomena. In each case, the embedded sentence can be interpreted as evaluated relative to the temporal interpretation of the matrix event. When a finite clause is embedded under a past-time clause, this temporal dependency is signaled by a change in the verb form in English. Thus, in the sentences above we get the following tense "sequencing": In (ib), the present tense manifests as a past-tense form *(is* to *was).* In (1d) the present progressive *is leaving* surfaces in the shifted reading as *was leaving.* In (10, under the shifted interpretation, the future *will leave* becomes *would leave.* In (lh), the past tense *ran* is replaced by the past perfect *had run.*

The change in the verb form is an important but superficial feature of SOT phenomena. It is important because it makes shifting easy to study in English, as shifting of temporal interpretation is signaled overtly in the morphology; in other languages this is not the case. [6] It is superficial for two reasons. First, the underlying tense form is not affected. Second, it is manifest only when the temporal interpretation of the embedded clause is shifted to a *past* event time.

The first point is clearly illustrated by sentences such as (7).

(7) a. John said that Harry was leaving tomorrow

b. John thought that Montreal played Boston tomorrow

c. *Harry was leaving tomorrow

d. *Montreal played Boston tomorrow

e. Harry is leaving tomorrow

f. Montreal plays Boston tomorrow

In (7a) and (7b), we have *tomorrow* modifying a sentence with the surface form of the past tense. Combining a future adverb with a sentence in the past tense is generally prohibited, as (7c) and (7d) indicate. However, the sentence (7a) and (7b) are perfectly acceptable.' This would follow if the underlying tense of each is really the simple present, the apparent past-tense form being just the morphological manifestation of a shifted temporal dependency on the matrix-event time. As (7e) and (7f) indicate, the present-tense versions of these sentences combine freely with future adverbs.

The converse also holds. Consider the sentences in (8).

(8) a. *John said that Harry would leave for New York yesterday8

b. John said that Harry would leave for New York tomorrow

c. John said that Harry would leave for New York

d. John will leave for New York tomorrow

e. *John will leave for New York yesterday

(8c) does not specify the actual time of Harry's departure. It is compatible with (8c) that Harry has already left for the Big Apple so long as his leaving occurred after John's saying. Note, however, that it is not possible to modify the embedded clause with an adverb such as *yesterday*. The reason is that it is never possible to modify a future-tense sentence with this adverb, as (8f) indicates. The acceptability of (8b) is expected in view of the acceptability of (8d). In other words, the embedded sentence keeps its future-tense properties even when it enjoys a shifted interpretation in SOT structures.[9] The examples in (7) and (8) indicate that as far as adverbial modification is concerned, the regular properties of the tense are maintained in SOT structures. This follows if *would* is simply the morphological form of *will* in SOT structures.

There is one other reason for thinking that the morphological change in tense form is superficial in SOT constructions. Consider the sentences in (9).

(9) a. Sally said that John left

b. John thought that Harry now understood our problem

c. *Harry now understood our problem

d. Harr^{y} now understands our problem

The SOT form of the embedded verb is tightly tied to that of the standard form of the verb in some cases. In discussions of SOT phenomena, attention is generally restricted to stative verbs—i.e., examples such as (lb) above. [10] Nonstative verbs do not manifest a shifted reading when in the simple past, as (9a) indicates.

However, there is a simple reason why (9a) does not manifest a shifted reading. The present-tense form of nonstative verbs in English is the present progressive, not the simple present. Hence, if SOT induces a surface morphological change but leaves the tense unaffected, then we expect nonstative verbs to have "was V-ing" forms under SOT. As (id) above indicates, this is what we find.

In addition, we find SOT manifested with verbs that have a simple past morphological form. But in these cases the SOT forms carry interpretations related to the present-tense form of the verb. So, **for example, *understand*** does not generally appear in the present progressive, only the simple present. In SOT configurations, it has a simple past morphological form.

In (9b), we can modify the apparent past-tense form *understood* with the present adverb *now*. This is not possible with verbs in the past tense in general, as the unacceptability of (9c) indicates. It is, however, possible with a present-tense verb, as (9d) indicates. Thus, we can explain the acceptability of (9b) if we assume that *understood* is not truly a past-tense form but rather a verb in the present tense manifesting the morphology induced by SOT.

The relationship between the SOT form and the present-tense form is also manifested in (1g) and (7b) above. (lg) can be interpreted as a habitual. We can roughly paraphrase (lg) as "Sometime in the past, John thought that Harry was wont to run". Similarly for (7b). The shifted form is acceptable, but it carries the same "scheduling" interpretation that characterizes the simple present-tense form (7f). This is what we expect if the past-tense morphology in (7b) is merely the morphological reflex of a shifted present tense in SOT structures.

In sum: If we assume that SOT induces a surface morphological change in the form of the shifted verb but leaves the underlying tense form intact, then we can account for why verbs assume the particular forms they have in SOT configurations. In addition, we can explain the interaction of tenses and adverbs in SOT configurations (as in (7) and (8) above).

A second important fact about this morphological change is that it accompanies shifting only under a past-tense verb." Consider (10).

(10) a. John thinks that Mary was pregnant/left

b. John thinks that Mary will be pregnant/will leave

c. John will think that Mary was pregnant/left

d. John will think that Mary is pregnant/is leaving

The embedded clause in (10c) and (10d) can assume a shifted reading. (10c) can bear the temporal interpretation in which Mary's being pregnant/departure is taken by John to be in the future of the moment of speech but in the past relative to his cogitations. Similar facts obtain for (10d). Thus, there exists a shifted reading for each of these sentences in which the embedded clause is dependent on the matrix for its temporal interpretation. However, in neither case is there a change in the morphology of the tensed form.

The temporal dependence is clearly seen once one observes that the difference between (10c) and (10d) lies in how the two sentences differently situate Mary's pregnancy/departure relative to John's thinking of it. In the first case, the pregnancy/departure is prior to the thinking; in the second they are contemporaneous. In other words, the past tense of the embedded clause does past-tense work and the present tense does present-tense work once we see that the temporal interpretation is fixed relative to the matrix-event time. The surface forms of the verb bear their typical tense properties, in contrast to the sentences in (7) above.

Similar facts hold in the case of (10a) and (10b). However, in these cases the shifted reading is harder to discern. I will discuss these cases more fully below. Let it suffice for the present to note that if SOT applies in these cases as well, then there is no morphological reflex of its application. Indeed, sentences such as (11a), where the morphological change is made, are decidedly odd whereas in sentences such as (11b), no morphological change has occurred.

(11) a. ??John says that Mary would be pregnant/be leaving

b. John says that Mary will be pregnant/be leaving

The *would in* (11a) cannot be understood as just being the surrogate for an underlying future-tense marker.

To sum up this brief description: SOT structures have two basic characteristics. First, the embedded clause displays a shifted temporal interpretation. The event time of the embedded proposition is evaluated relative to the event time of the embedding sentence. Second, in English, when the temporal interpretation of an embedded sentence

is dependent on an event time in the past, this dependency is marked morphologically by a change in the surface form of the verb. Only "backwards" shifting is so marked, however. Shifting to the future or the present results in no changes in the embedded verbal morphology.

In the next section, I will show how to extend the theory outlined in earlier chapters to include an account of SOT. As the description provided above suggests, I will not have much to say concerning the morphological change of the verb in the shifted clause. I will concentrate on explaining how the shifted temporal interpretation should be represented.

4.2 A Neo-Reichenbachian Theory of SOT

The key to integrating the temporal shifting characteristic of finite embedded clauses into a Reichenbachian theory is the S point, which functions as the primary deictic anchor for temporal interpretation. In chapter 1 we saw that the S point is typically interpreted as picking out the moment of utterance. However, this is not a necessary feature of S. Under the appropriate conditions, S can be anchored to times other than the moment of utterance—consider the case of the historical present.

The central features of S are (i) that it is a deictic element whose interpretation anchors the temporal interpretations of R and E and (ii) that it has the utterance time as a default temporal value. Conceptually separating the deictic character of S from the fact that its typical default temporal interpretation is the utterance time contributes to a full account of SOT phenomena.

What happens in typical SOT structures is that the embedded S point is associated with the embedding E point. Let us see what this says about the tense structures of the temporally shifted sentences in -(1), repeated here as (12).

(12) a. John heard that Mary was pregnant
b. John said that Harry was leaving
c. John said that Harry would leave
d. John thought that Harry had run

Consider (12a) under the shifted interpretation. This relevant interpretation is paraphraseable as *John heard "Mary is pregnant"*. Recall that the surface past-tense morphology of *was* is actually the form of a

present tense that has been shifted to the past. The tense structure is illustrated in (13)

(13) E_i,R_S_i $E_i,R\_\_S_i$
SOT
———> 1
S_{2},R,E_{2} S2,R,E2

The SOT rule shifts S2 and associates it with E_1. The derived tense structure perspicuously displays the shifted interpretation of (12a). According to the naive temporal interpretive procedures of earlier chapters, S_2's association with E_1 is to be interpreted with S2 contemporaneous with E 1 . E2 is associated with S2 as well, so it too is interpreted as contemporaneous with E_1. This yields the correct temporal interpretation for the sentence as a whole under the shifted reading. In particular, the sentence does not inform us as to whether Mary's pregnancy obtains at the moment of speech. Thus, it is perfectly OK, after hearing (12a), to ask whether Mary is still pregnant.

Observe that S2 is not interpreted as referring to the utterance time. It cannot be so interpreted in the derived tense structure of (13). To give this interpretation to S2 would required invoking the default rule that anchors S2 to the utterance time. However, invoking the default rule would violate the principle of full interpretation (PFI). S2 is associated with E_1 in the DTS of (13), so the PFI prohibits its further interpretation. Since S2 already has a temporal value, it cannot receive another.

In contrast, consider (14), the unshifted analogue of (12a).

(14) John heard that Mary is pregnant

In this sentence, the morphological present-tense form of is signals that no shifting has occurred. Therefore, the SOT rule has not applied. The DTS of (14) is identical with its BTS, as (15) shows.

(15) Ei,R_Si
S2,R,E2

In (15), S2 is not associated with E_1 or anything else. The PFI requires that S2 be interpreted temporally. The default rule allows an S to be specified as denoting the utterance time. It applies here to S2, so the tense structure in (15) can meet the requirements of the PFI. This maps S2 onto the speech time. In this way we obtain the correct temporal interpretation for the clause as a whole. Mary's pregnancy is contemporaneous with the moment of speech in (14). In contrast to (12a), after

hearing (14) it would be inappropriate to ask whether Mary was still pregnant.

Virtually the same analysis applies to (12b) and to its non-SOT analogue (16).

(16) John said that Harry is leaving

The underlying tense structures are identical to those in (13) and (15).

Example (12c) is more interesting. Here *would* signals the linking of a future-tensed embedded clause to a past event time. See (17).

(17) E1,R_S

SOT

S2_R,E2 S2_R,E2

Here, as in the other cases, SOT links S2 to E_1. The temporal interpretation of the DTS leaves the relative temporal relationship between E2 and the utterance time undetermined. Harry's departure date relative to the utterance time is indeterminate. Such is not the case with (18), the non-SOT analogue of (12c).

(18) John said that Harry will leave

The presence of *will* rather than *would in* (18) indicates that no SOT rule is involved. The DTS is represented in (19).

(19) Ei,R__S

S2__R,E2

Here S2 is not linked to E_1. To obey the PFI, S2 must be interpreted as denoting the utterance time. But this then locates E2 after the utterance time. In short, the utterer of (18) is claiming that Harry's departure has not yet occurred, given that John's information is accurate.

Example (12d) is more of the same. The tense structure of the sentence with SOT interpretation is shown in (20).

(20) E_1,R__Si Ei,R__Si

SOT

E2,R-S2 E2,R_S2

The DTS of (20) has S2 associated with E_1. Consequently, we interpret E2, Harry's running, as temporally prior to John's thinking of it. Furthermore, E2 is unambiguously prior to the utterance time of (12d). In

this respect, (12d) is different from the other examples in (12). The temporal specification of the embedded event is determinate relative to the utterance time. This emerges clearly in (20). E_2 must be prior to El, which is prior to S_1. Because of the PFI, S_1, in turn, must refer to the moment of speech.

The same analysis accounts for the shifting of tense to the future and to the present. Consider the tense structures of the sentences in (21).

(21) a. John thinks that Mary was pregnant
b. John thinks that Mary will be pregnant
c. John thinks that Mary is pregnant
d. John will think that Mary was pregnant
e. John will think that Mary is pregnant
f. John will think that Mary will be pregnant

Application of the SOT rule to (21a), (21b), and (21c) does not affect their interpretation. The SOT structures for these three sentences are given in (22) on the right side of the arrow, and the non-SOT configurations on the left.

(22) a. S,R,E_1 S,R,E1

SOT

$E_2,R—S_2$ E2,R—S2

b. S,R,E_1 S,R,E1

SOT →

S_2__R,E_2 S2_R,E2

c. S,R,E_1 S,R,E1

SOT →

S2,R,E2 S2,R,E2

Recall that in SOT sentences that do not involve linking an embedded clause to a past-tensed matrix clause there is no morphological change in the associated embedded verb. The DTS in (22) associates S_2 with E1. This links the temporal interpretation of S_2 to the temporal interpretation of E_1. In every structure, E_1 is contemporaneous with the matrix S point. This point is anchored to the utterance time by the default rule for S interpretation. Thus, S_2 is interpreted as contemporaneous with the speech time when associated with El.

However, the very same temporal interpretation results if the SOT rule does not apply. The reason is that without the application of the SOT rule, S_2 must be given the default interpretation to comport with the PFI. This maps S_2 onto the moment of speech. Thus, whether or not SOT applies, S_2 gets linked to the utterance time in SOT structures with matrix present-tense verbs. Consequently, application of the SOT rule does not result in any changes in the temporal interpretation of the embedded clause. The theory's prediction that the application of the SOT rule is interpretively vacuous in cases such as (21a)–(21c) appears to be correct.

In the cases of (21d), (21e), and (21f), the theory predicts ambiguity. If the embedded tenses are shifted by the SOT rule so that S_2 is associated with E_1, then one interpretation results. If SOT does not apply, the result is another interpretation. Consider the details. The tense structures when the SOT rule is applied are on the right side of the arrow in (23); those that result when the SOT rule is not applied are to the left.

(23) a. S_R,E.1

SOT

E_2,R —S_2 E_2,R_S_2

b. S_R,Ei

SOT

S_2,R,E_2 S_2,R,E_2

c. S_R,Ei SOT S_R,E/

S_2_R,E_2 S_2_ R ,E_2

Recall that the application of SOT in the sentences of (21) does not have a morphological reflex. The embedded verb does not change. Given this, the structures in (23) indicate clearly why it is that (21d), (21e), and (21f) are ambiguous.

Without the application of the SOT rule, the PFI forces the application of the default rule for S interpretation, and so S_2 is interpreted as denoting the moment of utterance. Consequently, Mary's pregnancy, E_2 is temporally located relative to the speech time in these non-SOT cases. On one of its interpretations, (21d) places Mary's pregnancy in the past relative to the utterance time, (21e) contemporaneous with it, and (21f) in the future. These interpretations are transparently represented in (23a)–(23c) in the tense structures on the left of the arrow.

Each of (21e)–(21f) has a second interpretation. If the SOT applies, we associate S2 with E_1. As E_1 is in the future relative to the utterance time, the application of SOT will shift the temporal interpretation of E2 to the future by associating S2 with E_1. Under the SOT readings, Mary's pregnancy is temporally located relative to E_1. The BTS of (21d)–(21f) after application of SOT yields the three DTSs to the right of the arrow in (23). The DTS in (23a) leaves the time of Mary's pregnancy indeterminate with respect to the moment of utterance. In other words, (21d) can be true even if John will think that Mary's pregnancy is in the future relative to the moment of utterance. All that is required is that John believe Mary's pregnancy is in the past relative to his thinking about it.

The shifted reading of (21e) locates Mary's pregnancy in the future relative to the moment of speech and contemporaneous with John's thinking of it. The TS to the right of the arrow in (23b) represents both of these facts.

The shifted reading of (21f) places Mary's pregnancy in the future relative to John's thinking of it and in the future relative to the moment of speech. These interpretive facts are clearly represented in the DTS of (23c).'2

The tense theory, then, extends without any complications to SOT cases in which the embedding clause is in the present or the future tense. The only difference between these cases and those involving SOT with a matrix past-tense clause is that SOT is morphologically signaled in the latter case. Aside from this surface difference, all the cases are quite parallel." The free application of the SOT rule, in conjunction with the default rule on S interpretation, yields the correct interpretive results.14

The theory as outlined also extends to cases in which the embedding clauses involve modals. Chapter 1 suggested that modals are tensed. *Might, can, should,* etc. are present-tense forms. *Might have, can have, should have, etc. are* past-tense forms of the modal. Given these assumptions, the relevant sentences behave as expected. For example, sentences (24a)–(24c) are unambiguous.

(24) a. John might believe that Mary was pregnant
b. John cannot believe that Mary is pregnant
c. John should believe that Mary will be pregnant
d. John might have believed that Mary was pregnant
e. John can't have believed that Mary had been pregnant
f. John should have believed that Mary would be pregnant

Mary's pregnancy is taken to be contemporaneous with the moment of speech in (24b), in the past relative to the moment of speech in (24a), and in the future relative to the moment of speech in (24c). As the matrix clause is in the present tense, the underlying structures of these sentences are identical to those in (22). Application of the SOT rule in these cases does not affect the temporal interpretation of the embedded clause. The SOT tense structure and the non-SOT tense structure both lead to the same temporal interpretation.15

Sentences (24d), (24e), and (24f) have the temporal interpretations that the theory predicts. Their tense structures are illustrated in (25),16 where the structure on the right of the arrow is the DTS that obtains after the SOT rule applies.

(25) a. E_I,R_S Ei,R_S
SOT
S_2,R,E_2 S2,R,E2

b. E_i,R_S Ei,R_S
SOT
E_2,R_S_2 E2,R_S2

c. E_1,R_S Ei,R_S
SOT
S2_1t,E2

Recall that when shifting to associate S2 with an E2 to the left of S_i we mark this morphologically on the verb. (24d) has as its SOT reading that Mary's pregnancy is prior to the utterance time. So too with (24e). This is indicated in the DTSs presented in (25a) and (25b). S2 is associated with E_1 in both structures. In (25a), E2 is associated with S2. By transitivity, E2 is interpreted as in the past relative to the moment of speech; E2 is contemporaneous with S2, which is contemporaneous with E1, which is prior to S, which is anchored to the moment of speech by the default rule for S. In (25b), E2 is temporally prior to E_1, as it is prior to S2, which is contemporaneous with E_1. E_1 is prior to S. S designates the speech time.

In (24f), the temporal location of Mary's pregnancy relative to the moment of speech is indeterminate. This is clear from an examination of (25c). How E2 is temporally related to S, the speech time, is indeterminate given the DTS in (25c).

Sentences (24d) and (24e) also have non-SOT readings. As I have already gone into this in discussing (15) and (19), I will not go into it again here.

4.3 A Locality Condition on SOT Tense Structures

Up to this point, I have discussed biclausal sequence-of-tense constructions. The S point of the embedded clause has been associated with the E point of the matrix clause. In this section, I discuss SOT constructions involving two embedded clauses. The question of interest is whether there any locality restrictions on the interaction of tenses among clauses. I will argue that there are, and that this fact provides important support for a Reichenbachian approach to tense phenomena.

To see this clearly, it is necessary to back up a bit and consider how SOT interacts with adverbial modification. Consider the sentences in (26).

(26) a. John said three days ago that Harry would leave in a week
b. John said three days ago that Harry will leave in a week
c. John said yesterday that Harry had left three days ago
d. John said yesterday that Harry left three days ago
e. John will say tomorrow that Harry is leaving in a week

Sentences (26a), (26c), and (26e) all support shifted temporal interpretations of the embedded clause. The presence of the temporal adverbs makes this very clear. In (26a), Harry is due to depart four days after the utterance. In (26c), John's claim is that Harry left four days before the utterance. Under one interpretation of (26e), Harry's departure time is eight days from the utterance.

The interpretations of (26a) and (26c) differ from those of the non-SOT sentences (26b) and (26d). Whereas in the former Harry's departure occurs seven days from the speech time, in the latter Harry's departure occurred three days ago, (not four, as under the shifted reading). In addition to the SOT reading, (26e) can be read as locating Harry's time of departure one week from the utterance time.

These data are all accounted for under the assumptions made to this point. As illustrations, consider the structures underlying (26a) and (26b). The DTS of (26a) after the SOT rule has been applied and the adverbs have been assigned is given in (27a). (27b) is the structure of (26b) after the adverb rules have been applied.

(27) a. Three days ago

Ei,R_S

S2-R,E2

in a week

b. Three days ago

Ei,R_S
S2-R,E2

in a week

The only difference between the tense structures in (27a) and (27b) is that the first is the output of one more rule—viz., the SOT rule, which results in the association of S2 and E_1. The modification of E_1 by *three days ago* fiixes the temporal location of S2 as three days before the moment of speech. Consequently, E2 becomes temporally located seven days after S2 (i.e., four days after the moment of utterance). In contrast, (27b) leaves S2 unlinked; thus, it becomes mapped onto the utterance time. E2 is seven days after S2 (i.e., one week after the moment of speech).

Examples (26c) and (26d) are exactly analogous. (26e) has two underlying tense forms. In contrast with the other cases, the shifting of the embedded tense is not morphologically marked. The structures of (26c), (26d), and the two readings of (26e) are illustrated in (28a)–(28d).

(28) a. yesterday

Ei,R-S1

E2,R-S2

three days ago

b. yesterday

E2,R—S2

three days ago

c. tomorrow

S2_R,E2

in a week

d. tomorrow

S2 - R,E2

in a week

(28a) and (28c) represent the shifted reading; (28b) and (28d) give the structures of the non-SOT sentences. Recall that in the latter cases, the PFI forces the mapping of S2 onto the moment of speech.

Now let us consider some more complex versions of this interaction between temporal adverbs and the SOT rule, as in (29).

(29) a. John said a week ago

b. that Frank would believe in three days

c. that Sam{ i. will / n. would17 } be in London in two days

The relevant facts about (29) are given in (30).

(30) a. Clause (29b) is four days before the utterance time (i.e., Frank's believing takes place four days before the moment of speech).

b. The temporal interpretation of (29ci) is that John is in London two days after the moment of speech.

c. The temporal interpretation of (29cii) places Sam in London two days before the moment of speech.

d. The temporal interpretation of (29cii) cannot be five days before the moment of speech.

The tense structures of the two sentences in (29) are illustrated in (31).

(31) a. a week ago

E_1,R_S in three days

S2_R,E2

S3— R ,E3

in two days

b. a week ago

EI,R_S in three days

S2—R,E2

S3_R,E3

in two days

The two structures in (31) differ in only one respect: In (31b), S3 is linked to E2. This puts E3 two days before the moment of speech in (31b). In (31a), E3 is two days after the moment of speech, because the default rule for S interprets S3 as the moment of speech; thus, E_3 is two days after the moment of speech.

Observe, however, that S3 cannot associate with E_1. If it could, we would expect (29cii) to be interpretable as temporally locating E3 five days before the moment of speech (i.e., two days after seven days before the moment of speech). The absence of this reading is of consid-

erable significance. It shows that SOT cannot associate any S point with any E point. Rather, the SOT rule must be stated as (32).

(32) SOT rule: Associate S_n with E,i_1

In short, the SOT rule applies only locally (i.e., to "neighboring" clauses). The S point of an embedded clause can associate with the E point of the clause under which it is directly embedded. We will consider a more precise specification of this locality condition below.

Given (32), we can account for the unavailable temporal interpretation in which E_3 is five days before the moment of speech by observing that this interpretation would require associating S_3 with E_1. The locality condition that is encoded in (32) prohibits this.18

Corroborating evidence for (32) comes from sentences such as those in (33).

(33) a. *John said that Harry believes that Frank would be here
b. John said that Harry believed that Frank would be here
c. John said that Harry believed that Frank will be here
d. John said that Harry believes that Frank will be here

Both (33c) and (33d) suggest that Frank has not yet arrived as of the moment of utterance. His arrival is expected, but he is not yet here. This simply indicates that regardless of how deep a finite sentence is embedded, and whether it is embedded under sentences that are linked via SOT (as in 33c) or not (as in 33d), its S point can always anchor to the speech time.

Example (33b) is simply a string of SOT-linked sentences three clauses deep. Frank may already be here, as far as (33b) tells us. Frank's presence at the moment of speech is left indeterminate by (33b). It is odd to ask if Frank has arrived yet on hearing (33c) or (33d), but not on hearing (33b).

The contrast between (33a) and (33b) is the main point of interest for current purposes. The presence of *would* signals that the SOT rule has been applied. However, we know that this morphological shift occurs only under a past-tense clause or if there are a string of shifted forms. The latter is what we obtain in (33b). *Believed* is the morphological form *believes* takes when shifted under a past tense such as *said.* The future morpheme *will* changes to *would* to indicate that it shifted too.

Example (33a) is odd in that the presence of *would* indicates that S_3 is associated with some past E point, but no such point is available. Link-

ing between S3 and E2 will not result in the morphological change of *will* to *would.* The present form *believes in* (33a) indicates that S2 is not associated by SOT with E_1. If it were so linked, its morphological form would be *believed, as in* (33b). Nor can *would* indicate that S_3 is linked to E_2. Associating with a present-tense embedding clause does not result in morphological change. Thus, the presence of *would* is not explained by supposing that an underlying future in the third clause down is associated by SOT with *believes.*

Would indicates that S3 is associated with a past-tense clause. The only one in (33a), however, is the matrix clause whose main verb is *said.* The unacceptability of (33a) supports (32) by prohibiting S_3 from associating with E_1 by SOT, the only remaining source for the morphologically shifted form.

Put more positively, the examples in (33) demonstrate two points: that regardless of how deep a non-SOT clause is its S point can denote the utterance time, and that a non-SOT form in an intermediate clause cancels the possibility that a shift in the SOT will relate the clauses on either side. The first fact follows from the ubiquitous presence of an S point in finite clauses in conjunction with the default rule on S interpretation; the second follows directly from the locality condition built into the SOT rule in (32).

Additional evidence in favor of a locality condition like the one built into (32) comes from considering the temporal interpretations of finite relative clauses. [19] Consider (34).

