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THE FORMAL SEMANTICS AND PRAGMATICS
OF FREE ADJUNCTS AND ABSOLUTES
IN ENGLISH
DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
Gregory Thomas Stump, B.A., M.A.

* * * * *

The Ohio State University
1981

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For Marcia
ACKNOWLEDGEMENTS

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**FIELDS OF STUDY**

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- Studies in Indo European Historical Linguistics. Professors Robert J. Jeffers, Ilse Lehiste, and Brian Joseph
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INTRODUCTION

The goal of this dissertation is to describe the interpretation of two constructions in English—the free adjunct and absolute constructions, exemplified in (1) and (2), respectively.

(1) Walking home, John found a dollar.

(2) Her children asleep, she watched television.

The descriptive framework assumed throughout is the semantic theory developed by Richard Montague (1970a, 1970b, 1973) and his followers. (For a very thorough introduction to Montague semantics, the reader may refer to Dowty, Wall, and Peters (1981).) Montague's theory, unlike the semantic theories most familiar to linguists, is a theory of referential rather than psychological meaning: it associates linguistic expressions directly with their denotations, without regard to processes of language comprehension. Such a theory lays no claim to psychological reality, but affords a model-theoretic account of such important notions as truth and entailment.

In recent years, it has nevertheless become clear that issues of language comprehension are not without relevance for referential theories of meaning. For example, Putnam (1975) has convincingly argued that a complete account of lexical meaning must comprise complementary referential and psychological components; and Partee (1979:10) has shown that "the linguist's concern for
psychological representation may be relevant to every semanticist's concern for an account of the semantics of propositional attitudes". Here, I shall argue that the meaning of a sentence with a free adjunct or absolute isn't always entirely determined by rules of grammar--that there is an isolable component of the meaning of most such sentences which is determined only by the inferences of language users. In such cases, the denotation assigned to the sentence by the grammar of English is indeterminate between a certain range of choices; this referential indeterminacy is resolved by nonlinguistic--inferential--means. As I shall show, a number of diverse factors may give rise to such inferences.

The following dissertation consists of three parts: Chapter I is an introduction to free adjuncts and absolutes and, in particular, to the problem posed by their semantic versatility; Chapters II-V provide a detailed formal analysis of the syntax of free adjuncts and absolutes, and of those aspects of their meaning which appear to be grammatically (rather than inferentially) determined; and in Chapter VI, I will be concerned with elucidating the means by which language users infer the logical role of a free adjunct or absolute in a given sentence.
CHAPTER I
THE SEMANTIC VERSATILITY
OF FREE ADJUNCTS AND ABSOLUTES

I begin this chapter with a brief summary of the defining properties of free adjuncts and absolutes in English (section 1); in section 2, the problem posed by the semantic versatility of these constructions--the focus of this dissertation--is explicitly stated. After reviewing traditional thoughts on this problem (section 3), I outline the solution argued for in the succeeding chapters (section 4). In section 5, I introduce some formal syntactic conventions to be employed in the Montague fragment for free adjuncts and absolutes to be developed in Chapters II-V.1

1. Introduction to free adjuncts and absolutes in English. Here, I briefly review the defining characteristics of the free adjunct and absolute constructions in modern English.

1.1 The free adjunct construction. A free adjunct is a nonfinite predicative phrase with the function of an adverbial subordinate clause; it is typically set off from the clause to which it is subordinate by a pause or a fall in intonation (sometimes--though not consistently--represented in writing with commas). Free adjuncts are used very commonly in English, especially in more formal speech
and writing; they are extremely heterogeneous from the point of view of both form and interpretation.

A free adjunct may be headed by a noun, an adjective, a prepositional phrase, or a verb:

(1) A center for shoe factories and breweries early in this century, it was industrialized at a time when the cities west of it were still tied to the land. (NY 6/16/80, 107)

(2) Unable to meet his eyes, Kate looks down at her hands... (NY 8/4/80, 68)

(3) The Second World War began, and, still scarcely in his teens, he was drafted into the coal mines of Fife and Kent. (CL 19-20)

(4) The W. S. Q. imitated the Ellington reed section, using a syrupy vibrato... (NY 7/16/79, 80)

In the following chapters, attention will be concentrated largely (though not exclusively) on verbal and adjectival free adjuncts, since they pose the most significant problems of analysis.

The main verb or head of a verbal free adjunct may be a present participle, a past participle, or a marked infinitive form:

(5) Glancing up at the Arch over the downtown skyline as I approached, I had to admit that it is an impressive structure... (NY 6/16/80, 109)

(6) Published here in 1972, Thomas Keneally's novel is no longer in print... (NY 9/15/80, 154)

(7) To tell you the truth, I have never really thought of them that way. (CL, 73)

A verbal adjunct may be in the active voice, as in (5), (7), and (9),
or the passive, as in (6) and (8).

(8) ...it was the home of a hardy race of Gaelic-speakers from prehistoric times to 1930, when—having been systematically destroyed or demoralized by the zealotry of Christian "missionaries," the myriad diseases of civilization, and the steamroller thrust of a superior technology—the remnant survivors were evacuated by a paternal British government.

(NY 10/15/80, 194)

(9) Arrived at the spot, the party lost no time in getting to work.

(Visser 1972:1255)

It may show perfect 'aspect' alone, as in (10); or the perfect combined with the progressive, as in (11) (thanks to Doug Fuller for pointing out the latter example).

(10) Having come to this conclusion, I settled down to enjoy the rest of the day.

(NY 9/1/80, 55)

(11) He was then drunk, having been all night taking his leave.