(34) a. We spoke to the man who was crying

b. John insulted the man who is walking toward us

In (34a), both the time at which we spoke to the man and the time at which he cried are in the past. However, there is no necessary temporal order between the two events. In other words, the temporal order of the two events is temporally indeterminate. Depending on context, any temporal ordering can be evoked. [20] These data conform to (32). The finite relative clause is not adjacent to the matrix, given that it is embedded within a noun phrase. As such, the SOT rule cannot apply between the two clauses, as they are not neighbors. Thus, the temporal interpretation of the finite relative clause is independent of the temporal interpretation of the matrix. All we can conclude is that both events occur in the past. Their relative temporal ordering is not constrained by the tense system at all. However, the temporal interpretation of (34b) is more specific. John's insulting occurred in the past relative to the speech

time. The man's walking toward us is simultaneous with the moment of utterance. This is what we expect given the theory above. As in (34a), the two sentences are not neighbors. Thus, no linking is possible between them. Nonetheless, one can deduce the relative temporal order of the two events. The past tense of the matrix places John's insulting in the past relative to the moment of speech. The present tense of the relative clause places the man's walking toward us at the moment of speech. Together, these two interpretive facts imply that John's insulting predates the man's walking toward us.

I have argued that the temporal interpretations of the sentences in (34) can be accounted for without supposing that the SOT rule applies to link the tense of the relative clause to the matrix. However, this does not preclude the possibility that linking can optionally take place and does so in those cases in which the temporal order of the two events is fixed.[21] The relevant case is (34a), which displays the proper morphological properties for linking a present tense to an embedding past tense in English. However, this optional linking causes serious difficulties when slightly more complex cases involving temporal adverbs, as in (35), are considered.

(35) a. John is in New York in a week
b. The Bruins play the Oilers in two days
c. *Frank met a man who was in New York in a week
d. *Frank met the team that played the Oilers in two days
e. I said that I was in New York in a week
f. Bill thought that the Bruins played the Oilers in two days
g. John has spoken to the man who will win
h. *John has spoken to the man who would win

(35a) indicates that we can modify a present-tense copula with a future adverb. The past-tense form *was in* (35e) is actually an underlying present-tense form in (35a). The morphological change signals that the SOT rule has applied. The DTS is shown in (36).

(36) Ei,R_S

S2_R,E2

in a week

In a week can modify E_2 and obey the CDTS, since *was* is not a true past-tense verb in this construction but an underlying present.

The unacceptability of (35c) indicates that the SOT rule cannot save the relative-clause structure from unacceptability. The *was in* (35c) is not the reflex of the SOT rule; it is the true past tense of *be*. Thus, it cannot be modified with a future adverb, as it would violate the CDTS.

(37) E1,R_S
in a week

E_2,R —S2
_____x__>

The reason that (35c) and (35e) differ in acceptability is that the SOT rule cannot apply in the first case but it can in the second. The reason this rule cannot apply in (35c) is that the relative clause and the matrix are not neighbors.

A similar account applies to (35b), (35d), and (35f). (35f) is acceptable, as the past-tense form *played* is not a true past but the morphological reflex of the SOT operation. The underlying tense form of the clause is the present tense. A present tense can be modified with a future adverb, as (35b) indicates. The unacceptability of (35d) follows once we see that in this structure the clause is a true past tense. Modification with a future adverb would violate the CDTS. (32) prevents the SOT from linking the relative clause to the past-tense matrix. If this were permitted, then (35d) should be perfectly acceptable, which it is not.

Clearer examples of the same effect are given in (38).

(38) a. John will think that Bill is walking toward us
b. John will visit the man who is walking toward us

(38a) is an instance of SOT linking an embedded present-tense clause to a matrix in the future tense. (38a) can be interpreted as locating Bill's walking toward us in the future. This contrasts with the temporal reading of the embedded relative clause in (38b). The man is walking toward us as the sentences is being uttered. John's visit is in the future. In short, we cannot apply the SOT rule optionally in the case of (38b), as we did in (38a), to link the embedded present tense with the matrix future. Once again, this follows if we assume that the SOT rule can apply only

to neighbors, and that this excludes cases such as (38b) because the relevant clauses are not adjacent.

Sentences (35g) and (35h) illustrate an important contrast that further supports the locality condition built into the SOT rule in (32). The presence of *would in* (35h) indicates that the SOT rule has applied, shifting an embedded future tense and linking it to a matrix past E point. However, this is not possible in (35h) without a violation of (32), for there is no E point close enough for the embedded S point to associate with. Being inside a relative clause, the embedded S point is too far away from the matrix E point provided by the present perfect. [22] In contrast, (35g) is fully acceptable, for the SOT rule has not applied. The embedded S point is interpreted by the default rule and is mapped onto the utterance time. (35g) places the victory in the future relative to the moment of speech.

An apparent counterexample to (32) is (39).23

(39) a man who would be king was born

(39) appears to link an underlying future-tense relative clause to a matrix past-tense sentence. Contrary to the claims above, (39) appears to have the structure in (40).

(40) Ei,R-S

S2_R,E2

Would is here treated as an underlying future form that has been morphologically altered by application of the SOT rule.

However, (39) does not really tell against (32), for (39) does not really involve SOT. Contrast the temporal interpretation of the relative clause in (39) with the temporal interpretation of the embedded clause in (41).

(41) John said that the Bruins would win the Stanley Cup

(41) is a true instance of SOT. The temporal location of the Bruins' victory relative to the utterance time is indeterminate. Uttering (41) does not imply that the Bruins have won yet; John will be correct if the Bruins win the cup after the time of his utterance. This contrasts dramatically with (39), in which the event adverted to in the relative clause is taken to already have materialized. The man whose birth is in the past has been crowned by the time (39) has been uttered.

The adverbial structures in (42) further support the claim that what we have in (39) is different from the tense dependency characteristic of SOT structures.

(42) a. John said yesterday that Frank would marry Mary in a week

b. ??A woman who Fred would marry in a week arrived yesterday

(42a) temporally locates Frank and Mary's wedding six days from the moment of speech. A similar interpretation is not available for (42b). In fact, (42b) is quite odd. One possible reason for its oddity is that, as in the case of (39), the relative-clause event is interpreted as already having been realized. This is incompatible with the future adverbial. At any rate, it seems clear that temporal interpretive properties of the sort displayed by the relative clauses in (39) and (42b) do not implicate the application of the SOT rule associating the S point of the relative clause to the E point of the matrix. [24] Thus, the locality condition on the SOT rule (32) is not threatened by such examples.25

In this section I have shown that the SOT rule has limited application. It can involve only sentences that are "close" to one another. This restriction is easily encoded within the Reichenbachian theory outlined in earlier chapters. Such is not the case with other approaches to the theory of tense.

4.4 Some Implications of the Locality Condition

Two salient properties of SOT structures will be central to the discussion in this section. The first is that SOT is optional. If it does not apply, then it is always possible to interpret an embedded clause as relative to the utterance time. Second, an embedded tense A can be temporally dependent on a higher tense B if and only if A and B are neighbors (i.e., adjacent to each other in a sense to made precise).

The first of the two requirements was met within the confines of a Reichenbachian theory by separating the deictic properties of S from the temporal value that it typically assumes. The second fact is explained by restricting the form of the SOT rule. However, there are other ways to meet each of the desiderata. My aim is to show that they run into problems. In particular, I show that a theory will run into difficulty if it treats the optional tense dependencies characteristic of embedded clauses as scope phenomena. Let us dub this flavor of theory a *scope theory* (ST).26

The core of a scope theory is that it treats the temporal dependency observed in SOT constructions as akin to the dependencies manifested by quantifiers in multi-quantified sentences or in propositional-attitude constructions. Consider (43).

(43) a. Everyone kissed someone

b. John believes that a Swede is in the garden

The ambiguity of a (43a) is explained by pointing out that either of the two quantifiers can have scope over the other. (44a) represents the reading in which the choice of the value of the y variable depends on the choice of the x variable, and (44b) the converse.

(44) a. Everyone$_x$[someone[x kissed *y]]*

b. Someone$_y$[everyone$_x$[x kissed *y]]*

In (44a) *everyone* takes scope over *someone; in* (441)) the opposite scope dependency holds. What is important for current purposes is that interpretive dependency is reflected in scope relations. Thus, if the interpretation of one operator depends on the interpretation of a second operator, the first must be in the scope of the second. Similarly, if the interpretation of a given operator is independent of the interpretation of another operator, the first operator must be outside the scope of this second. In sum: Interpretive facts have syntactic consequences of a rather particular sort within a scope theory.

A similar account extends to propositional-attitude constructions such as (43b). This sentence, it has been argued, is at least two ways ambiguous. It can mean either that there is some particular Swede who John believes is in the garden (e.g., Ingrid Bergman) or that John has a Swede-in-the-garden belief but no particular Swede in mind. The two readings are represented in (45).27

(45) a. A Swede$_x$[John believes [x is in the garden]]

b. John believes [a Swede$_x$[x is in the garden]]

The difference between these two structures is the position of the existentially quantified expression *a Swede.* In (45a) it lies outside the scope of the verb *believes; in* (45b) it is within the scope of the verb *believes.* The interpretation of the first structure gives a semantic value to the x variable independent of John's beliefs; the second form takes his beliefs into account.

This same distinction between narrow-scope and wide-scope structures can be pressed into service to represent temporal interpretive dependencies. Let us assume the existence of three tense operators: P for past, Pres for present, and F for future. Then we can represent standard SOT examples in terms of the scope dependencies these operators can display, as (46) shows.

(46) a. John said that Mary was pregnant

b. $\mathbf{P_x}$[John said at x[$Pres_y$ [Mary pregnant at y]]

c. John said that Mary is pregnant

d. $Pres_y[P_x$[John said at x [Mary pregnant at y]l

(46b) illustrates the logical form of a sentence in which the temporal value of a present-tense operator is dependent on that of a past-tense operator. $Pres_s$ is in the scope of P_x. This is the sort of dependency we find in standard SOT constructions such as (46a), in which Mary's pregnancy is interpreted as contemporaneous with John's speaking.

In (46a), Mary's pregnancy is not temporally dependent on some other past-tense operator; it is evaluated relative to the speech time alone.28

The problem with this sort of approach is that it appears to permit operators to have structures such as that illustrated in (47).

(47) $Pres_y[P_x$[. . . at x .. [. . . at y . . . [Fut_z[. . . at z ..]]]]

In (47), the value of the z variable depends on that of the x variable whereas that value of the y variable is independent of the value of the x variable. This is the sort of dependency that would be displayed by (33a): "John said that Harry believes that Fred would be here". However, (33a) is unacceptable. A scope theory fails to account for its unacceptability.

The main problem is that it is unclear why SOT must conform to locality restrictions given that tense operators can have arbitrarily wide scope. This should permit an intervening operator to remove itself, so that a tense in the matrix could directly determine the value of a more deeply embedded operator while leaving the intermediate one unaffected. This is what we see in (47). The problem is that such dependencies are illicit.

Another option that SOT structures do not to realize is illustrated below in (48). (48) represents reading (30d) of (29cii). (29), (30c), and (30d) are repeated here for convenience.

(29) a. John said a week ago

b. that Frank would believe in three days

c. that Sam. will / would29 be in London in two days

(30) c. The temporal interpretation of (29cii) places Sam in London two days before the moment of utterance.

d. The temporal interpretation of (29cii) cannot be five days before the moment of speech.

The (30d) reading makes the temporal value of the z variable dependent on that of the temporal value of the x variable but independent of the temporal value of the y variable. In a scope-theory account one can represent this by simply giving F_z intermediate scope, as has been done in (48). There is no general reason why this should be impossible. Indeed, (29ci) gives F_z matrix scope, as the temporal value of the most embedded clause is independent of all the other operators. Consequently, it should be possible to give F, intermediate scope as in (48).

(48) P,J . . . at x .. [F_z[F_y .. at y .. [. . . at z . . .]]]]so

Intermediate scope positions such as this are standardly regarded as possible in other ST theories. For example, the various interpretations afforded by multiple embedding under propositional-attitude verbs relies on this possibility. Consider (49), which displays the two interpretations (43b) carried.

(49) John believes$_1$ that Harry believes$_2$ that a Swede is in the garden

In addition, the value of *a Swede* may depend on John's beliefs but not on Harry's. In this case the quantified existential noun phrase would be assigned intermediate scope. In (50), the value of x is dependent on *believes*$_i$ but not on *believes2.*

(50) John believes$_1$[a Swede$_x$[Harry believes$_2$[x is in the garden]]

Observe that (50) is entirely analogous to (48).

The problem, then, can be summed up as follows: The trouble with scope theories is that they allow too wide a range of interpretive options. What a Reichenbachian theory naturally accommodates—the locality of the SOT process—is difficult for a scope theory to incorporate.

Further difficulties accrue to scope theories from the interpretation of relative clauses. [31] The difficult fact is that tenses within relative clauses seem always to be interpreted relative to the speech time. In other words, no SOT shifting is permitted. For a scope theory, this fact implies that tenses within relative clauses always enjoy the widest possible scope—see the discussion of (34) and (35) above.

This creates a puzzle: Why should tense within relative clauses always be given the widest possible scope? Why can these operators not assume intermediate scopes and hence be interpretively dependent on other operators? A scope theory offers no obvious answers to these questions.

The problem is further exacerbated when it is observed that the extraction of quantifiers from relative clauses is virtually impossible. Thus, tenses, if they are indeed operators, are rather different in their behavior from standard operators such as quantifiers. [32] All this points rather directly to the conclusion that natural-language tenses are not operators. I will supplement this negative conclusion with a more positive account in chapter 5.

4.5 The Tense Structure of Infinitivals

Infinitival clauses have two distinctive properties. First, infinitival clauses are found only in embedded position, never as free-standing matrix clauses. This generalization is not an idiosyncratic property of English; it holds across all natural languages. Matrix clauses must be finite. Second, the temporal interpretation of an embedded infinitival is always dependent on the temporal interpretation of the matrix clause under which it is embedded. I believe that another way of putting this same point is to say that infinitivals obligatorily undergo the SOT rule.

These two properties of infinitival clauses can be accounted for within the framework of assumptions adopted above. Specifically, let us assume that the key characteristic of infinitival clauses is the absence of an S point. This is a natural implication of the current theory, given that the properties of the S point were explicitly tied to the tense morpheme. In chapter 3 I suggested that it is the tense morpheme that goes surrogate for the S point and provides the information about the relationship between S and R. If this morpheme is lacking, as it is in infinitivals, then it is natural to suppose that S is absent as well. In short, the tense structure of infinitivals only specifies the RE relationship. [33] (51) and the prin-

ciple of full interpretation allow us to account for the two facts noted above.

(51) The tense structure of an infinitival clause lacks an S point.
Only RE relations are specified.

Consider the details. Recall that the PFI requires that all SRE points be interpreted temporally. In finite tensed clauses, there are two ways to accomplish this task. If the finite clause is embedded and "near" another tensed clause, the SOT rule can apply, associating it with a higher E point. This anchors the interpretation of the S point and of the R and E points that are dependent on it.

A second way of anchoring an SRE complex is to give S the default interpretation and map it onto the moment of speech. Once an S is temporally interpreted as the utterance time, the R and E points that are part of its tense complex are anchored by being related to it in the ways discussed in chapter 3. Once S is anchored, R receives an interpretation; once R is interpreted, E can be specified temporally.

Thus, we can meet the requirements of the PFI either by the SOT rule or by the default rule on S interpretation.[34] What happens, however, if the S point is absent, as I have suggested is the case with infinitival clauses? There is then no way to provide the R and E points with a temporal interpretation by way of the S-interpretation default rule. This directly implies the two general characteristics of infinitivals noted above.

There can be no main-clause infinitivals, for there is no way to interpret the R and E points. Neither has a default interpretation. The R point has no independent reference. It is an arbitrary reference point. However, as the R point is part of every tense structure, the PFI requires that it be interpreted. This cannot be done in main clauses in the absence of an S point to which it is anchored. The tense structure of an infinitival main clause is given in (52).

(52) R,E

Without the S point, a simple infinitival clause cannot be anchored and the PFI rules (52) ungrammatical—hence the unacceptability of the sentences in (53).35

(53) a. *For Bill to have read *War and Peace*
b. *to love Les Canadiens

These sentences meet every other known grammatical requirement. Their unacceptability can only reasonably be traced to the fact that they are infinitival rather than finite. By treating an infinitival tense structure as bereft of an S point, the PFI explains the unacceptability of these sentences.

In embedded position, infinitivals can escape the effects of the PFI by an application of the SOT rule. An embedded point $R_{n\_..1}$ can be associated with a point E_n. An R point that is so associated can be given an interpretation. Consider the sentences in (54).

(54) a. John wants to leave

b. John will want to leave

c. John wanted to leave

The temporal structures of these sentences after the SOT rule has been applied are given in (55).

(55) a. S,R,E1

b. S_R,Ei
R2,E2

c. Ei,R_S
R2,E2

In each of the tense structures in (55), R2 is associated with E_1. Consequently, it receives whatever temporal interpretation E_1 receives.

The tense structures in (55) appear to yield the right temporal interpretation for the embedded clauses in (54). [36] (54a) places John's desired departure at the moment of speech. Associating R2 with E_1 by the SOT rule results in this temporal interpretation. As E2 is associated with R2 and R2 is associated with E_1, we derive the implication that John wants to leave as we talk.

Similarly for (54b) and (54c). In the former, John's desired departure is in the future relative to the moment of speech. In the latter, it is in the past, The derived tense structures provided in (55b) and (55c) have just these implications.

Adding some temporal adverbs to the matrix clause, as in (56), makes these dependencies even clearer.37

(56) a. At 6 o'clock, John remembered to take his medicine
b. At 6 o'clock, John remembered that he took his medicine
c. At 6 o'clock, I will remember to take my medicine
d. I, at 6 o'clock, will remember to take my medicine
e. At 6 o'clock, I will remember that I should take my medicine
f. When he returned home, John remembered to take his medicine
g. John, when he got home, remembered to take his medicine
h. John remembered to take his medicine when he got home

From (56a), we understand that John took his medicine at 6 o'clock. This contrasts very sharply with (56b). In (56b), John need not have taken his medicine at 6 o'clock. (56b) tells us that 6 o'clock is the time that John remembered, not the time he took his medicine. The DTS of (56a) is given in (57).

(57) at 6 o'clock

R2,E2

As (57) indicates, E_1 is temporally located at 6 o'clock. $R2$ is associated with E_1 as a result of SOT. $E2$ is associated with $R2$ in BTS. Thus, $E2$ takes place at 6 o'clock. In other words, John takes his medicine at 6 o'clock.

Sentences (56c), (56d), and (56f) all pattern like (56a). (56c) and (56d) imply that I will take my medicine at 6 o'clock. In contrast, (56e) does not specify when John is supposed to take his medicine. (56f) implies that John took his medicine when he returned home. (56f) can be accurately paraphrased as (56g) or (56h). [38] The DTS of (56c) and (56d) is illustrated in (58a). (58b) represents (56f) and (56g); (58c) represents (56h).

(58) a. at 6 o'clock

S_R,Ei

R2,E2

b. Ei,

\ \

R3,E3

c. Ei,R_S

R2,E2

E3,R3_S

In (58a), E_1, R_2, and E2 are all interpreted as contemporaneous. As 6 o'clock modifies E_1, we understand E2 as occurring at 6 o'clock; that is, I take my medicine in the future relative to the moment of speech at 6 o'clock.

In (58b) and (58c), E_1, E_2, and E3 are also interpreted as contemporaneous (but see note 38) These structures are more complex, as they involve the operation of both the rule for temporal connectives and the SOT rule. What is important is that both structures yield indentical temporal interpretations. This accounts for the synonymy of (56f), (56g), and (56h).39

It is instructive to contrast (56a) and (56c) with (59a) and (59b).

(59) a. At 6 o'clock, John remembered to take his medicine at 7 o'clock

b. At 6 o'clock, I will remember to take my medicine at 7 o'clock

The sentences in (59) clearly place the medicine-taking at 7 o'clock. In contrast, both (56a) and (56c) place this event at 6 o'clock. The DTSs of (59a) and (59b) are given in (60).

(60) a. at 6 o'clock

EI,R_S

R2-E2

at 7 o'clock

b. at 6 o'clock

S-R,Ei

R2-E2

at 7 o'clock

Unless E2 is modified by an independent temporal adverb, it will inherit the temporal properties of the matrix adverb. This is what the theory leads us to expect, given that the embedded R and E points are associated and R2 must associate with E_1. If it fails to link to E_1, it cannot get a temporal interpretation and the PFI will rule the structure out.

As (61) illustrates, *have* has the same effect in infinitival clauses that it had in perfective-tensed clauses: It places the E point in the past relative to R.

(61) a. John will want to have won
b. John is hoping to have won
c. At six, John expected to have won

In each of these sentences the embedded event, the winning, is temporally prior to the matrix E time. In (61b) the winning is prior to the speech time, the temporal local of John's hoping. Similarly, in (61c) John's winning is prior to 6 o'clock. The tense structures of the three sentences, illustrated in (62), are self-explanatory.

(62) a. S_R,Ei

E2 _R2

b. S,R,E1

E2-R2

c. at 6 o'clock

Ei,R_S

E2 - R2

Furthermore, these constructions conform to the CDTS. Consider the sentences in (63).

(63) a. John will hope that he won yesterday
b. John will hope to have won yesterday
c. *John will hope to win yesterday
d. John will expect that he won yesterday
e. John will expect to have won yesterday
f. *John will expect to win yesterday

Both *hope* and *expect*, *in* a future-tense clause, seem capable of taking past-tensed finite complements and embedded perfective infinitival complements modified by *yesterday*. However, neither can take an embedded nonperfective infinitival complement so modified. The theory outlined above explains the contrast. The relevant structure, illustrated in (64), is the one underlying the unacceptable (63c) and (63f).

(64) S_R,E1

R2 , E2

< X

yesterday

Here *yesterday* modifies E2. It shifts it to the left of R2 in the direction of S. However, R_2 is associated with E_1. Thus, modifying E_1 in this way leads to a violation of the CDTS. The linear order of the BTS of the infinitival is altered in DTS. However, this problem does not affect (63b) or (63e), their DTS of which is illustrated in (64).

(64) S_R,Ei

E2—R2

yesterday

Here, modifying E_2 does not lead to a linearity violation, so the structure is well formed.

A similar account extends to (65).

(65) a. John expected to win tomorrow

b. *John expected to have won tomorrow

The underlying derived tense structures are shown in (66).

(66) a. Ei,R_S

R2-E2

tomorrow

b. E1,R_S

E2-R2

X

tomorrow

The presence of *have in* the embedded infinitival indicates that E2 is prior to R2. Thus, modifying it with *tomorrow* will violate the CDTS. E2 will shift to the right, moving around R_2. Linearity will thereby be altered, and the structure will become ungrammatical.

These cases are of interest because they corroborate the position taken in chapter 3 concerning the composed structure of basic tenses. In the case of infinitivals, we see that RE structures can stand independent

of SR relations. Moreover, RE pairs obey the CDTS. The fact that RE pairs can be found independent of SR relations and that these structures obey the CDTS supports the contention that tenses are composed from two separable relations, viz. SR and RE.

I have argued that assuming that infinitivals specify an RE relation but have no S point (and so no SR relation) provides a good account for the interpretive contribution infinitivals make to the temporal interpretation of complex sentences.[4o] Furthermore, this assumption accounts for two important facts about infinitivals: that they obligatorily undergo application of the SOT rule and that they are not found standing free in main clauses. These two facts follow from the principle of full interpretation once no S point is around to anchor the temporal interpretation of the R and E points that infinitivals provide.'"

Naked infinitival (NI) constructions are also relevant to a theory of temporal interpretation. The sentences in (67) exemplify their distinctive feature.

(67) a. John saw Bill leave

b. John made Bill leave

c. John will make Bill leave

d. John is watching Bill leave

Here the embedded event time is contemporaneous with the matrix event time. (67a), for example, has Bill's leaving in the past relative to the moment of speech and contemporaneous with John's seeing. In (67c), on the other hand, Bill's departure is in the future relative to the moment of speech and contemporaneous with John's future efforts.

NI constructions are different from infinitival clauses in several ways. First, as (68) shows, they do not allow perfective markers.

(68) *John saw Bill have left

Second, they do not allow a range of adverbial modifiers of the embedded clause that are allowed within infinitivals. Third, they cannot occur in structures in which the matrix clause and the embedded clause are modified by different adverbs.

Contrast (69a) with (69b) and (69c) with (69d).

(69) a. John wanted Bill to leave tomorrow

b. *John saw/made Bill leave tomorrow

c. At 6 o'clock, John wanted Bill to leave at 7 o'clock
d. *At 6 o'clock, John saw/made Bill leave at 7 o'clock42

These properties of NI constructions follow if we assume that NI clauses have only E points and that these E points must be anchored in accordance with the PFI.

The tense structures of (69) are illustrated in (70).

(70) a. Ei,R_S

R2-E2

tomorrow

b. Ei,R_S

E2

tomorrow

c. at 6 o'clock

Ei,R_S

R2—E2

at 7 o'clock

d. at six

Ei,R_S

E2

at 7 o'clock

(70a) is the DTS of an infinitival clause embedded under a finite verb. The SOT rule has applied, linking R2 to E1. The adverb *tomorrow* modifies E2, shifting it to the right away from R2. The structure is well formed and it has the transparent interpretation.

(70b), however, does not yield a coherent temporal interpretation. E2 is anchored to E_1 by the SOT rule, on the assumption that the rule applies freely. It must apply so that E2 is anchored and complies with the PFI. However, this prevents *tomorrow* from modifying E2. Such modification yields a temporal contradiction.

Similarly with (70c) and (70d). In the former case, E_1 is modified by *at 6 o'clock*. R2 is associated with E_1 by the SOT rule so as to comply with the PFI. The embedded adverb *at 7 o'clock can* still modify E2 to yield a coherent structure interpreted with Bill's departure at 7 o'clock. In the case of (70d), however, this is not similarly possible. Here the SOT rule associates E2 with E_1 in order to comply with the PFI. However, if E_2 is now modified by *at 7 o'clock* the structure yields a contradiction. E2 is specified as occurring both at 6 o'clock and at 7. If one of the adverbs is removed, the resulting sentence is fully acceptable, as expected: *At 6 o'clock, I saw/made Bill leave.*

If it is correct that naked infinitivals have only E points, then NI structures will always interpret the point within the NI clause as contemporaneous with the matrix E point as a result of the operations of the PFI. This seems to be correct.43

As in the case of infinitival clauses, we can explain the absence of matrix NI clauses by invoking the PFI. If only S can map onto the moment of speech, then only S can anchor a tense structure independently. Consequently, only finite clauses can be matrix clauses.

I have suggested that there are three kinds of clauses in English. Finite clauses have all three tense points (S, R, and E). Infinitival clauses have R and E but not S. NI clauses have an E point but not S or R. Further, we have seen that the temporal interpretation of embeded clauses follows from these structures in conjunction with the SOT rule and the PFI. As NI structures and embedded infinitival clauses indicate, however, the SOT rule must be generalized so that any embedded tense point can be shifted to E. In other words, (32) is only a special case of the SOT rule, the one that is operative when finite clauses are involved. However, SOT is more general than this special case; it is operative in infinitive and NI constructions as well. It is easy enough to generalize the rule stated in (32). We will return to this issue in chapter 5.44

4.6 Some Comparisons with Enc's Theory45

What specific properties allow the Reichenbachian theory to succeed? The first is the presence of an S point as part of the representation of every tense. The fact that the S point is part of the representation of every finite sentence permits an arbitrarily deeply embedded clause to anchor itself to the speech time. I believe that it is quite natural to relate the fact that embedded clauses can always link to the utterance time to the presence of an S point in every tense. However, there are other ways of obtaining this same end. For example, one could make this possibility a feature of embedded COMPs. A COMP may anchor to the speech time and thus specify an embedded tense in relation to the utterance time rather than in relation to another tense. This is essentially the proposal of Ens (1987). She suggests that tenses and COMPs can be bound by other tenses." The details are fleshed out in the following terms.47

(AP) *the anchoring principle:* Each tense must be anchored.

(AC) *the anchoring conditions:*

a. Tense is anchored if it is bound in its governing category, of if its local Comp *is* anchored. Otherwise it is unanchored.
b. If Comp has a governing category, it is anchored if and only if it is bound within its governing category.
c. If Comp does not have a governing category, it is anchored if and only if it denotes the speech time.

The anchoring principle forces every tense to be anchored; the anchoring conditions anchor it to another tense or a Comp. Ultimately, every tense is linked to the speech time via a Comp.

Eric's proposal, the theory I developed in Hornstein 1981, and the current theory share many properties in common:

• Each of them treats tenses as something other than operators. In fact, they are all neo-Reichenbachian with tense features actually being referential expressions more akin to pronouns."

• Each of them involves a locality condition on tense anchoring. This is encoded into the SOT rule (32) in the present theory. In Enc's theory it is incorporated by requiring tenses to be bound within their governing categories. Ens adapts a version of governing category to achieve this result. She stipulates that within the governing category the subject c-commands the governor. This has the result that a superordinate clause

is the governing category for an embedded tense. This then constitutes the domain within which tense and COMP binding apply.49

• Each of them allows reference to utterance time by an embedded tense as an option. In the present theory this is accomplished by treating the SOT rule as optional; it can fail to apply and S„ will not shift to E„_1. Within Dig's theory this same option is accomplished in one of two ways: If the embedded COMP has no governing category, it can anchor to the speech time; if it has a governing category, the embedded tense can be bound directly to the higher tense. This, in conjunction with the claim that the anchor of your binder is your anchor as well, allows temporal specification of the embedded tense relative to the utterance time given that the matrix COMP always anchors to the utterance time.

Despite these important similarities, there are some differences between Enc's theory of SOT and the present one. First, her theory is not really couched within an overall theory of substantive universals for tense. Eng takes the tenses as given and explains SOT given these tenses. Her account would have to be supplemented to account for the data I have discussed in earlier chapters, especially chapter 3. Second, there are some technical problems with Enc's proposal that do not afflict the present account. Her account of tenses within relative clauses relies crucially on the assumption that relative clauses are structures as in (71).

(71) [$_{\mathbf{NP}}$ NP [s,COMP [s . . . TNS . . .

Within this structure, COMP does not have a governor and so need not be bound. In particular, it can denote the speech time.

However, there is considerable evidence that the COMP in (71) is governed within the relative clause—i.e., it has the structure shown in (72).

(72) $_{[NP}$ SpecNI$_N$,N [s,COMP[s ... TNS ..]]]

The reason for assuming (68) is that the COMP is freely deletable within restrictive relative clauses. To conform with the Empty Category Principle, head government is required.[5°] This implies that in (72) the COMP is governed by the head N of the relative clause. In other words, the structure of restrictive relative clauses in English is (72), not (71).

Moreover, connectedness effects seem to indicate that the relative clause modifies N or N', not NP. Consider the examples in (73).

(73) a. pictures of each other; which the men, took ti
b. *Each other's; pictures which the men; took t;

Williams (1986) observed that these examples argue against structures such as (71) for relative clauses. The data indicate that what the relative clause is predicated of is some constituent less than the whole NP indicated in (71). It is, at most, the N'. This suggests a structure for relative clauses closer to (72).

Can Enc's theory accommodate a structure like (72) as the structure of relative clauses? Not obviously, since binding a tense outside a relative is not really permissible (see 34 and 35 above). Eng recognizes that tenses within relative clauses are most likely evaluated relative to the moment of speech.[51] However, now a problem arises.

Eng accommodates the inability to link a tense within a relative clause to a tense outside the relative by treating the head of the relative as a possible subject (1987, p. 646). But in conjunction with (72) this creates a problem. According to Enc's anchoring condition (ACb), a governed COMP must be bound in order to be anchored. The COMP is governed within the relative by the head N, and the head of the relative is a subject for it. However, there is nothing within the relative clause to bind it.

Even if we could finesse this problem and make the relevant binding domain for the relative clause COMP the higher clause in which the relative clause NP is situated, binding the COMP would imply that only two kinds of readings could occur within relative clauses.

The COMP, being governed, can be anchored only if bound. If bound, it must be bound by the superordinate tense. But this then creates structures like (74a).52

(74) a. [Compo[NPRNS4V[$_{N}$p Spec N^{i}[Comm[NP[TNS; . .
b. [Compo[NP[TNS4V[$_{N}$p Spec N/Comp[NP[TNS; . .

(74) has the shifted reading for the embedded tense. The tense of the relative is anchored to the matrix, and so the event of the relative clause is shifted temporally. But this is the incorrect reading for relative clauses in general. If the TNSs in (74) are Pasts this would imply that the relative clause event is in the past relative to the matrix event. The time of the relative clause need not precede the time of the matrix event in general, however. Nor need the time of the relative clause and the matrix event coincide, as would be required by (74b). Thus, binding the embedded tense directly to the matrix tense does not solve the difficulty.

The only temporal requirement on a relative clause in the past tense is that the event time of the relative be in the past relative to the moment of speech. This cannot be fulfilled if we allow COMP to be governed, for once it is governed it cannot be anchored by taking the 0 index—see (ACc). This is an option that only ungoverned COMPs (those without governing categories) have. Thus, to meet (AP), either the Comp of the relative clause must be bound to the matrix tense so as to anchor the embedded tense, as in (74a), or the embedded tense must be directly bound to the matrix tense, as in (74b). These two options are too restrictive, however, Therefore, it is crucial to Enc's analysis that relative clauses not have governed COMPs. However, as indicated, this assumption is incorrect

Another difference between the two theories is that Eng does not generalize her account to SOT structures that make the temporal interpretation of an embedded S dependent on a future matrix tense. In short, she has little to say about structures such as (75), in which John's being sick is contemporaneous with his future claims.

(75) John will say that he is sick

It is quite clear, however, that sentences of this sort will have to be treated differently within Eric's system. The reason is that Enc's theory relies crucially on the principle that in English the present tense denotes the speech time (1987, p. 649). However, this means that (75) with the reading in which the main-clause events and the subordinate-clause events are contemporaneous cannot involve a SOT-like operation or binding of the present tense by the future matrix tense.

Eng cannot relax the assumption she makes concerning the English present, for she would then have no account for the reading we find in (76) in which Mary's being in New York is contemporaneous with the moment of speech.

(76) John heard that Mary is in New York

Her analysis relies on the claim that the present tense in English always denotes the moment of speech.

Furthermore, it is unclear how Enc's theory would account for the difference between (77) and (78).

(77) John said that he will be in town

(78) John said that he would be in town

Eng seems to treat the future as something other than a tense, in contrast to the approach here. This results in a rather asymmetric treatment of SOT structures. Her theory prohibits SOT from linking an embedded tense to a matrix present tense. Her treatment of SOT structures such as (75) must be different from her treatment of (79).

(79) John heard that he was sick

In the first case, but not the second, binding of the embedded tense occurs.

A further difference between the two accounts is that Eng's theory is closely keyed to the properties of COMP. It is COMP that denotes the utterance time or is bound by a higher tense. However, this suggests that SOT-like phenomena should appear in nonfinite clauses. In particular, we should be able to forgo the SOT rule that binds a COMP to a higher tense and evaluate an embedded infinitival clause directly in relation to the matrix COMP, for we can bind these COMPS to higher COMPs and evaluate embedded infinitival clauses accordingly. However, this is incorrect, as I argued in section 4.5. Infinitival clauses must undergo the something like an SOT rule and can never be evaluated directly in relation to the speech time.

Furthermore, Enc's theory suggests that it should be possible to have matrix clauses that are infinitival. They could have COMPs and thus anchor to the speech moment. However, main clauses must be finite. This seems to indicate that it is not COMP that anchors a tense to the speech moment but something more abstract—perhaps something like an S point.

The last major empirical difference between Eng's approach and the one developed here revolves around how the morphological shift in SOT structures is to be handled. The theory outlined above treats it as a relatively minor surface effect. For Eng, it is language-particular-witness her language-specific injunction that in English but not in Russian the present tense denotes the moment of utterance, and that this indicates deep interpretive differences between the two languages.

I have offered some reasons for preferring an approach to sentences, such as (80), that treat the embedded past-tense form as a mere morphological alteration that leaves the underlying tense the same.

(80) John said that the Canadiens were in New York

I have argued that the tense of the embedded clause is actually a simple present, on the contemporaneous reading in which Les Habs[54] were in New York as John spoke. The past-tense form indicates that the embedded S point is associated with the matrix E point. The important point is that the embedded *were* is not truly in the past tense. The reason for this assumption is the contrast between (81a) and (81b)

(81) a. *The Canadiens were in New York tomorrow

b. John said that the Canadiens were in New York tomorrow

c. The Canadiens are in New York tomorrow

The relative acceptability of (81b) follows if the embedded tense is actually the present. We expect (81b) to be as good as (81c) and to contrast with (81a). The latter is unacceptable because in matrix clauses *were* is in the past tense and thus cannot be modified by a future adverb. The underlying form of (81b) is the same as that of (81c); hence, the acceptability of the latter explains the acceptability of the former. See (8) above for further discussion of this last point.

It is unclear what Eng would say about cases such as this. However, what (81) seems to show is that surface appearances within embedded clauses can be deceiving. An apparent past-tense form actually functions like a present-tense element. If the reasoning here is correct, this consititutes a major problem for Eng's analysis, for it would indicate that in cases such as (82) both embedded sentences are underlyingly in the present.

(82) a. John said that Harry was sick

b. John said that Harry is sick

There are some additional minor objections to Enc's particular proposal. The first has to do with her account of (83) (Eng 1987, p. 652ff).

(83) John heard that Mary is pregnant

Eng argues that embedding a present-tense sentence under a past tense implies that the past embedded clause is true both at the moment of speech and at the event time of the past tense, and that Mary was pregnant both when (83) was uttered and when John heard it. I find the first of these claims unobjectionable. However, the second claim seems less firm. Consider (84), which is an analogue of (83).

(84) I heard from a reliable source that John knows the killer's identity

It does not follow from (84) that John had this knowledge when I spoke to my source. I may have heard from my source that John was about to find out who the killer was but had not yet done so. Nonetheless, by the time I utter (84) John has made his discovery. Similarly for (85).

(85) John said that today is a blue moon

What John might actually have said is "tomorrow we will have a blue moon". He may have told me this the day before the moment of speech. I may utter (85) today. Perhaps yesterday there was no blue moon, but by the time I utter (85) there is one.

This is not to deny that we often interpret these sentences as Eng indicates. However, pragmatic factors seem a more promising way of accounting for this than tense. If someone claims that something is the case, it is often true that a reason for the claim is that something is indeed the case. Thus, John will say that Mary is pregnant when she is in fact pregnant. Otherwise John has little ground for saying it.

I also find Eric's supporting evidence for her LF-movement rule, which underlies her analysis of (83), suspect. Eng observes that there is a binding contrast between (86a) and (86b).

(86) a. Everyone; thought that he; was handsome
b. *Everyone; thought that he; is handsome

Eng takes this contrast to support her claim that (86b) involves LF movement of the embedded tensed clause to presentential position. As (87) shows, the reason (86b) is bad is that the pronoun is not within the c-command domain of the quantifier.55

(87) [S'IESIIS'2 [S2 . . . PRES pronoun; ..]] [s $_i$NP; Past V e2]]]

In (86), NP; is the quantified NP binding the coindexed pronoun with S2. e_2 represents the empty category left behind by the LF movement of S'2.

However, Enc's reasoning is inconclusive. First, she fails to discuss why connectedness effects do not apply in this case. It is well known that one can bind a pronoun that one does not c-command if one c-commands the position from which the container of the pronoun has moved.[56] In (87), NP; does c-command e_2, the trace of the container of the pronoun (i.e. , S'2). Thus, binding should be possible in this case even if S'2 moved in LF. Second, in structures such as (86b) the pro-

noun cannot be coreferential with a nonquantified NP. Consider the examples in (88).

(88) a. John, thought/complained that he, was handsome

b. *John, thought/complained that he, is handsome

(88b) is much less acceptable than (88a). However, as is well known, pronominal coreference (unlike binding) does not require the antecedent to c-command the pronoun. Last of all, it is not clear that the subject *everyone in* (86b) fails to c-command the adjoined sentence in the LF structure (87). If one assume May's version of c-command, then after QR has applied, if not before, *everyone* c-commands the adjoined sentence. Hence, binding should still be possible.[57] May (1985) has argued that this notion of c-command is required if binding of pronouns in Mig/pilot sentences is to be accounted for. However, this notion of c-command also allows the NP in (87) to c-command the pronoun.58

I have argued that the analysis of SOT structures presented here is preferable to the one outlined by Eng (1987). However, the differences should not obscure the broad points of agreement between the two theories that were elaborated at the beginning of this section.

4.7 Conclusion

In this chapter, I showed how the Reichenbachian theory developed in earlier chapters can be extended to accommodate sequence-of-tense phenomena. The analysis centered on treating SOT as involving an optional rule that associates an embedded tense point, such as S,,, R,,, or E_n, with a neighboring E point, En-1.

In English, the application of the SOT rule is at times accompanied by a morphological change in the tense form. We shall see in the next chapter that this fact has some interesting implications for the theory of grammar.

I also argued that infinitival constructions could be analyzed as RE structures (i.e., tenses without S points), and that naked infinitival constructions were bereft of both an S point and an R point. This assumption, in conjunction with the principle of full interpretation, led to an account of two salient properties of infinitival clauses: that they cannot be main clauses and that they are interpreted as sharing the temporal interpretation of the clause under which they are embedded.

Chapter 5

Deriving the Properties of Sequence-of-Tense Structures

In chapter 4 I outlined a theory to account for sequence-of-tense phenomena in English. In this chapter, I would like to trace some of the implications of this account for grammatical theory more generally. Three questions will be at the forefront of the discussion.

- What sort of elements are tenses? I will argue that SOT phenomena indicate that tenses cannot be operators. If not operators, what are they? I suggest that they are essentially adverbs.
- What is the exact nature of the neighborhood condition that, I argued, constrained the operation of the SOT rule (32)? What makes two tense structures neighbors? I will show that his turns out to be a more complicated question than one might think. However, I will demonstrate that neighbors are in a government configuration, and that the tense structures adopted here mirror the government relations of the interacting elements. Thus, if A and B are tense elements, A is in a higher tier in the tense structure than B if and only if A governs B in the syntactic tree.
- Are these properties interrelated? In other words, is the fact that tenses are adverbs related to the fact that interacting tense forms are in a government relation? I will show that these two facts are related, and that this indicates a deep grammatical distinction between operators and adverbs within natural language.

In addition to these issues, I will trace out some implications of the present theory for more specialized concerns within the theory of grammar. In particular, I will argue that SOT phenomena in English indicate that INFL is the head of S'. This is of some interest to the current grammatical debate; however, this somewhat technical discussion can be skipped by those interested only in the tense system *per se*.

5.1 Tenses Are Not Operators'

In section 4.4, I argued that the limited interaction of tenses with one another is difficult to account for if it is assumed that tenses are operators, at least if one thinks of quantifiers as canonical instances of operators. I presented two broad set of facts to support this conclusion.

First, embedded tenses can always be temporally interpreted as anchored to the moment of speech. Regardless of how far down in a complex clause a tensed sentence is situated, it can escape the influence of the superordinate tenses. If tenses are operators, this implies that a tense can always receive the widest possible scope. Consider the sentences in (1).

(1) a. John heard that Mary said that Bill denied that Fred is in New York

b. John said that Bill saw the man that is at the next table

In (la) and (lb), the indicated finite verb is embedded three clauses down from the matrix. In (la) two sentences intervene. In (1b) a sentence and a noun phrase intervene. Nonetheless, in both instances the embedded tense places Fred in New York and the man at the next table contemporaneous with the moment of speech. In short, the temporal interpretation of the indicated clause is independent of the superordinate past tenses.

Second, embedded tenses can be temporally dependent on a superordinate tense only if this latter tense is a neighbor. In other words, despite the wide scope option a tense can exercise, it cannot assume intermediate scope positions. This property manifests itself in two distinct ways:

(i) A tense in an embedded clause can only be temporally dependent on the tense of the clause under which it is immediately embedded.

(ii) A tense within a relative clause, regardless of how deeply embedded the relative clause is, is never temporally dependent on any other tense. In other words, it is always temporally interpreted relative to the moment of speech.

Neither of these two properties of embedded tenses fits easily with the claim that tenses are operators. if they are operators, why can they only be dependent on neighboring tenses? Why can't tense within relative clauses link to tenses higher up in the tree? In short, why can tenses

assume the widest possible scope or narrow scope but never intermediate scope? These are not the sorts of restrictions that an account of tenses as a species of operator prepares us for. Why not?

The main reason is that these are very odd restrictions for an operator to have. It is understandable that an operator might have limited scope. For example, it is well known that in natural languages most quantifiers assume the scope of the clause they are in.[2] It is even understandable that an element might always bear the widest possible scope. The discourse-oriented adverbs, such as *now, yesterday,* and *tomorrow,* must be interpreted relative to the moment of speech, for example.[3] What is odd is to find operators that can have the widest or the narrowest possible scope but nothing in between.

The puzzling nature of these facts becomes more evident in the context of the logical problem of language acquisition. A wide-scope element hangs outside the scope of the operators it is independent of. A narrow-scope element whose interpretation is dependent on that of other operators lies within the scope domain of these operators. On the assumption that an operator enjoying wide scope moves from its embedded clausal position to the matrix clause, it is hard to see what grammatical principles could stop it from moving step by step up the tree and what could prevent the operator from stopping at an intermediate point in *its* journey.

Processes such as (2) are abundant within natural languages.[4]

(2) [s Oi [s . . . [s . . . [s . . . [s . . . .]111]

However, once one derives the interpretation in which an operator is independent of the interpretation of other operators by assigning it matrix scope, as in (2), then accounting for the missing intermediate-scope interpretations is a pressing problem. After all, what evidence in the primary linguistic data could lead the child to so restrict the movement of the operator? The obvious answer is none at all. In short, the absence of intermediate-scope readings creates severe problems once sequence-of-tense phenomena are filtered through the concerns of the poverty of the stimulus.

An important virtue of the theory of SOT outlined in chapter 4 is that it meets these concerns. The ubiquitous possibility of wide scope is due to the presence of an S point in *all* tenses and to the principle of full interpretation, which maps S onto the utterance time if S is otherwise unanchored. The neighborhood restriction accounts for the narrow-scope readings and for the absence of intermediate-scope interpretations.

However, though denying tenses the status of operators and treating them as indicated suffices to explain the relevant data, it is not fully satisfying. If tenses are not operators, what are they? Are tenses *sui generis?* If not, what other elements does their extended family comprise?

5.2 Tenses as Adverbs

It is possible to account for the locality restrictions on the tense interactions characteristic of SOT phenomena by categorizing tenses as adverbs. The distinctive property of adverbs is their severely limited ability to modify a given element. Structurally, adverbs can modify only those elements that they govern. Government is defined in (3).5

(3) A governs B iff$_{def}$ all maximal projections that dominate A dominate B, and if A governs B then A governs the head of B.6

(3) looks more imposing than it really is. A few illustrations should help the neophyte feel comfortable with the definition. The main structures relevant for our discussions are provided in (4).

(4) a. Es, [s ..INFL^{I} [vp . V [s,$_{2}$ [s . INFL^{2} . .]]1I1
b. Es, [s . . . INFL [vp [vp . W. . TC-S']]]

In (4a), INFL^{I} governs VP and the head of the VP (i.e. V). V governs S'2 and the head S'2 (i.e. INFL^{2}). In (4b), INFL governs TC-S, which stands for the complex of a temporal connective and a sentence. I will assume that TNS is lodged in the INFL position. This is the standard assumption. Less standard is the assumption that INFL is head of S'. I will try to justify this assumption below.'

Given the definition in (3), we can now define "neighbors" as elements in a government configuration and examine how this affects SOT constructions.

What makes government the appropriate notion is that it is a very local, very tight relationship between elements. Consider adverbs for a moment. They modify the constituents that they govern. Consider (5).

(5) a. John necessarily believes that 2 plus 2 equals 3 plus 1
b. John believes that 2 plus 2 necessarily equals 3 plus 1
c. John cleverly said that Bill gave a speech
d. John said that Bill cleverly gave a speech

In (5a), the adverb *necessarily* modifies the verb *believes.* It cannot modify the embedded clause, even though structurally the embedded clause is in the scope of the adverb. [8] Nonetheless, its interpretive effects are locally contained. This is what prevents us from interpreting (5a) as (5b) with the adverb dipping down into the embedded clause to modify it. Similarly with (5c) and (5d). *Cleverly* is a subject-oriented adverb. (5c) can be paraphrased as (6a), and (5d) as (6b).

(6) a. It was clever of John to say that Bill gave a speech
b. John said that it was clever of Bill to give a speech

Note, however, that the adverb can only modify the subject of the clause that it is in. Thus, (5d) is not a paraphrase of (5c). This is so despite the fact the *cleverly* has the embedded subject in its scope. Despite this fact, the embedded subject is too deep for the matrix adverb to affect it. Assuming that adverbs can modify only those elements that they govern accounts for this restriction on an adverb's interpretational "reach." In the examples in (5), the adverbs can modify only those elements that they govern. In (5a) the embedded clause is too deep for *necessarily* to affect it. In (5c) *cleverly* cannot reach *Bill,* because it does not govern *Bill.9*

What the examples in (5) indicate is that adverbial modification is under government. Adverbs modify only what they govern. If we now assume that tenses are adverbial, then we predict that their interpretive reach is similarly restricted. In other words, in the tense system, elements that interact are in a government configuration because tenses are adverbs. Government is the relation in which tense elements must be in order to interact. Consider what this implies for SOT cases.

The SOT rule, which associates an embedded S point to a higher E point, is repeated here as (7).

(7) Associate S_n with E_{n_1}.

In chapter 3, I argued that TNS *is* the morpheme that represents the SR relation. Similarly, the perfective morpheme determines the RE relationship. [1°] In chapter 4, I assumed that the presence of an S point requires +TNS. In other words, the S point is provided by the +TNS morpheme. Only finite clauses have S points. The R point, on the other hand, is provided by the perfective morpheme. [+Perfective] is realized as *have in* English. It appears adjoined to VP. I assume that this is the position for the perfective morpheme, at least in English.

It is natural to assume that the predicate provides the E point, for the temporal nature of the event is further articulated aspectually. Many kinds of events exist with rather different temporal contours. How an event is distributed over time is a function of the predicate; that is, the temporal contour of the E point is a function of the particular predicate that provides it.11

In view of these assumptions, the specific structure of the SOT rule (7) can be accounted for. (4a), repeated here as (8), is the grammatical structure of embedded constructions that undergo the SOT rule.

(8) Es, [s .. $INFL^{1}$ [vp+/–P[vp •. V [s,$_{2}$[s . $INFL^{2}$ . .]1]]11

In (8), V and V alone governs $INFL^{2}$. If $INFL^{2}$ is tensed, then V governs this tense morpheme, as it governs *its* maximal projection S'2. Thus, the tense elements provided by V can interact with those provided by TNS. In other words, in (8) the E point can interact with the embedded S point. If (8) undergoes the SOT rule, the embedded S point is associated with the higher E point.

It is only the higher E point that is accessible to the lower S point, for only the V governs the embedded clause and the embedded INFL. In particular, neither $INFL_1$ nor the perfective morpheme +/–P governs $INFL_2$. As V provides the E point, this implies that only the E point will be visible to an embedded clause. This is of some interest, for it rules out the possibility of a tense rule that associates an embedded S point with a matrix R point. [12] This seems to be true for the SOT rule, though the temporal judgments are somewhat subtle. The reading of (9a) in which John's statement was before 6 o'clock requires *at 6 o'clock* to modify R.

(9) a. At 6 o'clock, John had said that Bill was on his way

b. At 6 o'clock, John will have said that Bill is on his way

On this interpretation, Bill's departure is also prior to 6 o'clock. In other words, it is dependent on E, not on R. (10a) represents the reading we get and (10b) the unavailable one.

(10) a. At 6 o'clock

S2,R,E2

b. At 6 o'clock

E1_R1_S

S2,R,E2

We account for the unavailability of the reading represented by (10b) on the assumption that only the matrix E point is visible to the embedded TNS. Consequently, the embedded S point can only anchor itself to E. This assumption follows if we assume that tense points can interact only under government.

A similar account extends to (9b). Consider the reading in which John's statement is made prior to 6 o'clock. On this reading, Bill's purported departure is also prior to 6 o'clock. This follows if the embedded S can associate with the higher E and only the higher E. This follows if V provides the E point, as (11) illustrates.

(11) a. at six o'clock

S_E1_R

S2,R,E2

Observe that the governed element S is the one that is anchored by the governing element E. In other words, the anchoring relation among elements in the tense system is mirrored in the government configuration of the representative morphemes. Thus, tense rules associate "lower" tense elements in the tree with "higher" ones. It is the lower tense elements that are "moved" to associate with higher ones.

This is of some significance, for in SOT constructions the lower clause can be temporally dependent on the higher but not vice versa. The lower S point shifts to associate with the higher E point. The higher S point never shifts to associate with the lower E point. Structurally, A can anchor B if and only if A governs B. Two points in the tense system can interact just in case they are in a government relation. E_{n_1} governs S_{n}, but not vice versa. Hence, S_n can anchor to E_{n_1}, but not vice versa.

The interpretive asymmetry that follows from government's determining anchoring is also reflected in adverbial constructions. Recall that an adverbial clause is subject to the rule for temporal connectives and

must associate its S and R points with the S and R points of the matrix tense. It turns out that the constraint on DTS is very sensitive to which sentence is put on the first tier and which underneath. (See chapter 3 for discussion.) The reason is that in shifting the embedded R point to associate with the higher R point, the CDTS must be respected. However, the CDTS is asymmetrical. It is permissible to dissociate points in DTS that are associated in BTS, but not to associate points in DTS that are separated in BTS. This accounts for the acceptability of (12a) and (12c) and the unacceptability of (12b) and (12d).

(12) a. John will leave when Harry arrives
b. *John arrives when Harry will leave
c. John will leave when Harry has arrived
d. *John has left when Bill will arrive

However, as these cases indicate, it is crucial that the lower tense structure be the one that moves. Consider (12a) and (12b) for illustration. Their derivations are given in (13).

(13) a. S_Ri,E

RTC I

S,R_2,E S_R2,E

b. S,R_1,E S,R1,E

RTC x > I I

S S,R2,E

In (13a), R2 is associated with R_1. Although in DTS R2 is dissociated from the S point with which it is associated in BTS, the CDTS is respected and the structure is fine. In (13b), R2 must move to associate with R_1. In this case, application of the RTC ends up associating R2 with S in DTS although it was separated from it in BTS. The CDTS is violated, and the structure is ill formed.

What is relevant here is that the governing matrix clause anchors the governed adjunct phrase. Thus, R2 moves to R_1, and not vice versa. The asymmetry is structural, just as it was in the case of SOT. The relevant structure is illustrated in (14).

(14) [s, Es . . . INFL r P[v p [vp • V. .] TC-S1]]]]

In (14), TC-S (the tense connective plus sentence) is governed by INFL. In specific, the INFL head of the S' to the right of the tense connective is

governed by the matrix INFL. Recall that TNS determines the SR relation. Adverbial finite clauses must match their SR points to those of the clause they modify. [13] The order of the tiers in (13) mirrors the government relations between the INFLs. The shifting of R2 to R_1 reflects the fact that the matrix INFL governs the embedded INFL. The RTC can be interpreted as requiring the SR relation in matrix and adverbial clauses to be identical. As in the case of SOT structures, the governing tense element anchors the governed one.14

Let us return to the fine structure of the SOT rule once again. If we assume that interacting elements are in a government relation and that the governing element anchors the governed one, then, as we have seen, we can account for why the SOT rule shifts an embedded S point to a higher E point. Furthermore, we can account for the locality restriction that constrains the application of the SOT rule; S_n associates with En

Why the subscripts are necessary should now be clear. E_{n-1} is the only governor of the embedded S point. In other words, no other E point governs the embedded INFL. Consider the multiclausal structure illustrated in (15).

(15) [s• ... INFL [vp . V^1[8,2. INFL^2 [vp . V^2 [s,3 .. INFL^3 . . l]]fi

Here V^1 governs INFL^2 and V^2 governs INFL^3. However, V^1 does not govern INFL^3. The maximal projection S'2 dominates INFL^3 but does not dominate V^1. Given that predicates "represent" E points and +TNS in INFL represents S points, E_1 is invisible to S_3 in (15).

The government restriction also explains why tenses within relative clauses do not manifest SOT. The structure underlying a relative clause is given in (16).

(16) Ls, ... INFL^1 [vp V^1 $_{[NP}$ DET N [s, . INFL2...

Here V^1 does not govern INFL^2. The latter is dominated by at least one maximal projection that does not dominate V^1, viz. NP. Thus, the S provided by INFL^2 cannot associate to the E provided by V'. In other words, the restriction that only neighboring points can interact follows.

This conclusion that government is essential to the interaction of tense elements is corroborated when we observe that the patterning of noun-complement constructions differs from that of relative clauses. We have just observed that relative clauses do not generally support infinitival clauses and do not permit SOT. This has been explained by the observation that the INFL^2 in (16) is not governed by the matrix V'.

However, these data in relative clauses contrast sharply with standard noun-complement constructions, which appear to freely permit SOT dependencies and infinitival complements. Consider the examples in (17).

(17) a. John endorsed our claim that Bill would win

b. John endorsed our claim that the Canadiens played tomorrow

c. John discussed our plan to leave with Bill

(17a) and (17b) show SOT effects. The future tense *will* has surfaced as *would in (17a).* In (17b) *played* is actually a present-tense form with a shifted morphology as a result of SOT, as the future adverb *tomorrow* indicates. (17c) seems perfectly well formed as well. Why do noun-complement constructions and relative clauses pattern differently?

We expect this difference if the structure of noun-complement constructions in English is as indicated in (18). This structure for noun-complement constructions has been independently motivated by Stowell (1981) and by Aoun, Hornstein, Lightfoot, and Weinberg (1987). If we adhere to this analysis, the contrast between relative clauses and noun-complement constructions readily follows.

(18) [$_{NI}$. NP S'l

In (18), S' is not governed by NP (given our definitions), for it is not dominated by all projections of N. Consequently, it is visible to elements outside the noun-complement construction. The S points of the embedded clauses in (17a) and (17b) can be anchored to the matrix E point by the SOT rule. So too can the R point in (17c). Thus, if we assume that tense elements can interact only under government and that the structures of noun-complement constructions are as indicated in (18), we predict that the data illustrated in (17) should be possible.

The assumption that elements interact only under government allows us to deduce the neighborhood condition that restricts the application of the SOT rule in multiply embedded clauses, in relative clauses, and in noun-complement constructions. The assumption enables us to simplify the SOT rule by removing the subscripts. These need not be overtly encoded in the rule, for their effects follow from more general considerations. Being adverbial, tense elements can interact only under government.

Simplifying the SOT rule in this way reflects important acquisition concerns. Rules must be learned. The more complex the rule, the more that has to be acquired on the basis of specific linguistic data provided by

the target language. Simplifying the form of the rule amounts to easing the burden on the language-acquisition device. If tenses are adverbials, then the subscripts on the SOT rule follow from universal properties of adverbs. In other words, more general properties of the language faculty supply the restrictions that the subscripts encoded. That the SOT rule is restricted to neighbors need not be gleaned by the child from the primary linguistic data.

This is clearly a very good thing. In view of the range of the restrictions on the application of the SOT rule, it is inconceivable that these could be acquired on the basis of the primary linguistic data. The structures are simply too complex and the cases are too recondite to play a significant role in shaping the resulting tense competence.

The assumption that tenses are adverbs allows us to derive virtually all the fine structure of the SOT rule. We have derived the neighborhood condition. We have also derived that it is a higher E point that is a possible anchor for an embedded tense, and that this E point anchors the embedded tense rather than the embedded tense anchoring the higher E point.

There is only one more fact left to explain: Of the three points that constitute the embedded tense, why is it S that associates with the higher E in the SOT rule?

The short answer is that this is not required. In chapter 4, we observed that R could associate with a higher E and that this was obligatory for embedded infinitival complements. Similarly, naked infinitival constructions associate an embedded E point with a higher E point. Thus, either S or R or E can associate with a higher E point. However, in finite clauses, when S is present, it alone is subject to the SOT rule. When S is absent, R can associate; when R is absent, E can do so. These facts all follow from more general considerations.

In finite clauses, only S can associate with E. R cannot. The PFI prevents R from associating with E in such cases. If R did associate with the higher E, then S would have to be interpreted via the S default rule to obey the PFI. But then, the value of R would be determined in two mutually inconsistent ways: via its relation with S and via its association with E. Thus, we need not stipulate that it is S that associates with E in finite SOT constructions. (19) illustrates the problem.

(19) 

Here R2 is associated with E_1. S2 is unanchored; thus, it is subject to the S default rule so that it obeys the PFI. But then R2 is modified in two inconsistent ways: Via its association with R2, it is interpreted as in the past relative to the moment of utterance; via its association with S2, which is anchored to the moment of speech, it is read as contemporaneous with the speech time. This leads to an inconsistent interpretation, and so the structure is ill formed.

/f the S point is absent, as is the case in infinitival clauses, the PFI cannot intervene to block the anchoring of E with an accessible E point. Similarly, if R is absent, E can anchor to another E. Thus, we see that any tense point can link to any other under the appropriate conditions. The properties of the RTC can be understood similarly, on the assumption that tense elements can interact only under government. The RTC has two important idiosyncratic features: It is obligatory, and it requires only the association of the S and R points (not of the E points).

The obligatory nature of the RTC can plausibly be traced to a general injunction that temporal modifiers must share the S and R points of the clause they modify. In other words, they cannot introduce new temporal anchors. This is trivially true in the case of nonsentential adverbs. It is also true of sentential adverbs when the S and R points are linked. To link the S and R points is, simply, to ensure that no new anchors are introduced.15

The harder question is: Why it is that the RTC does not specify that the E points must coincide? (14), repeated here, provides an answer to this question:

[s, Es . . . INFL [w[vp . V. .] TC-S1]]

Recall that the E point is provided by V. Observe that V does not govern S' in (14). V is dominated by VP; S' is not. [16] There is a part of the maximal projection of VP that does not dominate S'. Similarly, the E point of the clause S' does not govern V. Inside the S' there is a VP, and the E point is provided by the V of this VP. But this V is dominated by S', a maximal projection. This S' does not dominate V. Thus, the two E points are not in a configuration of government. Consequently, they cannot interact. They cannot "see" one another. Thus, we need not stipulate that in the RTC the E points don't associate. Given that tense elements interact only under government, they cannot link, as neither governs the other.

We have come very close to reducing the rules of the tense system to one rule: Link tense elements. This rule applies optionally to yield SOT

structures, and it applies obligatorily in the case of adverbial configurations in the guise of the RTC. The obligatory nature of the latter I have assumed, can be derived from more general principles following Yip (1984). All the additional specific features of the two rules have been shown to follow from more general principles, given the assumptions that tense elements are adverbials (and hence can interact only under government) and that certain specific morphemes provide SRE points and relations.

5.3 Bierwisch's Puzzle and the Diachrony of Tense

Categorizing tense elements as adverbials has proved to be remarkably fecund. Given this assumption, we can derive virtually all of the specific properties of the SOT rule of the RTC from more general considerations. This, in turn, allows us to reduce the burden on the language-acquisition device. The reason for this is that the specifics of the SOT rule and the RTC need not be learned on the basis of primary linguistic data, for they follow from more general, plausibly innate features of the language faculty. Once tenses are treated as adverbs, the SOT rule the RTC can be trivially stated as "Link tenses." All the specific details of the SOT process—that in SOT configurations S links to E, that the E is "higher" than S, that the E is a neighbor, that if S is absent R can link to E, that relative clauses do not display SOT, and so on—follow from innate principles of the language faculty and so need not be specified. Similarly for the RTC.

In addition to these global considerations for categorizing tenses as adverbs, there are several other reasons for doing so.

One of the striking facts about tenses is that they love to hang out around verbs. As Comrie (1985, p. 12) points out, in most languages that have tense, the tense is indicated as a marking on the verb or as part of the auxiliary complex. What seems not to occur is the morphemic realization of tense in presentential adjunct position—as a marking on the complementizer, for example, or as an adjoined particle. There are two obvious questions: If tenses are operators, why don't they ever syntactically appear in canonical operator positions? Why do they seem to like verbs so much?[17] Both questions can be easily answered if we assume that tenses are adverbs. The reason that they do not appear in operator positions is that they are not operators. The reason that tenses appear so frequently on verbs is that they are adverbs. There are classes of adverbs that typically appear within the *VP—quickly, seriously,* and

sadly, to name three. There are some that even appear exclusively in preverbal position—merely and *really*, for example. Finding adverbs around verbs is about as surprising as finding smoke where there is fire.

The adverb status of tenses is even clearer when one couples their promiscuous infatuation with verbs with one other distinctive property: Only adverbs both modify verbs and are in turn modified by adverbs. This is true of no other part of speech. However, it perfectly characterizes tenses, as we would expect if tenses were simply adverbs.

There is, in addition, evidence that tenses in the Indo-European languages historically derive from adverbs. Kiparsky (1968) argues that in the case of early Indo-European there are good reason to regard tenses as adverbial constituents. Kiparsky further points out that treating earlier Indo-European tenses as adverbs is "hardly a novel or very controversial" suggestion. He observes that "the augment *e-*, which denotes past tense in some languages, quite transparently originates as an adverb or a particle" and the "the suffix *-i*, which characterizes the primary non past tenses" has been widely regarded as having originated as an adverbial element since the latter half of the nineteenth century (p. 45).

Kiparsky presents two basic types of syntactic evidence in support of this analysis, aside from the more traditional etymological arguments. The first is the fact that they behave like constituents with respect to conjunction reduction. Kiparsky points out that tense "need appear only once in co-ordinate structures, and then ordinarily only in their first member." This fact follows from the ordinary rules of conjunction reduction. Consider (18).

(18) a. to sing and to dance to sing and dance
b. singing and dancing x > singing and dance
c. sang and danced sang and dance

In English, conjunction reduction does not hold below the word level. Thus, it is possible to "reduce" (18a) as indicated, but not (18b) or (18c). In earlier Indo-European it was possible to reduce tenses in a way analogous to (18a) and in contrast to the modern English case (18c). Kiparsky notes that "the sequence . . . Past . . . and . . . Past . . . is reduced to . . . Past . . . and . . . zero. . . . Repeated futures and subjunctives reduce in just the same way." (p. 35)

Kiparsky's second argument concerns what he dubs the "predicative" function of tense. He observes that it is "not possible in English to pred-

icate, and hence also not to negate, question, or contrast with each other true tenses . . . independently of their host verbs to which they are attached as syntactic features" (p. 48). This contrasts with Vedic and Greek, where the predicative function is clearly attested. [18] Once again, Kiparsky observes that this distinction would follow if in earlier Indo-European tenses were adverbial.

I have just cited some additional bits of evidence for the conclusion that tenses are adverbs. First, making this assumption allows an obvious account for why tenses typically occur on verbs and why they are typically modified by adverbs. Second, it appears that, historically, the tense system of the Indo-European languages derives from adverbials. It is reasonable to suppose that the main historical change has been a change of tenses from free-standing morphemes into bound morphemes. All else has remained the same. Interpretively, in particular, tenses have remained what they originally were: adverbials.19

There is one further side benefit from assuming that tenses are adverbial and that they interact under government: the possibility of deriving some of the order of auxiliary elements in English. In English, there is a precise order to the morphemes that appear. In particular, TNS always precedes *have,* and *have* always precedes the main verbal predicate. If we assume that tenses are Reichenbachian composites of SRE points, that S anchors R and R anchors E, and that anchoring is possible only under government, we predict that the morphemes that "represent" S, R, and E are arranged so that the morpheme representing S will govern the one representing R, which will govern the one representing E. If we assume that +TNS provides the S point, that R is represented by a perfective morpheme, and that V provides the E point, we predict that the structural relations of these elements are those shown in (20).20

(20) [. . . TNS[vp Perf [vp **V**. . .]]]

Here TNS governs *Perf,* and *Perf* governs V. In English, +Perf is realized as the morpheme *have.* Note that this is the only configuration permitted if we are to obtain a well-formed Reichenbachian basic tense structure, on the assumption that anchoring requires government—that is, A can anchor B if and only if A governs B. [21] The tense system requires S to anchor R and R to anchor E. The assumption that tenses are adverbials requires that these anchoring relations be mirrored in government configurations by the surface morphemes. From these assumptions, and from the fact that TNS, *have,* and V represent S, R, and E in English, we derive the structure in (20).

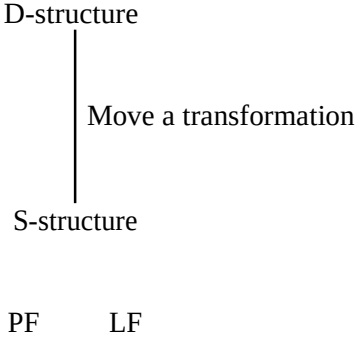
5.4 Tense and the Theory of Grammar

To this point, the main emphasis has been on the internal workings of the tense system. We have explored the nature of tense structures and the rules that allow these structures to interact. However, the tense system is but one part of the overall theory of grammar. As yet, we have not explored the implications that the theory outlined above has for grammatical theory more generally. In this section, I would like to look out from the neo-Reichenbachian theory of tenses developed above toward general grammatical issues and ask what implications, if any, this analysis has for current grammatical theory. To this end, I will assume, in this section, that the story presented above is largely correct. My question is what this implies for the theory of grammar.

One more caveat. This section has a narrow focus. My concerns are with one particular theory of grammar: the Government-Binding (GB) theory. My comments will be specifically directed toward it.

The aim of any theory of grammar is to provide a way of linking sound and meaning. A sentence has both a phonetic shape and an interpretation. One aim of any grammatical theory is to specify how this relation between sound and meaning is realized within natural language. GB theory has a very specific answer to the question: Grammars are organized as in (21).

(21)



(21) outlines the form of a natural-language grammar. One starts with a level of derivation, D-structure. One applies transformational rules to the D-structure phrase marker and derives a level-of-representation S-structure . The grammar then splits and two other levels are derived: phonetic form (PF) and logical form (LF). LF is the level that feeds interpretation.

Implicit in (21) are several important claims. The first is the claim that there is no direct relation between the grammatical levels of representation that account for the sound properties of the string and those that account for its interpretation. Rather, it is claimed, these levels are related only by deriving from a common S-structure. Second, (21) is standardly interpreted as claiming that LF is the only level of representation relevant for semantic interpretation. All grammatical information relevant to interpretation appears at the LF level. No other level contains information relevant to interpretation that is not also represented here. What unifies all the operations that apply at the LF level is that they are meaning-relevant.[22] Third, there is no necessary connection between the interpretation that a sentence receives and phonetic features of that sentence. The fact that LF and PF branch indicates that each of these two arms of the grammar is blind to the other's specific properties. LF processes do not get reflected in the phonology, and vice versa. These two arms of the grammar are informationally encapsulated with respect to one another's properties and operations.

This is the classical picture. I have argued elsewhere that this model is incorrect. I have suggested two particular emendations.[23] First, I have argued that other levels of grammatical representation besides LF contribute to interpretation.[24] Thus, not all meaning-relevant grammatical information is consolidated at LF: there is at least one other relevant level, LF'. Second, LF' is on the PF side of the grammar. In other words, there are some meaning-relevant interpretive processes that affect the phonetic form of the string. These are LF' processes.[25] This model is represented by (22), which breaks semantic interpretation down into two parts.

(22) D-structure

Move a transformation

S-structure

PF

LF and LF' are the loci of two different kinds of interpretive processes. LF is where internominal dependencies, broadly construed, are determined. Thus, LF is where bound anaphora takes place, pronominal interpretation, operator/variable binding, and so forth. The interacting elements at LF are nominal expressions. The relevant theory for LF is the binding theory. The relevant locality notions are those provided by this theory. In general, however, interacting LF elements can interact at long distance and can be several clauses away from one another. These have been dubbed SI-2 (semantic interpretation-2) processes.

LF' operations are much more local. The relevant relationship in LF' is government. The domain of an element's influence is the domain that it governs. Interacting elements are in a government configuration. LF' processes are between non-nominal elements. More precisely, they are between elements at least one of which is not nominal. Some examples are adverbial modification, predication, and opacity. These have been dubbed SI-1 processes.

There is a guiding intuition behind the model in (22). It takes seriously the distinction between adverbs and operators. it insists that the distinction is a fundamental one within natural language. In other words, interpretation breaks down into two very different types: SI-1 and SI-2. SI-2 is concerned with the binding relations of operators and variables, operators and bound pronouns, coreference between nominal expressions, and so forth. In other words, SI-2 comprises the typical concerns of quantification theory and binding theory. SI-1 is different. Its main concern is the way that non-nominal expressions interpretively interact. Adverbial modification is an example, as is scope of opacity. In each case we find relations between grammatical elements at least one of which is not nominal. What is important is that it is a central tenet of (22) that SI-1 processes are fundamentally different from SI-2 processes. Thus, neither should be reduced to the other. In particular, it is incorrect to reduce adverbials to operators or pronominals. If tenses are adverbials, as is argued above, then it is a fundamental mistake, given (22), to treat them as subject to the binding theory, as would be appropriate if they were operators or pronouns. Given (22), the gulf between the above approach to tense and more standard accounts that assimilate tenses to operators or pronominal expressions is very wide.

This intuition behind (22) can be expressed another way. Except for binding processes that relate nominal elements and operators with vari-

ables, natural languages are trivially compositional. Except for binding processes, the branching structure of the phrase marker encodes via the government relation how elements combine to yield a meaning: Just go up the tree from the bottom, composing the meanings of the individual units that meet at the major nodes. (22) is intended to capture the idea that LF' is the correct level for representing function/argument relations and the idea that LF can be viewed as a grid superimposed on a basically compositional base whose function it is to determine internominal dependencies26.

Before Frege, predicate/argument structure was taken to be the core semantical relation in the clause. Frege showed that quantification could be treated more adequately if predicate/argument structure was replaced by operators and variables. (22) suggests that, for natural language, both these approaches are correct when suitably restricted. Operator/variable relations are just a special case of internominal dependency, and they occur at LF. Predicate/argument relations are determined at LF' and comprise standard cases such as adverbial modification.

I will not rehearse the arguments in favor of (22) here. Rather, I will assume that (22) is correct and ask what this model implies for tense interpretation.

The answer is relatively clear. Tenses are adverbs. Thus, tense processes should take place at LF'. Like all LF' processes, tense elements will interact under government.

More interestingly, however, we expect tense interactions to have phonological effects. In short, tense rules can be expected to have phonetic effects precisely because they occur in LF'. I would like to examine this prediction in the context of the analysis of SOT phenomena outlined in chapter 4.

In English, I argued, SOT is made up of two processes: the process that associates an embedded S point with a governing E point, and a process that changes the surface phonological form of the underlying tense. This surface alteration occurs when the embedded S point, S_{n}, is shifted to an E point, E_{n-1}, that is itself to the left of its S own point, S_{n-1}. Thus, we have analyzed (23a) as having the tense structure in (23b). The underlying tense of the embedded clauses is S_2, R2, E2—i.e., the present tenses. Phonologically, however, the underlying tense has the form of a past-tense element, *were.*

(23) a. John said that the Canadiens were playing the Bruins

b. E1,R_S

S2,R2,E2

The process that changes the phonological form of the embedded predicate, we observed, is language specific. In Russian, for example, one retains the underlying present-tense form even under the shifted SOT interpretation. The existence of this process of shifting the overt phonological form of the underlying tense supports the claim that tense interpretation is an LF' process.27

We expect an LF' process to be capable of affecting the phonology of the string. The application of the SOT rule has the effect of changing the surface phonological form of the underlying present tense. It also changes the form of the future-tense morpheme from *will* to *would.* In short, the application of the SOT rule has phonological effects. This would be rather surprising if (21) were the correct theory of grammar. (21) localizes all interpretation at LF. This would include tense operations that clearly are determinants of meaning. However, as (21) indicates, LF is modular with respect to PF, so whatever happens in LF should not have any repercussions in PF. It would be equally surprising if (22) were the correct theory of grammatical organization if we assumed that tense operations were located in LF. In (22), as in (21), LF does not affect PF.

This suggests that tense operations take place in LF'. (22) indicates that LF' feeds PF. Thus, it should be possible for LF' processes to affect the PF structure of the string. This is precisely what obtains in cases of SOT. Application of the rule results in a phonological change in the surface form of the tense. To put this another way. SOT phenomena in English support the model of the grammar sketched in (22). We expect tense interpretation to be an LF' process. Tenses are adverbial and interact under government. These are the signature properties of LF' processes. Thus, we expect the possibility of PF fallout from tense-interaction effects if (22) is correct. This is precisely what results in English SOT constructions.

The fact that tense operations have PF effects adds further support to the claim that tenses are adverbial rather than nominal expressions or operators. Given (22), interactions between nominal expressions or operators are determined at LF. Adverbials "live" in LF'. This latter

assumption comports nicely with the fact that tense operations can have phonetic effects.

This phonological reflex of the SOT process has a second interesting implication. It implies that INFL is the head of S'. [28] The reasoning is as follows. There is evidence that SOT is an LF' process and that tense interactions are under government. We have observed that the SOT rule has a language-particular phonological effect in English of changing the form of the tense. In order for this operation to be performed, the underlying tense form must be visible. But to be visible it must be governed. After all, unless the SOT rule applies, no phonological change occurs.

Thus, we require the TNS of the embedded clause to be visible if it has been shifted to the matrix E point. If TNS resides in INFL, this implies that INFL is head of S', as in (24).

(24) a. John said that the Canadiens were playing the Bruins
b. [John PAST[say[s,that[s the Canadiens PRES [be playing .. .

Say, the provider of the E point, governs PRES and can "see" it, but only if INFL is head of S'.

It is not enough to know that the clause is tensed for the SOT process to apply. It is necessary to see the particular tense. This is important, for it blocks the retort that seeing the embedded complementizer *that* suffices. It does not suffice. Knowing that an embedded clause is tensed does not yet say what tense it has or what the phonological form of the embedded tense should be. In fact, not all tenses get changed. The phonological forms of the modal tenses, discussed in chapters 1 and 2, remain unaltered, as in (25).

(25) John said a couple of days ago that the Canadiens might play the Bruins in a week

Even with the shifted reading, the one in which the expected game time is five days from the moment of speech, there is no phonological alteration in the form of the tense. This contrasts with (24a). In short, the actual tensed element must be visible for the rule to apply correctly. This strongly suggests that INFL is visible, as it would be if it were the head of S' .

INFL would be invisible if the head of S' were the complementizer *that*. Chomsky (1986a) has proposed that S' is actually a projection of the complementizer. This complementizer selects an S complement,

which is +TNS. INFL is the head of S, and so this selection is permitted. However, if this is correct, the contents of INFL should be invisible from outside the clause.[29] The phonological effects of SOT in English are evidence against this claim.

Consider one last way around the conclusion that INFL is head of S'. What if TNS moved to COMP position prior to application of the SOT rule? COMP is head of S'. Therefore, once in COMP position, the tense would be visible from above. This will not suffice. The proposal requires moving tense to INFL prior to LF. Movement at LF would not help, for LF movement has no PF effects. Unfortunately, as is well known, INFL does not overtly move to COMP except in matrix clauses. Thus, even if INFL moved to COMP in LF, it would not help matters. It would have to move there in the syntax. Therefore, the conclusion that INFL is head of S' stands.3°

5.5 Conclusion

The picture of the tense system that emerges from the considerations of this chapter has two major points of interest.

First, it is a very simple system. Once we treat tenses as adverbs and realize that adverbials interact under government, then virtually all of the idiosyncratic properties of the rules that allow tenses to interact can be explained. There is really only one very simple rule: Link tenses. Depending on the syntactic relation of the interacting elements, either the RTC or the SOT rule results.

Second, tense interpretation is an LF' process. This follows from the fact that tenses are adverbials. This view of tenses is considerably different from the two other major approaches that have been taken to tense. One approach treats tenses as operators, akin to quantifiers. The other treats them as pronominal expressions. I have argued at length why I believe that the first approach is inadequate. The second is also inadequate, in my opinion, but less obviously so.

There is something attractive about assimilating tenses to pronouns. Both can be deictic. Both seem to be bindable. Eng (1987) pursues this intuition and makes tenses subject to a version of the binding theory. I have argued that Enc's particular proposals have technical problems. However, if the theory presented above is correct, then the intuition that tenses are like pronouns is incorrect. It is precisely because tenses are not nominal that they are in LF'. It is a defining characteristic of LF'

processes that they are not internominal. Thus, they are not subject to the binding theory, they interact under government, they have PF effects, and so forth. None of these properties follow if we assume that tenses are pronominal.

Chapter 6
Final Points

Theories of grammar aim to provide abstract descriptions of linguistic knowledge. The neo-Reichenbachian theory of tense developed above aims to describe a native speaker's tense competence. A mature English speaker's capacity breaks down into two parts: a language-specific part and a universal part. The latter purports to be a description of the native speaker's innate contribution to the task of language acquisition. It is intended to be an abstract description of the structure of the language faculty for the domain of tense.

These are the aspirations. Reality often falls far short. However, in this concluding chapter, I would like to review the basic structure of the theory outlined above, focusing on it from this perspective. If what is outlined above is correct, what does the acquisition of tense competence consist of?

6.1 An Outline of the Theory

The theory breaks down into five basic propositions.

First, tense elements are adverbials. This distinguishes the theory presented here from theories that treat tenses as either operators or pronominal-like elements. The interaction of tenses with one another, on this view, is not properly described as binding, nor is it accurate to say that tenses have scopes in the usual sense of the term. Notions such as "binding" and "scope" are terms of art borrowed from binding theory and quantification theory. As the theory outlined here deliberately distinguishes tenses from operators or pronouns, it would be misleading to describe their interdependences in these terms. Adverbs "modify" and "specify". They do not bind. They do not have scopes. Their domains of interpretive efficacy are not scope domains, nor are

they binding domains. Their domains are much more restricted. The interpretive reach of a tense element is the domain that it governs.

Second, basic tenses are Reichenbachian. That is, tenses are composed of three points (S, R, and E) and two relations (one fixing the SR relation and another fixing the RE relation). The principal empirical claim put forward by a Reichenbachian theory is the postulation of an R point as part of every tense. A good chunk of the argumentation of chapters 1-3 was aimed at justifying this assumption. The central benefit of a Reichenbachian approach to tense is that it provides a rather restricted notion of possible tense. Reichenbach's approach is easily interpreted as answering the question: What is a possible tense? In other words, Reichenbach offers a serious theory of substantive tense universals.

As was observed in chapter 3, this is no mean achievement. To my knowledge, there is no comparable theoretical attempt to delimit in some principled fashion the inventory of possible tenses. Most other theories of tense simply take the inventory of basic tenses as given and derive the full inventory of tenses by iterating these basic tense, or they simply finesse the problem by stipulating the invertory of tenses for any given language of interest. As was argued above, neither approach is satisfactory. One virtue of a Reichenbachian theory is that it provides an empirically serious alternative by offering a theory of substantive tense universals.

The third major characteristic of the tense theory presented here is the two tense rules (the rule for temporal connectives and the sequence-of-tense rule) and the restrictions they encode. We observed that the domain of application of these rules was very local. Roughly speaking, only adjacent tenses can interact. This locality restriction on the interaction of tenses is derived from the fact that tense elements are adverbial. In chapter 5, I attempted to derive the idiosyncrasies of these two rules from more general considerations. The aim was to reduce the rules to their simplest forms so as to alleviate the burden on the language-acquisition device.

I argued that the formal properties of both the RTC and the SOT rule are derivable from other, plausibly universal, assumptions. For example, following Yip (1984), the mandatory nature of the RTC was attributed to the hypothesis that adverbials could not introduce new temporal anchors into a sentence. This is encoded in the rule by requiring the S and R points of a temporal adverbial clause to associate with the S and R points of the clause that it modifies.

To take one more example, the fact that the SOT associated an embedded S, R, or E point with a higher E point, rather than with a higher R point or S point, was derived from the fact that only elements in a government configuration could interact. This same supposition suffices to derive the neighborhood restriction and many other formal details of the rules. The upshot is that we are able to reduce the rules of the tense system to a very simple form: Link tenses. The details of how and when this is done follow from much more general considerations.

Indeed, one might try to go further. The theory adopted here implicitly puts forward a substantive theory of possible tense rules, given certain plausible assumptions concerning clausal structure.

The only possible rules relating a matrix and an embedded clause will be of the form that anchors S, R, or E of the embedded clause of E of the embedding clause. In essence, the SOT rule is the *only* possible rule relating tenses of propositional arguments.

Furthermore, the RTC is the *only* possible way of relating the tense of an adjunct clause to any other tense. The reason is that the E point of an adjunct will never be governed by any other E point. Thus, adjuncts will never directly link E points.

However, clauses can only be in adjunct or argument position, and only clauses have tense. Thus, tense/tense relations reduce to only two possible types: the RTC and the SOT rule. Nothing else is possible under the assumptions made above.

It is unclear, in my opinion, how seriously to take this result. It would certainly be interesting to see how far the claim could be supported in further investigations[1]. What is clear is that this is a desirable result if it can be maintained in some form. If it should prove tenable, we obtain a theory of possible tense rules in addition to the aforementioned theory of substantive universals. This would clearly be of tremendous value to the language-acquisition device.

The fourth feature of the system is the mapping between the elements of the tense system and the English morphemes that "represent" them. It goes without saying that the details of the mapping will differ from language to language. However, the underlying features might reasonably lay claim to greater generality. Thus, it is reasonable to suppose that in all languages +TNS clauses have all three S R E points, —TNS have RE points, and naked infinitivals have E points. It is also reasonable to think of E points as provided by predicates, and of SR points as provided by the TNS and perfective morphemes. Just what these morphemes are in any particular language will have to be learned, however.

Thus, in English infinitival clauses and gerunds are —TNS, while in the Romance languages subjunctives might also be —TNS. At any rate, the details of the mapping between elements of the tense system and the overt morphemes that represent them constitute a major task for the language learner.

The last major component of the theory is the relation between the syntax of the tense system and temporal interpretation. Two different kinds of constraints affect the operation of the system. First, there is the constraint on DTS, which delimits the manipulation of tense structures. Tense structures must conform to the strictures of the CDTS to have a temporal interpretation. Violation of the CDTS leads to ungrammatical structures and unacceptable sentences. The second kind of constraint that has found gainful employment is the principle of full interpretation. The PFI forces the application of rules such as the SOT rule for embedded infinitival clauses, gerunds, and naked infinitival clauses. It also forces the default rule for S interpretation to map unanchored S points to the utterance time. The PFI has wide-ranging applications outside the tense system. It operates widely within the grammar. Its attested presence within the tense system testifies to the appropriateness of treating tenses as *grammatical* phenomena subject to the familiar concerns.

In addition to these constraints, a simple account of the interpretation of derived tense structures was provided. One important characteristic of this interpretive procedure is that DTS structure underdetermines interpretation. Thus, it is possible for the same DTS to be interpreted in different ways. DTS does not uniquely determine temporal interpretation. The syntax of tense is not interpretively unambiguous. This said, the temporal interpretation of complex tense structures is not particularly difficult. Reichenbachian theories support even naive accounts of temporal interpretation. One such has been relied upon above.

6.2 From Primary Linguistic Data to a Grammar of Tense

Each of these five properties has implications for the acquisition of tense competence. Let us begin with the universal properties of the system.

It is reasonable to treat the adverbial nature of tense, the fact that basic tenses are Reichenbachian, the PFI, and the CDTS as unabashedly universal properties of grammars. In other words, they are innate properties of the langauge faculty. If they are constitutive of an English speaker's native tense competence, it is not because they have been

induced on the basis of primary linguistic data. It is hard to see how they could be. Consider the constraint on DTS as an example.

Our evidence for the existence of the CDTS was a bunch of unacceptable multiclausal constructions. For example, the contrast between (la) and (lb) is unlikely to be learned by comparing the two.

(1) a. *John will see Harry after Peter left

b. John will see Harry after Peter has left

(la), being unacceptable, is unlikely to be used. If it is, its unacceptability is unlikely to be focused on. If the CDTS is an innate constraint on complex tense structures, however, we can explain our judgment of unacceptability without having recourse to the structure of the linguistic input.

Similar considerations hold for many of the other aspects of the system. The fact that the SOT only relates neighbors is not something we have induced on the basis of linguistic data. To establish the claim that the CDTS holds in the tense grammar of English, we examined sentences with three levels of embedding. Such complex sentences do not plausibly constitute part of the primary linguistic data. So too with the PFI and the proposition that every tense contains and R point. Once one asks what the PLD would have to look like so that these principles that regulate the tense system of English could be induced from it, it becomes relatively clear that these principles must be innate.

On the assumption that they are innate, these principles function to guide the acquisition process. The problem of learning (i.e., induction from PLD) is now strongly restricted. The child is faced with three tasks: (1) Figure out the tenses of the ambient language. (2) Figure out which morphemes represent which BTSs. (3) Figure out which rules apply to interrelate tenses in the particular language at hand.

The first task is bounded by the language faculty. A Reichenbachian theory provides a limited number of possible tenses. This helps in finding which of the tenses are actually realized in one's native language. Furthermore, finding which tenses occur is something that can be figured out using only simple sentences. On the assumption that the PLD is largely made up of simple matrix clauses, there should be ample data for this task.

Similar considerations apply to finding which morphemes represent which elements of the tense system. Presumably, predicates always represent E points. Thus, finding the surrogate for E amounts to distin-

guishing Vs from other categories. This is not a trivial task. However, it is one that the child must accomplish whether or not tenses exist.

Finding the representatives of S and R is not much more difficult. Matrix clauses are tensed. It is not hard to go from temporal interpretation to BTS once one knows that every tense is an SRE complex. Consider the examples in (2).

(2) a. John saw Susan

b. John is watching Susan

The input to the tense-acquisition device is a sentence with some temporal interpretation. An appropriate utterance of (2b) in the child's domain should allow the child to observe John watching Susan as the sentence is uttered. Thus, the moment of utterance is contemporaneous with the expressed event. From this, the child concludes that S and E are contemporaneous, (i.e., S,E). However, it is universally true that all **BTSs have** R points. The child knows this innately. Thus, we need to insert an R point. By principle (40) in chapter 3, given S,E the child assigns the present tense the BTS S,R,E; that is, (S,R) 0 (R,E).

Similarly for (2a), though this time the initial interpretive input is the fact that E is temporally prior to S. This temporal interpretive fact implies E_S. It is known innately that all tenses have R points. This leads to the conclusion that E and R are contemporaneous, as only the moment of speech and the event time are highlighted in the temporal interpretation of (2a). Thus, R and E must be contemporaneous (i.e., E,R). From principle (40), we again know that the linear order of R and E must match that of S and R, so E, R_S is the BTS that we derive.

In a sense, this is a bit too involved. The possible tenses, being finite in number, can be scanned and directly compared to the temporal interpretation of the uttered sentence. Once the temporal interpretation of a simple sentence is available, which BTS represents it is quite straightforward. The reason for this is that there is a transparency between the syntax of BTSs and the temporal interpretations they represent. Perfective tenses have three focal time points: the speech time, the event time, and the reference time. Simple tenses have but two: the event time and the speech time. R is supplied innately by the tense faculty even when it is not salient in the temporal interpretation of the uttered sentence. Thus, when interpretively "visible" in perfective tenses and when interpretively "invisible" in simple tenses, R is provided, and SRE basic tense structures can be constructed.

A Reichenbachian system has one further property of interest when viewed from the perspective of acquisition. The theory meets a condition of "epistemological priority." A theory has this property if the notions it employs can be applied to data without any knowledge of the language[2]. This seems to be true of S and E, the speech time and the event time. These are not primarily linguistic notions, and they should be detectable without any linguistic knowledge. Nonlinguistic creatures, for example, can identify utterance events and non-utterance events. Once S and E can be identified, the resources of the language faculty can then be deployed to determine the structure of the tense system. In particular, R can be added to every BTS. The reference point seems a perfect candidate for a purely linguistic entity, i.e., one that is not epistemologically prior but requires the resources of the language faculty to detect. I have provided a sketch above of how the tense system might "boot up" given an identification of the utterance time and the event time, i.e., how the epistemologically prior elements could prime the system as a whole.

Knowing the basic structures of tenses will also make mapping morphemes onto SRE points easier. The presence of *have in* English alters the temporal interpretation of a sentence in structurally transparent ways. It always results in the E point's being temporally separated from the R point. Thus, perfective tenses have three individuated points of temporal interest. Similarly, the TNS morpheme will covary with the placement of the E point. Thus, which tense goes with which morpheme should be quite transparent.

In sum: Knowing what the available choices for tense are helps to bound the acquisition problem from above, and this greatly helps in sorting out the primary linguistic data. Given the space of possibilities that the theory of substantive universals provides, sorting through the data to pinpoint the tenses of one's particular language becomes considerably less daunting.

Once the basic tense structures are known, how to construct complex structures is known as well. They are freely constructed subject to universal constraints, such as the CDTS, the neighborhood condition, and government. In other words, linking tenses together into complex tense structures is driven by the innate resources of the language faculty subject to innate constraints of the language faculty. For example, the fact that English has sentences such as (lb) whereas French does not follows from the fact that English has a present-perfect tense and French does

not. Once this fact is discovered by a native speaker of French or English about the native language, the language faculty provides the other. No further learning is required.

The rule for temporal connectives is obligatory. The SOT rule is not, at least when we consider embedded finite clauses. The present system, as developed, does not require that every language have an SOT rule, though the RTC is presumably universally attested to. There are two possibilities. The first is that any language that has the right embedding configurations (i.e., ones in which the morpheme representing the E point governs the morpheme representing the S, R, or E point) also attests to sequence-of-tense interpretations. If this is what occurs, the SOT rule can always apply if the conditions of its application are met. It is a universally available option, and its ubiquity is expected. The second possibility is that the availability of the SOT rule is partially data driven. This would make it analogous to *WH* movement in languages like English. The language faculty optionally permits syntactic-movement rules. Whether questions in any given language exercise this option is data driven. Thus, in English, *WH* elements are fronted in forming questions. In Chinese, they are left in place. Whether a particular instance of the movement rule "Move a" obtains is partially explained by looking at the linguistic input. If movement is attested to, then the option is exercised. If not, it isn't.

If the SOT rule is analogous to *WH* movement, then its presence in any given language requires the appropriate instances of SOT-interpreted structures3.

Of these two options, I prefer the former. It seems reasonable to think that embedded clauses are always able to be linked to the matrix. This possibility is required for nonfinite clauses as a result of the principle of full interpretation. Once nonfinite clauses must be so interpreted, it is hard to see how the SOT rule could be prevented from shifting an embedded S to a higher E point. My prejudice is that the first option is the correct one. However, this is an empirical issue, and the second option might prove to be the right one.

Sequence-of-tense processes do differ across languages, though not at the level of tense structure. Chapters 4 and 5 discussed the fact that there is variation among languages in their realization of SOT structures. In English, the form of the verb is often changed in SOT configurations. This is not always true, however, as Russian seems to attest. In Russian, one expresses the English (3a) as (3b).

(3) a. John said that Mary was pregnant

b. John said that Mary is pregnant

In other words, SOT can apply without a phonological shift in the verb form.

This sort of language-particular variation must be learned. It clearly must be guided by the primary linguistic data. Some of the implications of this fact were discussed in chapter 5. That is is possible that the **SOT** rule have phonological effects follows from the fact that it is a rule that applies in LF', a level of representation that feeds PF. However, that **SOT** constructions must involve phonological variation in the verb form is a language-particular fact that must be learned on the basis of the primary linguistic data.

6.3 Conclusion

My main goal at the beginning of this book was to develop a theory of tense for natural languages. Like all empirical theories, this one aspires to broad empirical support and a modicum of elegance. These are the general attributes of a successful account. However, I had an additional aim: to construct a theory of tense that would be responsive to the special concerns of linguistics, particularly the poverty-of-stimulus problem. The central fact about language acquisition is that it is dominated by poverty-of-stimulus problems. This realization has guided work in syntactic theory for many years. However, semantic theory, the theory of interpretation, has rarely reflected the force of this concern. One aim of this work has been to show that poverty-of-stimulus considerations affect interpretive issues no less than syntax, and that taking them seriously provides reasonable and powerful criteria for theory evaluation and construction. That they are powerful seems clear. These considerations force attention toward the construction of principles of universal grammar and away from simple descriptive semantics. That they are also reasonable can ultimately be judged only by the fruitfulness of the theories that arise from taking them seriously. I have tried to show the fecundity of this approach in one small domain.

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Notes

Introduction

1. The picture of the child as a "little linguist" is thus somewhat misleading. The child's task and the theoreticians are parallel but not identical. Both must project from finite data to a grammar capable of generating a practically infinite set. However, the evidence that each can exploit in performing this task is significantly different.

2. This logical problem of language acquisition is identical to the issue of explanatory adequacy.

3. With the possible exception of Platonist approaches such as those developed by Katz (1981) and Soames (1984). I have nothing to say about them here.

4. I have argued elsewhere that syntactic methods are *a priori* preferable given the psychological perspective adumbrated above. For discussion see Hornstein 1988a, 1988b, forthcoming.

Chapter 1

1. For a discussion of the various ways time specification is marked in natural language, see Comrie 1985.

2. See chapter 1 of Comrie 1985 for discussion.

3. But see Eng 1981 and Hornstein 1981, as well as Enc 1987.

4. This supposition is examined extensively in chapter 3.

5. The structure of the future and the present perfect will be discussed more fully below. Where these tense structures come from is discussed extensively in chapter 3. For the time being, I treat these structures as given.

6. Temporal adverbs do not modify the S point. It appears that modification of deictic elements is, in general, quite infelicitous:

(i) ?* Here, which is near Detroit, is far from there

?*I, who Bill adores, am hungry

Why this should be, however, remains unclear.

7. The discussion concerning the use of tense in narratives carries over to the interpretation of these adverbs. In the right context, they refer not to the actual moment of utterance but to the time established by the narrative.

8. Examples such as these carry a restricted interpretation in English. They suggest that the event is scheduled to take place tomorrow. This restriction appears to be idiosyncratic to English. Peter Coopmans tells me that sentences such as "It rains tomorrow" are fine in Dutch on the normal future interpretation. I will assume that the pecadillos of the English construction can be ignored for present purposes.

9. The asterisk is meant to indicate that the sentence is unacceptable with a pure temporal interpretation. See below for discussion.

10. Placing the vertical line between R and E on the comma is intended to indicate that the adverb can modify either element. However, as the two are associated, they move in tandem. This assumption just eases exposition. Nothing changes if it is assumed that a given adverb modifies just one of two associated elements, moving it alone and leaving the other in its BTS position.

In the case of two adverbs, each modifying one of the points R and E, movement of the points is independent.

11. Peter Coopmans informs me that the same holds true in Dutch.

12. I have treated sentences like (16c) as unacceptable. However, there is a use of the historical present which some have claimed allows these sorts of constructions, though to my ear they are quite marginal. Let us, nonetheless, assume that analogues of this construction are fine. Examples (i) and (ii) are from Wachtel 1982.

(i) John comes home yesterday

(ii) John is coming home yesterday

Are these inconsistent with the theory presented above? Not necessarily. Recall that S, though normally interpreted as the speech time, can take on other values under certain conditions. The paradigm case is the historical present discussed above in example (2). In these cases, S is interpreted as the saliently identified historical moment. (i) and (ii) can be seen as instances of this. Indeed, these two sentences have the narrative flavor characteristic of the use of the historical present. In (i) and (ii) we can take *yesterday as* reorienting the value of S to yesterday rather than to the moment of speech. In this case, *yesterday* is modifying S, changing its value. Here the adverb reorients the deictic value of S rather than modifying R or E. As all three points are associated, however, E will be interpreted as temporally located in the past.

This process by which adverbs can reorient the S point is highly restricted. Indeed, the historical present itself is quite distinctive. Consider the following narrative:

(iii) a. ??John sits in his favorite armchair yesterday, and gulps down a beer.

b. ?* John is sitting in his favorite armchair yesterday and is gulping down a beer.

c. ? John sits in his favorite armchair right now and gulps down a beer.

d. John is sitting in his favorite armchair right now and is drinking a beer.

These sentences have great difficulty standing alone, unlike their simple past analogues. They require the story to continue. In addition, (iiib) seems far worse than (iiia). But if we change the adverb from *yesterday* to *right now*, the judgments reverse and the (c) sentence becomes less acceptable than the (d) sentence. The reason is clearly related to the fact that most verbs in English relate to the temporal present using the progressive form. However, when we go to the historical present these same verbs are preferably put in the simple present rather than the progressive.

The restrictions on the use of the historical present are rather subtle. For example, in the course of a narrative one cannot move back and forth between the past tense and the historical present. Once one switches, the present tense must be maintained. The narrative in (ivb) is odd because the second sentence is in the historical present, though the rest is not.

(iv) a. Yesterday, John goes into a bar. He orders a drink. He begins a conversation before leaving. He forgets to pay.

b. ??Yesterday, John went into a bar. He orders a drink. He began a conversation before leaving. He forgets to pay.

Just what the restrictions on the use of the historical present are is beyond the scope of this study. My only point is that it is not odd to segregate it from other uses.

The present tense in English clearly has interpretive roles beyond temporally locating an event. We will see that even when its role is not to temporally locate events, it generally adheres to the restrictions proposed below.

The use of the historical present in cases such as (i)–(iii) above does not occur in languages closely related to English. In German, one cannot say (v).

(v) *Gestern gehe ich ins Kino
"I go/am going to the movies yesterday"

One must use a tense referring to the past, as in (vi).

(vi) Gestern bin ich ins Kino gegangen
"I went to the movies yesterday"

In French, similar facts obtain. Though one can use the historical present to narrate an account of past events, sentences such as (vii) are decidedly odd.

(vii) * J'arrive de Paris hier

What is odd here is not the historical present. Rather, it is using the present with a past adverbial *(hier)*. The S point can be oriented to yesterday but not by appending an adverb to the clause as in (vii)

In short, the use of the historical present with past adverbials, as in (i) and (ii) above, on the assumption that it exists at all, seems quite idiosyncratic to English. I would like to thank Gunther Pfister and Jean-Roger Vergnaud for providing me with the German and French data.

The examples that Wachtel cites are not obviously problematic for the theory outlined below. It is possible to accommodate his data within the present

framework of assumptions. Still, I believe that his data do not represent a central case. To my ear, the English cases are quite infelicitous. In German and French, the analogous constructions seem quite unacceptable.

13. It is well known that the range of adverbs that the present perfect can take in English is limited. It is decidedly odd to say "John has left yesterday". However, as Comrie points out, this restriction is cross-linguistically unusual. He points out that languages similar to English that have a present perfect do not similarly restrict the range of adverbs. He cites data from Norwegian (p. 32):

i natt har jeg sovet godt
? "Last night I have slept well"

Because English has these restrictions, I have chosen more appropriate adverbs.

14. These examples are from Comrie 1985 (p. 34).

15. Comrie (1985, p. 71), criticizing claims made in Hornstein 1977, points out that sentences such as (i) below are acceptable with the interpretation where E is prior to S.

(i) John will have finished his manuscript by tomorrow

Comrie observes that the unacceptable sentences cited in (27) are indeed unacceptable; however, he suggests tracing their unacceptability to pragmatic factors having to do with the implicatures that utterances of these sentences would typically invoke. (i), above, leaves the event time unspecified, though the sentence cannot be used by someone who thinks that John has already finished his oeuvre.

The facts cited by Comrie are important and interesting. However, it is unclear whether they imply that the unacceptability of the sentences in (27) should be traced to pragmatic considerations or whether the acceptability of (i) should be so explained. In other words, one might treat (i) as semantically deviant (i.e., strictly speaking false) if it should turn out that E is prior to S no matter how pragmatically clear it is under the circumstances. This would make the position of E between R and S part of the meaning of the future perfect. This implies that semantic deviance does not imply incomprehensibility.

I do not see any principled way to arbitrate between these alternatives. However, I think that Comrie's point is probably correct. Below, I will suggest an alternative interpretation of tense structures that accommodates Comrie's objection. It incorporates within a Reichenbachian scheme an analysis similar to the one that he puts forward.

16. The judgments concerning (27c) are less clear cut than is stated here. The discussion of note 12 is relevant here as well. The emendation made below to accommodate Comire's remarks concerning (27a) will extend to these cases as well. On the amended version of the theory, the DTS in (35a) will be well formed whereas the DTS in (35b) will be ruled out by the CDTS. See section 2.3 and chapter 3.

17. Below, the CDTS is reinterpreted to allow (35a) to be well formed. (35b) continues to violate the CDTS even on the revised version. This comports well with the interpretations of these sentences. Thus, though it seems possible under

the right pragmatic conditions to treat the E point as contemporaneous with the moment of speech, it seems that the R point is always in the future relative to the speech time. Thus, both (27a) and (27c) are unambiguous, when acceptable. This follows from the CDTS.

18. Recall that the range of adverbs that the present perfect can take is restricted for various reasons.

19. Observe, incidentally, that the prohibition against the modification of S cannot be a semantic one. R is associated with S and can be modified. Thus, S can be derivatively modified via its association with R. However, it cannot have adverbs mapped onto it directly.

20. This approach originated with Bennett and Partee (1978).

21. This interpretation of the present prefect is a feature of those sentences in which S is deictically anchored to the moment of speech. S, however, is not always interpreted in this way. In subordinate clauses, S can obtain an interpretation by being linked to another element. This method of interpretation is very different from the default interpretive rule that maps S onto the moment of speech. The intimate interpretive relationship between S and R discussed above is tied to those cases in which S is deictically anchored to the utterance time, not simply to cases in which S is interpreted as the moment of speech. Interpretively, these two cases are indistinguishable. However, interpreting S as the moment of speech because it is linked to another element that is so interpreted is formally different from directly interpreting S in this way. We will see below that this difference has more than metaphysical significance. See section 2.5.

22. These "bunched" adverbials might well form single constituents that are hierarchically organized. In fact, this might be the only way for multiple adverbials to inhabit a sentence. For some discussion, see note 16 to chapter 3.

23. This is essentially the same problem noted in conjunction with example (35). See note 15 above for discussion.

24. Recall that the notion "the moment of speech" is itself variable. It can refer to the speech time set up within a narrative. The default case is the actual moment of utterance, but it is not the only value the deictic element can assume. See the discussion relating to example (2) above.

25. The principle suggested here is conceptually quite close to the Bijection Principle postulated by Koopman and Sportiche. As will be shown below, the relevant condition is not to interpretation but to the syntax of DTS. Basically, the mapping between adverb positions and R and E points cannot be many to one. This is very similar to the prohibition against an operator locally binding more than one variable, i.e., the Bijection Principle. It is also similar in spirit to the theta criterion, which requires a one-to-one relationship between theta roles and their bearers. For some further discussion of this issue see chapter 3.

26. As is well known, modals have both root and epistemic senses. This is especially true of *can. Could* is the past tense of the root interpretation. There is a reading of (72d) with *could* which is fine, but it is the root reading. The epistemic reading is bad. This reading is available with the adverbs *now* and *tomorrow*.

The discussion in this section does not do justice to the complexity of the English modal system, though it suffices for current concerns. For example, I assume that "modal + have" designates the past tense of a modal form. This is not incorrect as far as it goes, but it does not go far. *Could,* not *could have, is the* past tense of *can* where the latter means "have the ability". For some discussion of this case, see Cross 1986.

27. This observation is due to Jonathan Kaye.

28. The modal nature becomes more evident when *any* is considered. It is well known that *any* is most felicitous when placed within the scope of a modal. It seems that imperatives "license" *any* phrases:

(i) Leave this instant on any available flight

Moveover, analogues of (20b) do as well:

(ii) John will leave this very *instant* on any available flight

This contrasts with cases such as (iii):

(iii) *John left yesterday on any available flight

The fact that (ii) patterns with the imperative sentence (i) in licensing an *any* phrase supports the contention that (20h) is well formed because it can carry an imperative interpretation.

Further support for this position comes from sentences such as (iv) and (v).

(iv) ?? It will rain right now

(v) It will rain tomorrow

(iv) is clearly odd. The reason is that it is odd to command it to rain. It is not similarly odd to predict that it will rain, and thus (v) is fine.

Finally, consider (vi):

(vi) You will leave tomorrow on any flight

This sentence has an imperatival force to it, as one would expect. It is not a simple prediction of future behavior. If the lack of imperatival force is made clear, oddness results:

(vii) ?? I simply believe that you will leave tomorrow on any flight.

29. See Braroe 1974, for example. The use of higher verbs, however, was characteristic of much of the general semantics literature.

Chapter 2

1. Yip (1984) argues that the acceptability of embedding a present under a future is idiosyncratic to English. This is incorrect. One can get present under future in French as well:

(i) Je suis sur qu'il arriveront tons au moment que/quand tu manges

(i) contrasts very strongly with the unacceptable (ii).

(ii) *Je suis sur qu'il arriveront tous au moment que/quand tu a mange

I would like to thank Jean Roger Vergnaud for discussion on this point. Peter Coopmans informs me that Dutch has the same pattern as French.

2. The RTC requires that S points associate. However, it may not be necessary to state this explicitly in the rule. See section 5.2 for discussion.

3. I assume the definition of government proposed by Belletti and Rizzi (1981): A governs B iff A and B share all maximal projections, and if B is maximal then A also governs the head of B. Observe that this definition of government is asymmetrical. It is possible for A to govern B without B's governing A. For example, in (i) A° governs B° but not vice versa.

(i) [AO . [Bmax . BO . . . [

4. This indicates that in the CTS schematism a place must be left for features of the connective. In fact, the temporal connective and the tense of the sentential adjunct together modify the matrix clause.

5. It should be clear that the restriction against associating points in DTS not already associated in BTS is restricted to apply *within a* BTS. R_2 does come to be associated with R_1 by means of the RTC. This association is permitted by the CDTS. The constraint applies only to points within a BTS.

6. This restriction on use is, plausibly, due to pragmatic considerations (see note 8). By locating an event relative to the moment of speech, one is providing more information about that event than if one locates it relative to an earlier event whose exact temporal specification is less exact than the utterance moment.

7. One way of representing this is to use two-dimensional representational formats for tenses, as Comrie (1985) does. Within such a format we would represent the past and future perfect as in (i).

(i) a. R_S

E

b. S_R

I will refrain, for reasons of convenience, from adopting this notation. However, if one takes the view that tenses are actually composed of two separate relations, then this sort of representational format is the most perspicuous.

8. Either of these approaches to tenses is different from the one I advanced in Hornstein 1977, where I assumed that a tense was not decomposable into two separate subparts. Rather, every tense specified an S/E relationship, both for purposes of syntax and for most purposes of temporal interpretation (but see section 2.7 of the 1977 paper). In other words, I assumed that temporal interpretation was transparently represented in tenses determined by the specification of three relations: S/R, R/E, and S/E.

I have changed my mind concerning these issues as a result of Comrie 1985. On pages 70-72 Comrie provides interesting data against this interpretation. Though he agrees that sentences such as (i) are odd, he provides a pragmatic account for why they have this status.

(i) *John will have finished at this moment
*John will have finished yesterday

These sentences were discussed in chapter 1. There I assumed that they should be excluded as they violated the CDTS, on the assumption that the future perfect has the tense representation R. As is noted in the text, it is possible to maintain the CDTS as a syntactic constraint while adopting Comrie's observations concerning the interpretation of the future perfect by treating the mapping from tense structures to temporal interpretations as not fully transparent. Practically, this would mean determining the temporal interpretations of well-formed tense structures by considering S/R and R/E relations alone. Thus, though syntactically the S/E relationship is treated as fixed, interpretively it is treated as derivative.

The advantage of this sort of mixed theory is that one could exclude sentences such as (i) on grammatical rather than pragmatic grounds. Pragmatic explanations are notoriously fuzzy, and so this might be reason enough to prefer a mixed theory. To my mind, however, this is hardly decisive. Pragmatic considerations do affect acceptability, so there is little reason to abstain from them on principle.

Comrie provides one further empirical example which supports the view that transparency should be maintained but that tense structures should be seen as leaving S/E relations indeterminate. It is given here as (ii).

(ii) If it rains tomorrow we will have worked in vain yesterday

Comrie (1985, p. 73) observes that in this case *yesterday* modifies a past event. For the theory developed here, this is of import, as it would destroy linearity if the future perfect has the BTS S_E_R. *Yesterday* would move the E point to the left of S and violate the CDTS.

The logic strikes me as clear. My problem is with the data. Sentences such as (ii) are somewhat marginal. Compare (ii) with (iii), which carries virtually the same meaning.

(iii) If it rains tomorrow then we worked in vain yesterday.

(iii) sounds far better than (ii). Indeed, many speakers, myself included, find (ii) decidedly odd.

This said, I believe that Comrie is probably correct and that there are strong reasons for treating the *syntax* of tenses so that S/E relations are not represented except derivatively. This assumption results in a more constrained theory of tense. See chapter 3 for discussion.

9. See Comrie 1985 for a discussion of the pragmatic parameters.

10. Recall that in chapter 1 I noted that the present perfect, when interpreted with a future adverbial, did not permit the dissociation of S and R. As these more complex cases indicate, this is clearly not true in general. In this case, we must dissociate the two to obtain an adequate temporal interpretation.

11. It might be objected that it is infelicitous in general to have a future tense inside a temporal adjunct clause, as in (i) below.

(i) ?John will leave when Harry will sing

However, this cannot be the whole story. First, as (ii) shows, sentences such as (i) are quite acceptable in French.

(ii) J'irai quand Jean arrivera
"I will leave when John will come"

Nonetheless, (iii) is unacceptable.

(iii) * Je part quand Jean arrivera
"I leave when John will come"

Second, whatever the unacceptability of (i), it is far better than (iv).

(iv) * John is leaving when I will come

12. The distinction between syntactic well-formedness and temporal interpretation is an important one. Failure to keep this distinction firmly in mind vitiates criticisms lodged against an earlier version of this theory by Wachtel (1982). It is not a weakness of the theory that the CDTS abstracts away from issues of temporal interpretation. To receive an interpretation, a CTS must comply with the CDTS. However, what its specific interpretation is depends on the tenses involved and the connectives linking them. We will discuss some details of the latter below. However, Wachtel (1982) often takes necessary conditions to be sufficient as well. The account presented here, as well as the one Wachtel criticized, should not be interpreted in such a way.

13. On page 544 of Hornstein 1977, I claimed that it was possible to embed a past tense under a future perfect with the connective *since.* I now believe that this is factually incorrect. There is a clear difference in the relative acceptability of (ia) and (ib).

(i) a. Bill has eaten a lot since he's been ill

b. * Bill has eaten a lot since he was ill

The unacceptability of (ib) is what the theory outlined here leads us to expect.

However, this said, the data relating to *since* are often somewhat unclear. I suspect that this results from the fact that it is an ambiguous connective. *Since* carries both a temporal interpretation and a causal one. Thus, (ib) seems perfectly acceptable if *since* is interpreted to mean *because.* If we abstract away from this interpretation, however, the sentences become quite unacceptable. Consider (ii).

(ii) a. I've distrusted John since I've known him

b. *I've distrusted John since I knew him

It is implausible to construe *since in* (ii) with a causal meaning. This leaves only the temporal reading. On this reading, (iia) is perfectly acceptable and (iib) is not. This is what we would expect given the CDTS.

I suspect that this sort of confound is quite typical with these sorts of sentences. There is, after all, a strong connection between causality and time. It would not be surprising if the temporal connectives partook of both interpretations. Indeed, Peter Coopmans informs me that (26g) is fully acceptable in Dutch. However, in this case *after* assumes a reading like *since.* Thus, we get the

same sort of causal reading for these cases in Dutch as we do for the *since* cases in English.

14. It is hard to locate an event relative to a possible event. For this reason, it should be hard to find relevant examples with modals in the adjunct clause.

15. Much of the discussion in this section is a revised version of pages 546ff. of Hornstein 1977.

16. As (i) below demonstrates, it is preferable to use the progressive form with *while in* the case of (33b).

(i) John scored while Frank was leaving the goal crease

For present purposes the aspectual properties are not very important, so I will ignore them.

17. I have chosen verbs that can be taken as specifying punctual events. Contemporaneousness is relative to the event types involved. For punctual events it means simultaneity; for events extended in time it requires overlap. If we put the unacceptable sentences in (36) into the progressive, then we get acceptable sentences once again. In (i) John's entrance overlaps with Mary's departure.

(i) John had been entering as/while Mary left

However, when this interpretation is precluded, oddness results.

The interaction of tense and aspect is an important topic. However, it falls outside the focus of this work.

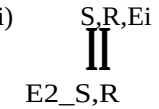
18. This is not intended to be an analysis of *already*. All that is required is the empirical data in this particular set of cases.

19. There is a secondary conjunctive interpretation that all these connectives shade into. They get an interpretation similar to *and in* these contexts. *And* is not a temporal connective, and these conjunctive interpretations do not tell against the theory.

20. I am not going to discuss the simple present tense. It has many interpretations that are nontemporal. However, the CTSs always render the relative temporal relationships of the E points accurately enough. (i) has a generic interpretation.

(i) John plays well when he has rested

It says that whenever John plays well he has come off of a rest. The CTS is (ii).

(ii)


(ii) accurately renders the relative temporal position of the two events. However, it does not say how to further interpret the present tense. Clearly, "S" should not be interpreted as the utterance time in generic constructions such as (i). However, how it should be interpreted lies beyond my present concerns. Suffice it to say that the interpretation of generics is notoriously obscure.

21. Wachtel (1982) discussed these cases. He argued that they created insurmountable problems for this sort of theory of tense. However, he assumes that the tense system alone suffices to yield *all* the aspects of the temporal interpretations that obtain. If one allows a role for pragmatic factors, such as those which Comrie (1985) motivates, Wachtel's arguments loose their force.

22. Partee (1973) points out a case which one might treat as the pragmatic restricting of the range of temporal interpretations. If you say (i) while driving down the freeway, then it most likely means that there is some specific time at which you did not turn off the stove and this time is in the past.

(i) I didn't turn off the stove

Eng (1981, p. 65ff.) explains Partee's observation by claiming that the domain of relevant time intervals is pragmatically determined, as is the domain of individuals for the semantic evaluation of quantification. Pragmatic considerations, Eng argues, can dramatically restrict the domain of temporal evaluation. This is important, for it indicates that the full properties of a sentence's temporal interpretations will depend not only on the properties of the tense system but also on pragmatic features of the discourse situation.

23. The relationship of the E points to S follows the interpretive procedures outlined above. As they are not problematic in any way, I will refrain from discussing them further.

24. Why *before* has a counterfactual interpretation in addition to the temporal one is left unexplained. It is clearly a feature of the lexical semantics of *before, as* the contrast with *after* indicates. My hunch is that the counterfactual reading is related to the fact that temporal priority is strongly associated with causality. In (i) we often take Harry's departure to be caused by Sam's impending arrival.

(i) Harry left before Sam arrived

Counterfactuals typically supervene on causal relations. We will see in the next section that conditionals that are often given counterfactual glosses in *if . . . then* construction display CTSs similar to the ones underlying counterfactual *before.* This is similar to what was observed in the case of *since in* note 13 above.

25. The problem of how E_2 is to be interpreted relative to the moment of speech does not arise in the case of (71a), as the event does not occur temporally. When the entailment is canceled and the event can be interpreted as possibly occurring, its occurrence is once again after the utterance time. The same reasoning that applied in the case of *when* concerning these CTSs extends to these cases. S/E relations cannot be read directly off CTSs. The relationship between E and S is indeterminate under the interpretive procedures I have adopted. In addition, pragmatic considerations enter to favor interpreting E_2 as after the time of utterance.

26. These were discussed by Heinamakki (1972).

27. The relevant papers are Dudman 1983, 1984a, 1984b.

28. These examples are from Dudman 1984a (page 147, examples 10-14).

29. These last several sentences paraphrase Dudman (1983, p. 35).

30. It is not clear that the ability for the component sentences to stand alone is constitutive of type 1 conditionals. Sentences such as (i) below seems best analyzed as type 1 despite the fact that (ii) does not stand alone in English.

(i) If John comes tomorrow then he sold his house yesterday

(ii) John comes tomorrow

31. Dudman observes that it is possible to get past tensed If clauses under modals, as in (i) below.

(i) In those days Grannie would/might walk home if she missed the last bus

In chapter 1, I noted that modals carried tense. The simple modal was treated as bearing present tense whereas past tense was realized in *modal + have* structures. This would seem to indicate that (i) violates the CDTS. However, this would be an incorrect conclusion to draw. It appears that *might* and *would* have past-tense properties. When these modals appear with adverbs such as *in those days, we* get acceptable sentences such as (ii) below.

(ii) In those days, Grannie would/could/might dance

However, with other past adverbials this is impossible; consider (iii) and (iv).

(iii) * Granny would/might dance yesterday

(iv) Grannie would/might have danced yesterday

What forms modals take when realizing the past tense is a complicated issue. *Could,* for example, is both the past tense of *can* and a simple present-tense modal. What is important for my purposes here is that sentence (i) above does not constitute a true problem for the present analysis. For some diachronic observations concerning the issue of what modals realize what tense, see Lightfoot 1972.

32. To make the translation between sentences and their CTSs as transparent as possible, I have put the *if* clause after the matrix, rather than before it as Dudman does.

33. The past-tense form of these sentences can have what appears to be a simple past form in place of the *were to + V,* as (i) demonstrates.

(i) Grannie would walk home if she missed the bus tomorrow

However, the presence of *tomorrow* indicates that this is not really the past tense but a form of the subjunctive or conditional. As Dudman points out, in sentences like (i) the *were to + V* freely substitutes with the other form. I will assume that these are simply variants of one another. The subjunctive is not very robust in English, and it is likely that the form of the subjunctive is being absorbed into that of the simple past. *Were to + V* is a present-tense form. Consider (ii) below.

(ii) * If John were to leave yesterday. . . .

34. The structure underlying (83c) is similar to the one underlying counterfactual *before in (i):*

(i) John left before he had stolen the silverware

35. See example (83) in chapter 1 as well.

Chapter 3

1. This is the degree-0 learnability assumption. For a discussion and a defense of this assumption, see Lightfoot 1989.

2. We will return to the details of sequence-of-tense phenomena in chapters 4 and 5.

3. This is the view I adopted in Hornstein 1977 and Hornstein 1981.

4. It can also increase it. For example, if one allowed a tense to have more than one R or E point then this would increase the number of possible tenses. I will not consider theories that allow a more expansive range of possible tenses here. It is clear that it is better to move to these more expansive sorts of theories only if forced to do so.

5. For the shift from rule-based to principle-based theories of grammar, see Chomsky 1983 and Chomsky 1986.

6. This point is of methodological interest as well. It is often assumed that LF (logical form; the structure underlying interpretation) is too remote from experience to be fixed by it, so that whatever form it has must be fixed by principles of UG. Nothing could be further from the truth. If the syntax of logical form is transparently related to interpretation, then no greater problem arises in relating its structure to PLD than in relating phonological form to phonetic form. The structure of LF will be opaque to PLD if and only if the mapping between the two is not transparent (i.e. the structure and organization of LF is richer than the interpretive information it underlies). In the case of tense this is easy to see, as we have some idea concerning what the "semantic" value of a tense is. In other domains of interpretation this point is less obvious, for we are unsure as to what the appropriate semantic values are. In other words, we have nothing equivalent to phonetics in the domain of semantics, as the earliest work within generative grammar strenuously observed (see chapter 9 of Chomsky 1957). At anv rate, it indicates that the *a priori* conviction that LF must be shared across languages and that it cannot be parametrized because of remoteness from experience is quite tendentious. It all depends on what one takes semantic values to consist in. Our current ignorance concerning this question is too great for us to conclude anything with much conviction.

7. For a standard presentation of the approach of tense logicians, see McCarthur 1977. McCawley 1972 offers a generative-semantic approach that shares relevant properties with the one favored by tense logicians.

8. The present is not usually counted among the basic tenses. Rather, a proposition without a past or a future operator is evaluated relative to a designated constant (usually the speech time). This is clearly not necessary, however. One could introduce a present-tense operator as well, as in Dowty 1982.

Dowty's a˙:.tual theory departs from standard theories by incorporating something very close to a Reichenbachian reference point—see his example (22) on page 32. In addition, Dowty ends up treating the present perfect as a different kind of tense. Following Bennett and Partee (1978), he treats the present perfect as designating an "extended now"—"an interval beginning in the past and ex-

tending up to and including the time of speech" (p. 27). Dowty says little concerning the past the future perfect in this paper, however.

9. See McCawley 197X.

10. Dowty's (1982) theory is *not a* theory of this sort. He introduces a double indexing account, which has certain analogies with Reichenbach's original theory (p. 31). However, unlike Reichenbach, Dowty does not specify an event time E. His indices refer to the speech time and a reference time only. It is unclear how Dowty could represent the data discussed here without introducing the functional equivalent of an event time E. As Comrie (1981, 1985) observes, the interpretation of the "have " in the English present perfect is not akin to its interpretation in the past and future perfect. It is hard to see, therefore, how one could generalize Dowty's approach to the cases under discussion here without developing a theory with an E point.

We should expect relatively little difficulty in ignoring the E point so long as we stick to the past, present, and future tenses. The reason is that the event time E is contemporaneous with the reference time R. So long as this fact holds, ignoring E is relatively safe. Indeed, it is not much different from ignoring R. However, the difficulties should become evident when R and E diverge—i.e., in the past and future perfect.

11. The treatment of this ambiguity using the other notation should be straightforward. There are several operators nested in the structure. Depending on which one the operator modifies, we obtain one or another representation. The ambiguity of the past and future perfect structures is related to the fact the there are several operators.

However, this sort of treatment requires approaching adverbs as modifiers rather than operators. In other words, they act to restrict the range of the relevant tense, rather than introducing a new point or interval in relation to which the point or interval introduced by the tense is evaluated. This "restricting" function is characteristic of modifiers. Of course, given enough interpretive alchemy, one can turn an operator into a modifier and vice versa. However, it seems that one is missing a serious distinction in doing so. See the discussion in chapter 5 concerning the distinction between adverbs and operators.

12. Indeed, one *can* find such multiple reference points in very complex sentences, but these extra points are introduced by actual embedding of infinitival sentences syntactically. We will consider some similar cases in chapter 4. Comrie (1981, p. 27) makes the observation that multiple reference points are possible though very awkward. Comrie concludes that this indicates that Reichenbach is wrong to set a limit of one R point per tense. However, his counterexample only indicates that multiply embedded sentences have more than a single R point. However, this does not imply that a basic tense needs more than one R point. Rather, it suggests that Reichenbach's theory must be supplemented to include an account of embedding and an account of infinitivals. Such an extension is proposed below in chapters 4 and 5.

13. See Berwick and Weinberg 1984 for discussion. They show that subjacency, for example, involves the notion of "next" clause rather than counting predicates.

14. This latter possibility is not really the straw man it might appear to be. Tense logicians do not really address the issue of what constitutes a possible tense; neither do linguists and philosophers of language influenced by this style of theorizing. The practical effect is twofold: Either the issue is ignored and less complex tense phenomena are the focus of attention, or it is simply assumed that if the need arises another primitive tense can always be added and its properties investigated. Neither option is attractive once one takes the logical problem of acquistion seriously. From this perspective, providing nontrivial theories that demarcate the range of possible tenses is of central concern.

15. The full account is given in sections 1.3 and 1.4 above.

16. Adverbial clusters might well be hierarchically structured so that all we really have are two adverb phrases per sentence. This would follow if the principle of full interpretation were interpreted so that the theta criterion became a special instance of it.

Assume that the PFI has two parts. First, every occurring element must be interpreted (e.g., must get a theta role). Second, every element can be modified by at most one modifier (e.g., an element can bear at most one theta role). The PFI, if seen in this way, is easily extended to cover the tense system. One result of the PFI in this domain will be that a given SRE point can be modified by at most one adverb. Another will be that a given SRE point can be anchored in one way only. This version of the PFI also implies that adverbial clusters of the sort discussed in the text actually form single adverbs and are hierarchically structured. This implication sits well with the proposal that phrase markers respect a principle of binary branching (see Kayne 1984).

David Lebeaux has pointed out to me that this has implications for other parts of the grammar. For example, it suggests that multiple adjectives form a hierarchical structure; they are never flat. There is some evidence to suggest that this is indeed correct. Consider adjectives such as "toy" and "fake" in (i).

(i) a. a toy gun
    b. a fake doubloon

These adjectives function differently from more regular adjectives such as "red" and "large". Most important, a toy gun is not a gun but a toy, and a fake doubloon is not a doubloon. However, a red house is a house. Now consider multiple adjectives, as in (ii).

(ii) a. toy American pistol
     b. American toy pistol
     c. fake American doubloon
     d. American fake doubloon

(iia) denotes a toy Colt 45 or a toy Remington. However, it cannot appropriately pick out a toy Luger, since a Luger is a German pistol and not an American one. This contrasts with (iib). However, if flat structures were an option, one would expect both interpretations to be available in both cases. A flat structure would allow both adjectives to modify the noun without either one modifying the other.

Similarly for (iic) and (iid). (iic) denotes a counterfeit American coin. The coin picked out by (iid) is most likely not American. The doubloon was a Spanish coin. The fact that (iic) cannot be interpreted as (iid) suggests that "American" is modified by "fake" in the former but not in the latter. Once again, this would follow if binary branching were required.

For regular adjectives, this effect would be invisible. A big red house is also a red big house. These more typical adjectives do not cancel the semantic values of what they modify.

Chomsky (1965, pp. 196-197) argues that hierarchical structure for multiple adjectives is not a necessary assumption. He is correct. However, the evidence above indicates that it might nonetheless be a correct assumption. Furthermore, we could force it by interpreting the PFI as indicated above. Chomsky's strongest counterarguments to this proposal involve the phrase structure of coordinate constituents. Nothing said here extends to coordination.

In what follows, I assume that this sort of interpretation of the PFI is tenable and that multiple adverbial structures are indeed hierarchically structured.

17. In chapter 5, I will argue that SRE points are essentially adverbs. Thus, R1 modifies R2 in (28). If R points were eliminated, then E_2 would be modified by two adverbials, and this is not permitted by the version of the PFI adopted in note 16.

18. Recall that in adverbial structures the S points are linked.

19. If the direct anchoring of the event time by the utterance time is prohibited by universal grammar, then Reichenbach's discovery of the R point constitutes a deep fact about the structure of natural-language tenses. There is nothing necessary in this fact. Indeed, if correct, it exploits an intuition directly at odds with most traditional approaches to tense, which construe the primary interpretive relation as holding between the event time and the utterance time.

20. In chapter 1, I claimed that only R or E could be modified by a temporal adverbial. Why not S? The reason given there was that deictic elements are never modifiable. Thus, *1* or *you* is never seen with adjectival modifiers. Once we decompose tenses into SR and RE relations, a structural analogy between R and E emerges. Both are dependents in one of the constructions. Thus, in the SR relation, S is the anchor and R the dependent. In the RE relation, R is the anchor and E the dependent. The modifiability of R and E can perhaps be traced to their dependent status. This suggests that when R functions only as an anchor, it cannot be adverbially modified. This seems to be correct. See section 3.8 and chapter 4 for discussions of gerunds and infinitivals.

21. What is less clear, in my opinion, is that Reichenbach is committed to the interpretation that Comrie makes of his system. Reichenbach also sees tenses as composite; as made up of two separable SR and RE relations. As such, it is not a gross distortion, if it be distortion at all, to interpret him as claiming that SE relations are indeterminate where not independently fixed by properties of the SR and RE relations. See Reichenbach 1947, p. 296ff.

22. This assumes that examples (35) in chapter 1 are handled as suggested in note 14 of chapter 1. In these cases it is possible to interpret S and E as contem-

poraneous under the right pragmatic conditions, as Comrie suggests. However, it is impossible to interpret R as contemporaneous with S. This is what we would expect. See note 8 of chapter 2 for further discussion.

23. We could put this more abstractly or obscurely as follows: "Where the order of two points is not intrinsically determined, assume that the linear order of the anchors to the dependent in both relations is the same." In the SR relation, S is the anchor and R the dependent. In th RE relation, R is the anchor and E the dependent.

This principle is not explicable in terms of the semantics of the tense system. By hypothesis, elements separated by a comma are interpreted as contemporaneous. Consequently, they are not intrinsically ordered (i.e., ordered by the temporal semantics of the tense).

This conclusion relies on the assumption that the comma indicates contemporaneousness. However, if it designated a nonsymmetric temporal relation, then an intrinsic ordering would be induced. Yip (1984) suggests that the comma be interpreted as "less than or equal to". In this case, S,R, E would not be equivalent to S,E,R.

However, it is not clear how helpful this assumption is. The problem the comma raises is how we determine the BTS of a given tense on the basis of temporal information encoded in simple sentences. If we assume that the comma means "less than or equal to" we still do not know whether to represent the simple past, present, and future as in (i) or as in (ii).

(i) a. E,R_S
    b. S,R,E
    c. S_R,E

(ii) a. R,E_S
    b. S,E,R or E,R,S or E,S,R or R,S,E or R,E,S
    c. S_E,R

In other words, the problem with the comma comes in settling on what the BTS is, given the temporal interpretation of the sentence.

Yip provides an ingenious way around this difficulty. He sets up a markedness hierarchy in which the labeling of the SRE points must be consistent and must constrain the SE link. From these assumptions he derives a set of unmarked tenses. The future perfect tense, however, becomes a marked tense in this system, and the present perfect must be represented as E_R,S rather than as E_S,R, as proposed here.

This latter assumption leads to some difficulties. First, Yip has no real explanation for why sentences such as (iii) are well formed in English.

(iii) John will come when we have arrived

He suggests that this is formed by deleting the will from the adjunct clause. (iii) is derivationally related to (iv).

(iv) John will come when we will have arrived

The problem, however, cannot be solved so easily. We also get (va), but there is no source such as (vb).

(v) a. John may/should/can/come when we have arrived

b. *John may/should/can come when we may/should/can/will have arrived

The sentences in (vb) are ill formed. As such, they cannot be used to explain the acceptability of the (va) sentences. A second difficulty with Yip's analysis is that he must assume that English has two forms of the present tense: S,R,E and E,R,S. But this assumption leaves us with no explanation for why (vi) is not as acceptable as (vii).

(vi) *John arrives/is arriving yesterday

(vii) John is arriving yesterday.

These sorts of cases are discussed more fully in section 3.4.

Yip is also postulates a principle (which he dubs RP) that requires R points to remain immovable. This forces Yip (p. 9) to explain the acceptability of (viii) by a principle of economy of speech that alllows us to delete the future will.

(viii) a. John will come when we arrive

b. John will come when we will arrive

(viiia) is derived from (viiib) by deleting the will. Yip treats this rule as idiosyncratic to English, citing Jespersen that it does not hold in French.

There are three problems with Yip's approach. First, as is pointed out in note 1 to chapter 2 above, the French facts are simply incorrect. There is a clear contrast between (ixa) and (ixb), which also shows up in Dutch.

(ix) a. Je suis sur qu'il arriveront tous au moment que/quand tu manges

b. *Je suis sur qu'il arriveront tous au moment que/quand tu a mange

Second, the mechanics of Yip's rule are very unclear. It is not simply a matter of deleting the will, as becomes clear when one considers the third-person singular form. If Yip is right, where does the third-person ending come from in (x)?

(x) John will come when Mary arrives

This type of ending appears only with the present tense. Third, the source for the underlying sentence is not all that good. It has long been observed that the future is not felicitous in adverbial adjuncts. It is not horrendous, but it is hardly perfect. Consider (xi).

(xi) John will come when we will arrive

Yip might explain this as a violation of the principle of the economy of speech. However, why does this principle not extend to other tenses as well? Isn't it curious to invoke it for just this case?

There is one more difficulty with RP. Yip cannot account for the contrast between (xiia) and (xiib):

(xii) a. Tomorrow John leaves in a week

b. *In a week, John leaves tomorrow

With only one adverb in the clause, Yip might claim that it is only the E point that can be modified and moved. However, once multiple adverbs are invoked,

this is not really a tenable position to take. Cases such as (ix) require movement of the R point, contrary to RP.

The motivation for Yip's advocacy of RP is that he wishes to do away with the asymmetrical property of RTC. As was noted in chapter 2 above, which tense is on top matters to the operation of the system. Yip (p. 7) maintains that this asymmetry has no "obvious semantic explanation" and tries to do away with it.

However, aside from the empirical difficulties observed above, it is hard to see why we should have a *semantic* explanation of these facts. It was observed in chapter 2 that government is the characteristic relation that holds between interacting elements of the tense system. Government is an asymmetric notion when heads are involved. Thus, the asymmetry is natural enough on syntactic grounds. Furthermore, in chapter 5 I will show how to derive the fact that tense interactions are under government.

The government relation is something Yip also assumes. Sequence of tense is conditioned by government as well. Contrary to both Yip 1984 and Hornstein 1981, government, not subjacency, is the relevant locality condition.

One last critical point, but an important one: Yip interprets the commas as the asymmetric "less than and equal to" rather than simply as "equal to". This interpretation, however, faces significant semantic difficulties. It suggests that tenses such as the simple past, the future, and the present are ambiguous. Indeed, the simple past should be interpretable as similar to the past perfect under the "less than" part of the definition. What Yip's gloss of the comma implies is that when two points are associated, the interpretation of the tense should be ambiguous. But this is incorrect. These simple tenses are univocal. Indeed, unlike the future or the past perfect, when combined with adverbs they do not yield any ambiguity. Why not, given Yip's assumptions?

One way of focusing on the interpretive problems the assumption that the comma glosses as "less than or equal to" is to consider how such an account explains the temporal interpretation of the present tense. It has the structure S,R,E or E,R,S. Without adverbial modifiers, this makes the present tense six ways ambiguous. Using the interpretation of the comma as "same time as", we arrive at the disambiguated interpretations of Yip's present tense listed in (xiii).

(xiii) a. S_R_E
b. S_ R,E
c. S,R_E
d. E_R_S
e. E,R_S
f. E_R,S

Each of these disambiguated structures should be a possible temporal interpretation of the present tense. Thus, a sentence such as "John is sleeping" is really six ways ambiguous.

Yip attributes this interpretation to my earlier work (Hornstein 1977, 1981). However, in those papers I interpreted the comma as meaning contemporaneous with not "less than or equal to". Yip's gloss of the comma in the latter way arises from James Allen's formalism for tense and time, which he uses to derive some properties of the tense system. I cannot make out whether this

assumption is crucial for Yip. It seems to be crucial to deriving the constraints and the markedness hierarchy. However, it is clearly inadequate. Moreover, if Yip were to abandon this gloss in favor of contemporaneousness, then he would require some principles to induce extrinsic ordering of SRE points in cases where they are associated. I find it hard to say whether this would result in a system essentially equivalent to the one here.

I have argued that Yip's revisions encounter considerable difficulties. However, I should add that his work is extremely interesting. It would be worth trying to revamp the system to accommodate these concerns.

24. This is similar to Berwick and Weinberg's constraint (1984, p. 219) for the significance of the passive morpheme.

25. (43) allows two possible representations for the simple present. This might seem like one too many. However, there is some indication that in some languages the same morpheme marks the past and the present tense. This might be the case with Yoruba, Igbo, Hua, and Greenlandic Eskimo. For a very brief discussion of the first two, see Enc 1981, p. 58. Eng cites Comrie 1976 as a source of data. I owe the observations concerning Greenlandic to Alana John.

These data suggest a representation of the simple present as E,R,S. This might account for why the same construction that carries a present-tense interpretation can also be modified with the adverb "yesterday" but not with "tomorrow".

In the text, I have left open the possibility of an E,R,S representation of the present tense. If this should prove to be false, that would suggest making the form S,R,E of the simple present a substantive universal. Whether this is the right conclusion awaits further research.

26. The *pasee composee* is not analogous to the present perfect, but to the simple past. For example, it cannot be embedded under a future in a clausal adverbial structure. (i) has the status of the English sentence (ii).

(i) *Jean mangera apres qu'il a chante

"John will eat after he has sung"

(ii) *John will eat after he sang

One expresses (ii) in French by placing an infinitival in the adverbial clause, as in (iii).

(iii) Jean mangera apres avoir mange

This suggests that the *a* in (i) is not analogous to the present perfect *has* in English.

Two other bits of evidence support the conclusion that in French the *pasee composee* is not the analogue of the present perfect. First, it can take a full range of adverbs. Whereas (iva) is odd in English, (ivb) is perfectly well formed.

(iv) a. *John has sung last week

b. Jean a chante it y a une semaine

Second, the form of the auxiliary in French is verb dependent. Thus, both *etre* and *avoir* are used to form the *pasee composee,* depending on the verb. This

seems to indicate that the auxiliary *avoir in* French is different from *have in* English.

27. I am assuming that R,E is the canonical form here, rather than E,R. We might try to account for this by giving the present-tense form a certain central role to play in determining the linear order of RE points when not further specified. Thus, the "default" value is the linear relations that obtain in the simple present. This would give R,E as the representation for the gerund without an overt *have*. We could use this to supplement (42). However, not much hangs on this assumption, so I discuss it no further.

28. The numerals (i) and (ii) indicate that the indicated tenses must be chosen together. Thus, if a language has the first form of the present it cannot have the second form of the present perfect. Of course, it need not have the present-perfect tense of all.

Chapter 4

1. This is the verb of which the embedded clause is the argument.

2. The SOT rule will generalize to allow any point to associate with a higher E point. Thus, it is not restricted to S points. However, in finite clauses only S points will be able to associate with higher E points for independent reasons. Indeed, in chapter 5 I will show that virtually all the specific properties of the SOT rule follow without further stipulation from more general assumptions. The actual form of the rule can be simply stated as "Associate tense points". All the restrictions on this rule follow from more general considerations.

Below, I will argue that all tense points can function as deictic anchors in the sense of being liable to association by the SOT rule. Thus, the distinctive property of S is not that it can be deictically anchored, but rather that it can have a default interpretation which maps it onto some designated moment (the utterance time being the most common point).

3. I have benefited from Dig's (1987) discussion of SOT phenomena. Many of the example sentences are from her paper. I will discuss her particular treatment of SOT phenomena in detail in section 4.6.

4. I do not mean to suggest that the indirect speech statements are parasitic on the quotational forms used to specify the temporal relations between the clauses. Adverting to the quotational forms is simply a convenient way to make the exposition clear.

5. This terminology is borrowed from Eng (1987).

6. Russian is apparently a case in point. It seems that in Russian the equivalent of (i) can have the shifted SOT reading without any morphological change in the embedded verb form. In other words, in Russian the translation of (i) can mean what we say in English using (ii).

(i) John heard that Mary *is* pregnant

(ii) John heard that Mary *was* pregnant

These facts are points out on page 649 of Eng 1987.

David Lightfoot has pointed out to me that classical Greek is similar to Russian. The embedded tense in SOT constructions has the form used by the speaker. Thus, (i) would be the form of an SOT structure in classical Greek.

The fact that languages differ in this regard is important for two reasons. First, it indicates that semantic/interpretive phenomena can be parametrized. This is often denied—see note 6 to chapter 3. Second, it strongly suggests that the change in the form of the embedded verb is not a distinctive feature of SOT constructions. In other words, theories of SOT must extend to both English-like and Russian-like languages.

7. Sentence (7a) can be interpreted as making a simple claim. It need not mean that John thought that Harry was *supposed* to be leaving tomorrow. This is quite different from (8a). If (8a) is acceptable at all, it carries a counterfactual implicature when standing free. It suggests that Harry won't be leaving. (7a) carries no similar implicature.

8. This is to be read without an intonation break at the end of the sentence. Without the break, the adverb is read as modifying the downstairs tense, on analogy with "*John said that yesterday Harry would leave for New York".

9. This is of some interest, for it indicates that the adverb must be compatible with the tense rather than with the overall temporal interpretation of the sentence. The interpretation of (8c) allows Harry to have actually departed yesterday. However, we cannot specify this by appending *yesterday* to the shifted tense. Doing this violates the CDTS. In other words, adverbial modification must respect the principles of the tense system even when those principles are capable of supporting a different temporal interpretation. It is the syntax of the tense system, not the temporal interpretation, that is decisive.

Other examples of this same effect are evident in complex clauses. (i) has the reading in which Fred is in NY next week. However, (ii) is ill formed.

(i) John wanted to announce that Fred was in New York next week

(ii) *Fred was in New York next week

The acceptability of (i) follows from assumptions developed below concerning the application of SOT in infinitival clauses. The structure of (i) is shown in (iii).

(iii) ,R_S

R2,E2

S_R3,E3

next week

Observe that (iv) is ambiguous as well. Its two possible structures are given in (v). Note that under the shifted reading, (va), Fred is in New York at the time of the announcement. *Was* is the morphological form of the present tense *is* under SOT.

(iv) John wanted to announce next week that Fred was in New York

(v) a. E_1,R_S next week

R2-E2

S,R3,E3

b. E_1,R_S next week

R2-E2
S,R3,E3

The details of these cases will be discussed in section 4.5. What is important for present purposes is the observation that the morphological form of the verb does not reflect its true interpretive properties.

10. For example, see note 3 on page 635 of Eng 1987.

11. In other words, except for SOT structures with a past-tense matrix, SOT in English resembles SOT in Russian and classical Greek. See note 6 above.

12. The theory also predicts that there will be temporal shifting in cases such as (i), although, as seen in (22), the present tense with no adverbial modifiers does not result in SOT ambiguities.

(i) Tomorrow, the press secretary is announcing where the President is

(i) is ambiguous. It can be represented as either (iia) or (iib).

(ii) a. tomorrow

S_1—R,E_1

S2,R2,E2

b. tomorrow

S1,R,E1
S2,R2,E2

(iia) represents the shifted reading, with S_2 associated with E_1. It underlies the interpretation in which the press secretary is telling where the president is at the time of the press secretary's announcement. (iib) represents the nonshifted reading. On this interpretation, what the press secretary will announce is the president's whereabouts at the time (i) is uttered.

13. The free application of the SOT rule in these cases makes the rule entirely optional. We need not make its application dependent on the tense of the matrix verb. This is rather different from the approach adopted by Enc (1987). She does not allow tense shifting to apply in the case of an embedded present-tense form. Her main reason for not generalizing the SOT operation is that she does

not separate the morphological change in the verb form from the process of tense shifting. However, it is quite clear that the two processes are separate. This is indicated by the fact that, although the morphological change appears to be absent in Russian, the temporal shifting does occur. It is also indicated by the fact that shifting to the future does not require morphological change in English. Eng does not consider this second fact, as she does not take the future to be a tense. However, as will be shown below, it acts in SOT constructions just as we would expect if shifting were to occur.

The fact that the SOT rule is perfectly general and applies to all combinations of embedded and matrix tenses is an important feature of the present account. Generalizing the SOT rule is important, for it avoids the obvious question one can ask about any theory that restricts its operation: Why is the rule so restricted, and how does the child come to know that it is so restricted? Morphological cues alone might suffice for English; however, they will fail in Russian-like languages, where these cues are absent.

14. The morphological rule requires shifting of the tense form when the shifting of S_2 is to a point E_1 to the left of S_1. This can be used to support the claim that the present perfect has an E point to the left of S. Its structure is E_S,R. In (i), the *would* indicates that there has been a shifting to the left.

(i) John has said that Mary would be at Sam's

This indicates that an E point is there. It is thus not enough to interpret the present perfect as providing an extended present (see Dowty 1982 and Bennett and Partee 1978). The present does not have the morphological shift characteristic of past-tense SOT sentences. Thus, the present perfect, like the simple past, has an E point to the left of S, whatever its interpretive properties.

15. It is interesting to contrast these cases of modals with the future-tense cases analysed in (23). Unlike these modals, the future-tense morpheme *will* does have a perceptible shift on temporal interpretation of the embedded clause under one of the readings. In other words, will leads to ambiguity whereas the modals (e.g. *might)* do not. Contrast the SOT readings of (i) and (ii).

(i) John might think that Mary is pregnant

(ii) John will think that Mary is pregnant

In (i), Mary's pregnancy is taken as contemporaneous with the speech time. In (ii), it is in the future in relation to utterance time. This would seem to indicate that there is a real difference here between the future morpheme and modals as regards tense. Thus, treating *will* as just another modal will run into some complications. Considerations such as this suggest that treating *will* as a modal rather than a tense marker, at least in the typical cases, will make it difficult to explain why modals and *will* have different temporal interpretations.

16. Given that these are past-tense structures, one expects that SOT is marked by a morphological change in the embedded verb form. The fact that this occurs supports both the claim that *might have* and the like are past-tense forms and the claim that morphological marking is characteristic of SOT operations of clauses embedded under tenses with E points left linear to S.

17. The fact that *would* is what we get here for the shifted reading indicates that associating S_n with a back-shifted E_{n-1} results in the morphological change characteristic of backward shifting.

18. There are other sentences of the same kind that show a similar pattern. (i) is such a case.

(i) John said a week ago that Frank had been saying three days before that Sam would/will be in London in three days.

With *would in* the final embedded clause, (i) places Sam in London one week ago. It cannot be interpreted as placing Sam there four days ago. In our terms, the embedded S point cannot gain access to the matrix E point. It can reach only as far as the intermediate S point. With *will,* Sam has yet to arrive as of the moment of utterance. I leave the detailed DTSs of these two cases as an exercise for the reader.

19. Sentences (34a) and (34b) are taken from Eng 1987, where they are examples (16) and (19).

20. This is not to say that pragmatic effects will not strongly prefer one reading over others. However, it is not necessary to interpret the relative clause as contemporaneous.

21. This is position adopted in Eng (1987:645) in her discussion of the sentence (34a).

22. The acceptability of (i) below indicates that the present perfect allows the morphological shifting charateristic of SOT.

(i) John has said that Harry would win

23. This sentence—discussed in Dowty 1982—is due to Prior (1967). Dowty (p. 30) accepts the characterization of this sentence as involving temporal shifting of the embedded future-tense relative clause to the matrix past tense.

24. For what it is worth, my belief is that the historical present is implicated here. (39) seems usable only in a narrative setting, where one is telling a story and the *would* indicates that the event takes place in the future in the narrative but the whole narrative is of an event in the past. The interplay of tenses and narratives is clearly quite complex and interesting. Unfortunately, I have little of interest to say on the topic.

25. A similar oddness characterizes relative clauses with a matrix clause in the present perfect. Contrast (i) and (ii).

(i) John has recently claimed that John would be crowned king

(ii) John has recently met the man who would be crowned king

(i) has the standard SOT interpretation. The *would* is an underlying future tense, and John's crowning is in the future from the time at which John made his claim. However, as is well known, the present perfect has the property of suggesting present relevance of the past event. Dowty (1982), following Bennett and Partee (1978), explicates this by claiming that the present perfect sets up an extended present stretching from the event time to the speech time. Whatever the exact explanation, the present-relevance feature of the interpretation of the

present perfect makes it difficult to interpret the relative clause as already having been temporally realized. This leaves (ii) with only one interpretation, given below as (iii).

(iii) John has recently met the man who desired to be crowned king

In other words, the SOT interpretation is not available in (ii)—as we would expect given the locality restriction—despite its being available in (i).

26. All scope theories lead back to Prior's (1967) original work on tense logic. The treatment of tenses as sentential operators is still a favorite of tense logicians (see McCarthur 1977). This approach has been extensively criticized by Eng (1981, 1987), Dowty (1982), and Hornstein (1981).

27. Data of this sort are discussed by McCawley (1970), who cites Bach (1968). I am not at all convinced that the ambiguities they cite obtain. However, whether they obtain is immaterial in the present context. For some attempts to divorce the interpretive phenomena from a scope approach to these issues, see Hornstein 1984 and the works cited therein.

28. The relationship between the interpretive dependencies and the scope relations they imply relies on a specification of the notion "in the scope of". Standard grammatical treatments assume a definition in terms of c-command, as in (i).

(i) A is in the scope of B iff A c-commands B

C-command can be variously interpreted. The classical account is (ii).

(ii) A c-commands 13 iff the first branching category dominating A dominates B.

However, for the case of tense, this will not work in general. One needs a notion that makes it possible for operators to be independent of one another in multi-operator structures. This is necessary to represent those cases in which all the tenses are interpreted relative to the speech time in multiclausal constructions.

One can make the two tenses scopally independent of one another by adopting a definition of c-command advanced by May (1985). Here, c-command is defined in terms of the Aoun-Sportiche (1983) definition of c-command, given here as (iii).

(iii) A c-commands B iff all maximal projections dominating B dominate A

If we interpret "domination" in (iii) to mean containment, then we obtain the right formal notion, given here as (iv).

(iv) A contains B iff B is dominated by *all* the A projections

What (iv) permits is the case in which operators are all adjoined to the same projection without any one operator c-commanding the others, as (ii) would require. Let's assume that if A and B c-command each other, neither is in the scope of the other. This means that if A c-commands B, and vice versa, then A and B are interpretively independent.

These assumptions make tenses adjoined to the same S projection independent of one another. Thus, in (46d), represented here as (v), we can adjoin both tenses to S. Thus, the two tenses are interpreted as temporally independent of one another.

(v) $Pres_y$ [s_i $P_.$ Est John say at **x**[$_{S2}$ Mary pregnant at y]]]]

In (46b), shown here as (vi), the embedded present tense *Pres*$_y$ is c-commanded by the matrix, for it is dominated by maximal projections that do not dominate $P_.$ (S2, for example).

(vi) Est Px [s_i John say at s_2 $Pres_y$[s_2 Mary pregnant at y]]]]

Thus, the interpretation of the embedded tense is dependent on that of the matrix past tense.

These technical niceties are important for the success of an ST approach to tense. However, as my criticisms do not rely on these details, I will ignore them in the body of the exposition.

29. The fact that *would* is what we get here for the shifted reading indicates that associating S„ with a shifted E„_$_1$ results in the morphological change characteristic of backward shifting.

30. Recall that in the structure indicated here it is not necessary to assume that F_z has scope over ɪꜰ.

31. This problem has been discussed by Eng (1987) and by Dowty (1982).

32. There are serious grammatical difficulties with this approach as well. Extracting standard operators, (e.g. quantifiers) from relative clauses is impossible. Relative clauses constitute islands for extraction processes even in LF, where subjacency does not hold. This is manifested in the unacceptability of (i) with a bound-pronoun interpretation.

(i) A man who met everyone; annoyed him;

A pronoun is bindable by a quantified expression only if it is c-commanded by it at LF. However, in (i) this implies extraction of *everyone* from a relative clause, which is impossible.

However, despite the impossibility of extraction from relative clauses for standard operators, an ST implies that this is easy enough for tenses. What is so special about tenses? And why, if extraction is so easy, is it impossible to move to intermediate scope positions? Questions such as these led Eng (1987) to argue against treating tenses as operators. This is similar to the conclusion drawn by Hornstein (1981) and Dowty (1982).

33. For what follows, it is possible to assume that infinitivals have an S point but that the default rule that anchors S to the utterance time does not hold. This assumption will suffice for what follows. However, it strikes me as far less natural than the assumption that infinitivals simply lack an S point. The latter assumption makes sense of two facts. First, it explains why the default rule for S interpretation does not apply: There is no S point for it to apply to. Second, if the S point is truly tied to the presence of the TNS morpheme, it is natural to assume that the absence of this morpheme signals the absence of an S point. In short, infinitivals have RE relations but not SR relations.

There is another reason to think that this is the right way to proceed. Later in this section, I will suggest that naked infinitival constructions do not have either an S nor an R point.

Aspectual morphemes are not permitted in the embedded clause. Interpretations of these structures always place the event time of the embedded clause as contemporaneous with that of the matrix. Both of these facts fit well with the supposition that the embedded clause has only an E point. Thus, if the impossibility of *have in* a embedded naked infinitival signals the absence of an R point, and the absence of a tense morpheme signals the absence of an S point, it seems natural to assume that the absence of the tense morpheme in regular infinitives also coincides with the absence of an S point.

34. In adjuncts, finite clauses are obligatorily subject to the RTC. Thus, the S point is obligatorily linked to the higher S point, and R is associated with the higher R point. We observed that the same thing was true in the case of gerunds. Gerunds, like infinitivals, lack an S point. Nonetheless, the RTC applies to link the R points. See section 3.8 for a discussion. For further empirical support that the RTC is obligatory for adjuncts, see chapter 5.

35. There is an optative nontemporal reading that infinitivals can have in main clauses; it is given here as (i).

(i) Oh to have a job that pays well

These are different from standard infinitival clauses. I will ignore them for purposes of this discussion.

36. This analysis, if extended to French, will also yield the right results for adverbial constructions involving infinitivals, as in (i).

(i) Jean partira apres avoir mange
John will leave after to have eaten
'John will leave after having eaten'

The DTS of (i) is (ii).

(ii) S_R,E,

E2_R

Observe that the R points are associated. E_2 is in the past relative to E_1, but its temporal interpretation with respect to S is indeterminate. Thus, in French, the infinitival construction can yield the same interpretation the English present perfect yields, even though French has no equivalent tense. Indeed, (ii) is the underlying structure of (iii) in English.

(iii) John will leave after having eaten

As far as the temporal specification of the relevant events goes, this is virtually synonymous with (iv).

(iv) John will leave after he has eaten

37. It is important to remember that adding adverbs adds interpretations not available without them. Thus, adverbs do not simply bring out interpretations that are there; they make available interpretations that are absent without them.

This said, it may nonetheless be too strong to suggest that the SOT rule yields univocal interpretations in all of these cases. Can (i) carry the interpretation suggested by the adverbial in parenthesis without explicit use of the adverbial?

(i) I want to go to university (next year)

I do not believe that the answer to this question is clear. There is no doubt that context effects can impinge to affect the interpretation of this sentence; however, does this really make (i) vague in the way indicated? I am not sure. Let us assume that it does. What does this mean for the present analysis? Not all that much. In chapter 2, in the case of adverbial sentential modifiers, when points were associated in DTS the temporal representation was sensitive to the specific lexical content of the temporal connective. *When* functioned differently from *while,* and *before* differently from *after.* If we should decide that (i) is indeed vague, then it would be possible to extend the same considerations to these cases. Thus, the temporal interpretation of a DTS such as (ii) below would be sensitive to the specific lexical items involved as well as to the DTS.

(ii) S,R,E

R,E

On the other hand, a tense structure such as (iii) would have its temporal interpretation fully determined by the DTS.

(iii) S,R,E

E_R

This would make cases of this sort entirely analogous to those discussed in chapter 2.

In what follows, I will assume that this second alternative is incorrect. However, the data are murky, and alternatives are real possibilities. I would like to thank David Lightfoot for bringing these issues to my attention.

38. This may not be quite accurate. (56h), if said without an intonation break after *medicine,* need not imply that the remembering is contemporaneous with being at home. Thus, (56h) contrasts with (56g) and (56f) in this regard. This, I believe, is a general feature of tense structures. Modification usually goes from the top down, not from the bottom up. Thus, if an element X is anchored/associated with another element Y, then Y modifies X, but not vice versa (but see chapter 2, example 46). In (56h), the adverbial modification of the embedded E point does not flow up to specify the matrix E point, though in (56f) and (56g) the modification does flow downward. This descriptive fact follows from general properties of modification among adverbial elements, which will be discussed at length in chapter 5. For present purposes, all that we need observe is that both (56f) and (56g) place the taking of the medicine at the same time as (56h).

39. In (58c), the most deeply embedded S point is left unattached. This has no bad results, for the S point will be interpreted by the default rule for S interpretation as denoting the moment of speech. This will yield the correct interpretation for the structure as a whole.

40. This account of infinitivals is somewhat different from that of Stowell (1982). I do not assume that infinitivals have tenses on a par with finite clauses. They specify only an RE relation, not an SR relation. Furthermore, I do not couple the presence of tense with the presence of overt COMP. Stowell contrasts infinitivals with gerunds. He claims that the former, but not the latter, are tensed. I showed in section 3.8 that gerunds also specify RE relations. Like infinitivals, they do not have an SR structure. The main evidence Stowell advances revolves around (i).

(i) a. John remembered to bring the wine

b. John remembered bringing the wine

Stowell claims that in (ia) the tense of the infinitival is understood as being unrealized. Thus, in (ia), John has not yet brought the wine at the point at which he remembers to do so. In contrast, the understood tense of the gerund is "completely malleable to the semantics of the governing verb" Stowell 1982, (p. 563).

It is not clear what distinction Stowell is trying to make here. Stowell claims that in (ia) John's remembering precedes his wine-bringing. He also observes that the embedded clause need not be realized. From this he concludes that the embedded clause is tensed.

Three points are worth making here. First, when one modifies (ia) with a temporal adverb, as in (ii), the two events are interpreted as contemporaneous.

(ii) At 6 o'clock, John remembered to bring the wine

Second, on the assumption that one can remember only things that have in fact happened, the ordering of the events Stowell claims to obtain follows.

I do not think that Stowell's descriptive claims are accurate. It is not clear that (ia) involves an ordered set of events (a remembering preceding a wine-bringing). Remembering need not be occurrent in this way. In ordinary discourse, the fact that John remembered does not imply that John had a memory event; it just implies that he did what he was supposed to do. This is clear when one considers a verb like *forget*, *as* in (iii).

(iii) Yesterday, John forgot to bring the wine

In (iii) the time at which the wine was supposed to be brought was yesterday. In other words, the unrealized event was bringing the wine yesterday, not simply bringing the wine. However, here one could not say that the forgetting was prior to the wine-bringing. Nonetheless, the temporal relationship between the matrix and the embedded clauses is similar to the one that holds in (ia).

Third, Stowell's observations concerning the difference between gerunds and infinitivals are traceable to differences other than tense. Gerunds are NP-like in a way that infinitival clauses aren't. Thus, the former are easily objects of English prepositions whereas the latter are not. This provides a possible clue to the realized/unrealized distinction Stowell points to.

Embedded clauses can be opaque. With very few exceptions, direct objects cannot be. Any distinction between gerunds and infinitivals on this score might well hinge on the fact that gerunds can be direct NP objects of propositional attitude verbs whereas infinitivals cannot be. This is essentially the analysis

offered by Lightfoot (1974). Why direct object differ from embedded clauses is unclear. However, it is a distinction with real generality—see Bach 1968.

I am unsure that I fully understand Stowell's point, or even whether the analysis presented here is incompatible with his claims. The present analysis requires that the temporal interpretation of infinitivals be dependent on that of the matrix clause it is directly embedded under. Further, it appears that gerunds and infinitivals pattern identically in this regard. The realizability of the embedded event is at right angles with the temporal interpretation of the clause. It is likely tied to the facts observed by Lightfoot.

41. This account of the tense properties of relative clauses makes one additional prediction of great interest. In the discussion of SOT and relative clauses (examples (34) and (35) above), we observed that the SOT rule (32) could not relate an embedded S point within a relative clause to a matrix E point outside it because it was too far distant in a way still to be made precise (see chapter 5). This predicts that if the SOT rule must apply to a given structure, then embedding it within a relative clause should lead to unacceptability. This is just what happens with infinitival relative clauses.

It has long been noted that infinitival relative clauses are rather marginal. Consider the examples in (i).

(i) a. *A man to buy flowers makes Bill sick

b. A man that bought/buys/will buy/has bought/may buy flowers makes Bill sick

c. *I persuaded a man to fix the car to leave

d. I persuaded a man who fixed the car to leave

We have a straightforward reason for this now: These sentences must link the R point within the relative clause to the matrix R point; however, the two R points are too far apart, just as in the finite-relative-clause cases of (34) and (35). Thus, the current theory predicts that natural languages will disdain infinitival relative clauses. This seems to be a correct prediction, at least to a first approximation.

This requires that the standard case often presented, exemplified by (ii) below, should be reanalyzed as having the structure of a purposive, as in (iii).

(ii) John found a man to fix the sink

(iii) John found [$_{NE'}$ a man] [s• PRO to fix the sink]

The structure in (iii) can be base-generated, as in the case of purposives, or it can be derived by the application of an extraposition rule that moves the relative clause out of the NP. Once the clause is so moved, it is possible for it to access the tense points of the main clause.

The distribution of infinitival relative clauses is an interesting problem that the interpretive properties of the tense system might partially account for. These issues are treated at greater length in Hornstein (in progress).

42. The unacceptability noted here should not be traced to the lexical differences between *want* and *see/make*. This emerges clearly when one contrasts (69d) with (i).

(i) At 6 o'clock, John forced Bill to leave at 7

The two lexical items *force* and *make are* very similar in their interpretations. Nonetheless, they differ in this sort of multi-adverb structure.

43. The absence of perfective, modal, or copular elements follows from the fact that an NI construction, being a small clause, has no INFL or only a null INFL. If these sorts of constituents must appear in INFL in English, then their absence follows the fact that these sentences have no INFL position. See Hornstein and Lightfoot 1987 for a discussion.

44. We can assume that clauses are specified in English as +TNS (i.e. finite) or —TNS (i.e. infinitival and without tense, i.e. NI clauses). Observe that —TNS is a specification of tense. In languages other than English, it may even be realized morphologically as subjunctive. The subjunctive in the Romance languages has many of the properties of the English infinitival. It can appear only in embedded positions, and it has many of the temporal properties we have observed for English infinitivals. I owe this observation to Juan Uriagereka.

If we adopt a feature specification like this for these three sorts of clauses, we may be able to accommodate Stowell's account quite directly and still hold onto distinction between tensed sentences and infinitival clauses required here. See note 40.

45. This section will be somewhat technical and will presuppose some familiarity with current grammatical theory of the Government-Binding variety. Those more narrowly interested in the details of the tense system can skip this section.

46. In fact, this proposal extends only to past tenses in English. The future is not treated as a tense by Eng, and the present always denotes the moment of speech in English. Thus, the binding theory that Eng proposes to account for SOT phenomena affects only past tenses. The generality alluded to by the conditions is therefore somewhat misleading. These limitations of her proposal are discussed in more detail below.

47. See (26) and (27) on pages 642 and 643 of Eng 1987.

48. I will argue in the next chapter that tense features are actually adverbial rather than pronominal. This distinction is important. However, it does detract from the fact that both this account and Eng's deny that tenses are operators.

49. Eng 1987, p. 644.

50. See Stowell 1982, Kayne 1981, and Aoun et al. 1987 for discussion.

51. See pages 645-646 of Eng 1987.

52. (70a) is analogous to Eng's (33) (page 646).

53. There are also traditional semantic reasons for assigning relative clauses a *Det N* structure. These are discussed in Partee 1975. For an interesting discussion of this issue, see Chomsky 1975.

54. This is the nickname for the Montreal Canadiens hockey team.

55. (86) is similar to Eng's (45) (p. 653).

56. See Higginbotham 1980, Barss 1986, and Hornstein 1984 for discussions.

57. See note 28 for discussion

58. Hornstein and Weinberg (1988) provide another way to accomodate Mig/ pilot sentences that does not involve May's definition of c-command. However, this theory permits only operators to move at LF, not maximal projections. Thus, a structure analogous to (87) is not derivable in LF.

Chapter 5

1. This conclusion is arrived at in Enc 1981, Dowty 1982, Hornstein 1979, and Hornstein 1981.

2. May (1977), Hornstein (1984), and Aoun and Hornstein (1985) all observe that quantifiers such as *every* in English are typically clause-bound in their interpretation. (i) cannot be interpreted with the embedded subject *everyone* taking scope over the matrix subject *someone.*

(i) Someone thought that everyone was at home

May (1977) accounts for this in terms of subjacency. Aoun and Hornstein (1985) and Hornstein (1984) offer an explanation in terms of a revised version of the binding theory first advanced in Aoun 1981.

3. This is not to suggest that these adverbs are in fact operators. In the analysis adopted here they are adverbials that modify R and E points. However, their interpretations are consistent with the position that they are operators that always assume the widest possible scope.

4. Thus, the formation of multiple questions in English involves clause-by-clause movement of the operator *in situ* to its landing sight. In Chinese all movement is done in LF, and successive movement is attested here as well (Huang 1982).

5. This definition of government was proposed by Aoun and Sportiche (1983) and amended by Belletti and Rizzi (1981).

6. For present purposes, I interpret domination to imply domination by all parts of a maximal projection. Thus, an adjunct to VP that adjoins the VP is not governed by the V. In (i) the adjunct is adjoined to the VP.

(^{i}) *[vP* [vi **V**. .] .. adjunct]

Thus it is not dominated by all the segments of VP; hence it is not dominated by all parts of the VP; thus, it is not governed by V in (i).

Furthermore, the VP does not block government of the adjunct from outside the VP. Let us say that an element is t-dominated by a category iff all the maximal projections of the category dominate the element. We now use definition (3) but read "dominates" as "t-dominates".

7. The assumption that INFL is the head of S' is not universally shared. Aoun et al. (1987) argue in favor of this assumption. Chomsky (1986a) treats the cornplementizer as the head of S' . For present purposes, however, this will not do. It is necessary to be able to "see" the embedded INFL, the position of TNS, so that tenses can interact. If the elements that interact must be in a government relation, this implies that INFL is the head of S'.

One possible way around this conclusion is to assume that INFL moves to COMP at LF. However, I will suggest below that tense interpretation is carried

on not in LF but in LF', a level of grammatical representation on the PF side of the grammar.

A second possible way of avoiding this conclusion is to treat COMP as a specifier of INFL and to have some form of SPEC-head agreement between the two. Two points are worth making in reply.

• This assumption goes against the grain of Chomsky's (1986a) analysis. Here, COMP is not a specifier of INFL; the subject position is. Rather, Comp is the head of S', INFL is the head of S, and S is a complement of Comp. SPEC-head agreement would not index Comp and S under these assumptions. Indeed, under standard assumptions concerning selection, an embedded TNS should be invisible to a higher verb.

• Even if SPEC-head agreement is possible, I will argue below that it is insufficient. It is not enough to know that the embedded clause is finite; the particular form of the tense must be visible. SPEC-head agreement does not typically convey this sort of information.

8. Technically this means that the adverb c-commands the embedded clause; that is, the first branching category that dominates the adverb dominates the embedded clause. This is true on the simple assumption that *necessarily* is higher in the tree than the VP.

9. Though it does c-command it. This indicates that c-command is the wrong notion for explaining adverbial modification. Both c-command and government bound the upward effects of an element. In both cases, an element A can affect another B if and only if it is higher in the tree. The main distinction between c-command and government is that the latter is bounded in how deep its effects can go. An element's c-command domain is arbitrarily deep. This contrasts with an element's domain of government.

10. I assume that finite clauses have the feature +TNS, whereas infinitival clauses have the feature —TNS. Similarly, +Perfective is realized by the morpheme *have in* English, whereas —Perfective is realized by a null morpheme. What is important here is that only +TNS has an S point. As was argued in chapter 4, however, —TNS does provide an R point, though no S point.

11. Comrie (1985) defines aspect in terms of the internal temporal contour of a situation. Is it a punctual event, or is it extended in time? Is it durative, or habitual? These are properties of the E point, and the specification of these properties is dependent on the particular lexical properties of the verb and its morphology. See Comrie 1985, p. 6ff.

12. In fact, this makes a very strong prediction concerning the types of tense relations that can obtain between matrix and embedded tenses. In effect, the prediction is that the only kind of tense dependency is the one exemplified by the SOT rule. For example, an analogue of the RTC can never apply to embedded clauses. The reason is that the matrix TNS, which provides the S point, does not govern the embedded TNS. Thus, linking of the S points or the R points, which the RTC requires, is not possible.

I do not know if this prediction is correct. However, as the theory now stands, it severely limits the kinds of relationships that can obtain between a tense in an embedded clausal argument and its embedding clause.

13. The S' that follows the tense connective must be visible to the higher INFL. This means that the clause is not embedded under the preposition in cases such as this. The TC and the embedded sentence form a single structure, but both parts are transparent for purposes of government. One way of accomplishing this end is to treat the TC-plus-sentence as a flat constituent in which neither is the head. Thus, the S' is not embedded under the preposition in a preposition phrase, but both constituents form a single complex constituent. In this sense, the tense connective is more like a coordinating conjunction than a preposition.

This assumption is not as odd as may first appear. Prepositions typically take NP objects. In TGS' cases, however, they appear to take clausal complements. If we assume that in these cases the TC is a coordinating conjunction, the generalization concerning prepositions can be maintained.

14. Yip (1984) argues that the built-in asymmetry that ordering the tiers has in this system does "not have an obvious semantic explanation" (p. 7). In a sense, this is correct. It is possible to build a consistent system in which anchoring works in the opposite direction, with lower tiers anchoring higher ones. However, whether logically necessary or not, the asymmetry is pervasive. It appears that, irrespective of adverbials, governing elements anchor governed ones and not vice versa. This is a structural condition imposed by grammars.

15. This proposal is very similar to the one Yip (1984, p. 13) calls "Revised RP". This may not be the whole story, however. The Yip proposal suggests that what is obligatory is that the S and R points introduced by the adjunct "respect" those introduced by the clause the adjunct modifies. However, what happens if the modified clause has no S and R points, as in the case of NI constructions?

There are two possibilities. One is that the RTC need no longer apply because its semantic *raison d'etre* no longer holds in these cases. A second possibility is that the structures are ill formed because the RTC cannot apply in cases such as this. This second possibility treats the RTC as a syntactic requirement on the well-formedness of a temporal adjunct. The second possibility seems to be the operative one.

Naked infinitival (NI) constructions have only E points. Can they have temporal adjuncts? Consider the examples in (i).

(i) a. Sheila saw everyone/no one; dance after he; hung up his; coat

b. *John saw Sheila dance with everyone/no one; after he; hung up his; coat.

(ia) represents an interpretation of the sentence in which the quantified expression ***everyone/no one*** binds the pronoun in the adjunct clause. Contrast this with (ib) under the same interpretation. It seems clear that (ib) is quite unacceptable and that (ia) is considerably better. This follows if the adjunct clause cannot adjoin to the embedded clause—i.e., if only (iib) is a possible structure.

(ii) a. [NP V [$_{\mathbf{NI}}$NP [vpIvp V2 . . . I after. . . .][1]

b. [NP V [$_{\mathbf{NI}}$NP [vp V2 . . .]1 after ...]

If only (iib) is possible, then we expect that (ib) should be impossible. The reason is that scope assignment of quantifiers such as *everyone/no one* obey a version of the Binding theory, as is shown in Aoun and Hornstein 1985. Thus, if either of these quantitiers is an object to V2 in (iib) then neither will be able to bind anything in the *after* clause without violating the Binding theory. As the adjunct clause hangs from the matrix in (iib), the quantifier would have to take scope outside of the embedded NI clause to bind it. However, this is precisely what the Binding theory forbids.

If the adjunct clause could be generated in the embedded clause, however, according to the Binding theory nothing would prevent the indicated binding and (ib) should be no less acceptable than (ia). Thus, if we assume that the structre of (ia) and (ib) is (iib), we can account for the unacceptability of (ib) as a violation of binding.

What precludes (iia)? The obligatory application of the RTC. If the RTC must apply to link the R point of a temporal adjunct with that of the clause it modifies, then the absence of an R point in NI clauses prevents the application of a necessary rule. There is no R point to associate with in NI constructions. Thus, under the syntactic interpretation of the RTC, we can account for the differences in (i).

16. Recall that we are interpreting "dominate" as "t-dominate".

17. I am indebted to Manfred Bierwisch for bringing these questions to my attention. I have dubbed them "Bierwisch's Puzzle."

18. The argument Kiparsky (1968) presents is subtle and not of immediate concern here. I refer the interested reader to section 8 of his paper.

19. In languages in which there appear to be no overt tenses, temporal specification is still the function of adverbial elements.

20. I assume that the perfective morpheme is a modifier of the VP, and that in English +Perf is represented by *have*. I remain agnostic as to whether it is simply a VP or something else. I assume that *have* is the realization of the feature +Perf. –Perf is a null morpheme. Similarly, +TNS is different from –TNS. The latter is realized in English by the infinitival marker *to.*

These are housecleaning assumptions. I do not think much hangs on assuming that there is no perfective morpheme but that the R point is assumed to be present even if not morphemically represented. Recall that the central tenet of a Reichenbachian theory is the omnipresence of an R point in tenses. If we assume that this is true universally, then whether there is a null morpheme or not is irrelevant. Its presence will always be assumed.

The presence of a null morpheme representing R in the nonperfect tenses cannot be induced on the basis of primary linguistic evidence. If there is nothing overtly there, the language-acquisition device cannot postulate the null morpheme on the basis of overt evidence. Thus, assuming that a null morpheme exists in these cases does not simplify the basic linguistic problem. However, it does serve a useful expository purpose.

21. Once we treat tenses as adverbs, "anchoring" reduces to "modifying". The interpretive relationship between tense elements is the same one that holds be-

tween any given adverb and what it modifies. We know that an adverb can modify only what it governs. Thus, we expect that a tense point can anchor only what it governs.

22. This is the position implicit in Chomsky and Lasnik 1977, for example: "We understand LF to be a universal system of representation that incorporates *whatever* aspects of meaning are strictly determined by sentence grammar. . . ." (p. 428)

23. See Hornstein 1987, 1988c.

24. This is to return to a theory of interpretation more similar to Jackendoff's (1972) proposals.

25. A natural way of looking at this proposal is that S-structure does not exist; rather, there is only LF and PF, the front end of PF being a slightly modified version of S-structure. In place of (21), (i) below more nearly represents what I take to be the correct structure of the grammar.

(i) LF' LF

SI-2

PF SI-1

Here SI-1 and SI-2 stand for two kinds of semantic interpretation.

26. There is nothing very original in treating meaning compositionally. The idea goes back to Frege at least. Humboldt was the first to make central the idea that natural languages make infinite use of finite means. However, standard approaches to meaning in natural language have tried to unify the two types of relationships that I have separated. In other words, the distinction between operators and adverbials has been treated as a relatively superficial syntactic difference that should be eliminated in the logical form of the sentence. It is this claim that (22) rejects.

27. Georges Rebouschi (personal communication) informs me that Hungarian acts like Russian whereas Basque is similar to English. It seems that the morphological changes that indicate SOT differ rather significantly across languages.

28. Or at least a head of S', It is possible that S' can have more than one head.

29. There is one more reason for thinking that INFL is visible within an embedded clause and that it is thus a/the head of S'. Consider French, in which certain verbs require subjunctive complements. These complements are not distinguished by the form of the complementizer they take. For both regular and subjunctive clauses in French, the complementizer is *que.* But how then does the child learn the correct selection restrictions, if COMP is the head of S', if he cannot use embedded clause information? There is no way, for seeing a *que* does not tell the child whether the clause is finite or subjunctive. This problem disappears if INFL is the head of S'. The child can see that certain verbs select subjunctive complements by seeing what the INFL of a given sentential complement is.

30. Edwin Williams (personal communication) has pointed out that if INFL is a head of S', it cannot be selected if selection has also taken place for +/—WH COMP. The reason is that, as Grimshaw (1977) has observed, +WH embedded clauses are not selected for +/— finiteness. In other words, +WH embedded clauses are both finite and infinitival and are never restricted by verb type. This suggests that if the verb is selecting for the feature +WH it cannot also select the INFL. In other words, verbs can select only one of the two heads of S' COMP or INFL, not both.

These facts for English might not carry over to other languages, however. In Italian, for example, certain verbs that take embedded questions also prefer the verb to be in the subjunctive, as in (i).

(i) a. Mi domando chi possa aver detto una cosa simile
"I wonder who could have said such a thing"

b. Ho chiesto a Gianni quando sarebbe tomato
"I asked John when he would be back"

If this relation is quite general, then it would appear that the matrix verb requires both an embedded +WH and a subjunctive form on the verb. At the very least, verbs differ in whether they permit subjunctives even if +WH. Thus, it seems that here is a clear case in which information contained both in INFL and in COMP is required. I would like to thank Paola Merlo for discussing these issues in Italian with me.

Whatever the restrictions on selection, it is also clear that the matrix tense must be able to "see" the embedded INFL even in indirect questions (I owe this important observation to Ken Safir). The reason is that there are SOT effects with these constructions. The sentences in (ii) indicate that SOT can take place in indirect questions.

(ii) a. I wondered whether Bill would leave

b. I wondered whether the Canadiens played tomorrow

But this requires that the lower INFL be visible to the matrix V even if the V also selects +WH.

It appears, therefore, that both COMP and INFL have headlike properties in relation to S'. This is a position compatible with the one advanced in Aoun et al. 1987, where it was argued that INFL is the primary head of S' but that COMP could be a secondary head if selected directly. The data above seem compatible with this position.

Chapter 6

1. A cursory look at the literature seems to indicate that sequence of tense and adverbial modification are the principal kinds of phenomena that have been studied by those interested in tense. We can add to this Dudman's studies of the role that tense plays in conditionals. These three types of phenomena have been addressed here.

2. Chomsky (1981, 1987) has discussed this notion.

3. Even if the story is data-driven, it stays within the confines of degree-0 learnability on the assumption that what constitutes the PLD are simple clauses and the heads of what the constituents of simple clauses govern. This makes the INFL of an embedded clause visible to the language-acquisition device on the assumption that INFL is a head of S'. For discussion of degree-0 learnability, see Lightfoot 1989.

Acknowledgments

This book is largely the product of the generosity of others, many others. Perhaps it is appropriate that a book on tenses should have taken a very long time to write. It is clear to me that it would never have seen the light of day except for the generous support and encouragement that I received along the way.

The project originated while I was still an undergraduate at McGill. Jim McGilvray is responsible for getting me interested in Reichenbach in general and his theory of tenses in particular. Harry Bracken and David Lightfoot were always available to lend an ear so that a particularly voluble undergraduate would have an educated sounding board.

As this project sailed into graduate school I was able to pick another set of first-class brains. The scope and the general setting of the project owe a tremendous amount to the work of Noam Chomsky. My appreciation of the centrality of the issue of explanatory adequacy to work in the theory of meaning is due to him. So too is the belief that syntax should never be overlooked even in the most expressly semantic matters. In addition, I would like to acknowledge Noam Chomsky's detailed help. Spell checking has ruined a lovely relationship.

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This book does not address every issue that researchers have focused on when dealing with tense. It is not intended to be a survey of the current theoretical thinking on the topic, or an empirical survey of the range of tense phenomena in natural language. The aim is more modest and somewhat idiosyncratic: to present a theory of tense that is responsive to the cognitive concerns that the rest of generative grammar recognizes as central to the enterprise of linguistic theory. Nonetheless, I have benefited greatly from reading the work of others who may not share my theoretical predilections. I hope that this work can in some way return the favor.

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