(Scheffer 1975:253)

The progressive may not occur alone, as (12) suggests: this might be attributed to Ross' (1972) Doubling Constraint; another explanation will be noted in Chapter IV, where the broader problems posed by the perfect and the progressive in free adjuncts will be discussed.

(12) *Being eating, John couldn't answer.

Free adjuncts may be dependent upon a subordinate clause:

(13) In the 1935 etching called "Minotaumachy," the monster seems to look for guidance to a little girl who faces him fearlessly, holding a candle aloft in one hand and a bunch of flowers in the other.

(NY 6/30/80, 57)

(14) But when the man, having backtracked, picked up her glove, and put it on, touches her shoulder with his gloved hand, she is so startled she bolts away.

(NY 8/4/80, 68)
They normally occur either immediately before or immediately after their superordinate clause, or after its subject, provided this isn't a pronoun; the order chosen is sometimes iconic, but needn't be—

(16) He entered college at the age of fifteen, graduating four years later at the head of his class.

(Jespersen 1940:407)

(17) He occasionally lectured night-club audiences ten or fifteen minutes at a stretch, issuing a mixture of invective, musical pedagogy, autobiography, and homemade philosophy.

(NY 6/18/79, 100)

The 'subject position' of a free adjunct is commonly controlled by the subject of the superordinate clause; in such an instance it is termed a related free adjunct, as in all of (1)-(17) except (8). But frequently control of the subject position of a free adjunct rests elsewhere—with a nonsubject noun phrase in the superordinate clause or with an extralinguistic controller; in this case the adjunct is termed unrelated or (more prescriptively) misrelated (such is the 'dangling participle'). Besides (8), examples of unrelated free adjuncts are:

(18) Having received only an elementary education, the simple teachings and the colourful ritual had appealed to her.

(PT, 76)

(19) Having done either of the above his turn is ended unless he uses all tiles on his rack... or if he accumulates 9 points on one stack...

(Instructions to Stack-Ominos™, Pressman Toy Corporation)
(20) Her mother too had expressed incredulity, but being the sort of woman she was, that was only to be expected.
(MMB, 24)

(21) I want them to vote their conscience on the great issues of the platform and then on the nomination, and I'm still very confident that, voting on their conscience, we'll gain the nomination and go on.
(Ted Kennedy, cited in NY 9/8/80, 69)

(22) Considering the enemies of citrus as a whole, it is no wonder that the trees people keep in their yards for ornamental effect seemed--to me, at least--to be the sorriest-looking trees in the state.
(Q, 43)

(23) A number of people, including some of Kennedy's friends, and even some of his staff, have become puzzled about what he thinks he is doing. Leaving aside the style in which he is doing it, the question is not so puzzling.
(NY 9/8/80, 46)

(24) The laird simply has no wish to be the animated exchequer of an insular, private, picayune welfare state--or, to give the situation its full setting, a welfare state within a welfare state.
(CL, 110)

(25) The Carter people insisted then, as they insist now, that the interest groups assembled were not and are not reflective of the Party as a whole, to say nothing of the country.
(NY 9/8/80, 80)

(26) ... now it [Los Angeles] has almost three million, making it the largest city in the country after New York and Chicago.
(NY 9/15/80, 109)

(27) With daily flossing, bleeding should stop, indicating that gums are getting healthier.
(Johnson's Dental Floss package, Johnson & Johnson, New Brunswick, N. J.)

The problems of control in free adjuncts are fascinating and not simple, but are, regrettably, outside the scope of the present study; in the remaining chapters, I will be dealing almost exclusively with
free adjuncts under the control of the subject of the clause upon which they are dependent (more correctly, with those interpretations of free adjunct sentences which entail that the adjunct is subject-controlled).

1.2 The absolute construction. The absolute construction consists of a 'subject' noun phrase combined with a nonfinite predicative expression, the whole functioning as an adverbial unit subordinate to an associated main clause; like free adjuncts, absolutes are normally set apart intonationally. In modern English, the free adjunct and absolute constructions show a number of similarities; and although the latter is seen as somewhat more literary, it is often observed that it is formally just like the former construction but with an overt subject supplied for the 'free' predicate.7 The predicative constituent of an absolute phrase may be headed by a noun, a verb, an adjective, or a propositional phrase:

(28) ... Joe Turner, seated in a press of admirers and backed by Jay McShann, sings "Roll 'Em Pete," his great voice a thunderhead. (NY 7/21/80, 91)

(29) ... and there was Chuck Green—a square, flapping scarecrow moving in half time, his head bent forward in concentration, his arms loose. (NY 7/21/80, 92)

(30) At five-thirty in Carnegie Recital Hall, Dardanelle sang and played a dozen or so songs, among them "It Could Happen to You," "Spring Can Really Hang You Up the Most," "Out of This World," "It's All Right with Me," and "In the Evening." (NY 7/21/80, 50)

In the discussion which follows, attention will be focused primarily on verbal and adjectival absolutes—like verbal and adjectival free
adjuncts, they pose the most interesting problems.

The head of the predicative constituent of a verbal absolute may be a present participle, a past participle, or, infrequently, a marked infinitive:

(31) The eggs and vermiculite are placed in an earthen vessel, the eggs just touching each other, in case there is some inter-egg communication at hatching time.

(NY 9/1/80, 59)

(32) Communist Party leader Edward Gierek, his power battered by striking workers and a corruption scandal, was ousted from office today and replaced by Politburo member Stanislaw Kania, a surprise choice.

(Ashland (Ore.) Daily Tidings 9/6/80, 1)

(33) We shall assemble at ten forty-five, the procession to start at precisely eleven.

(Visser 1972:1056)

An absolute phrase shows the same range of voice and 'aspect' as a participial adjunct: it may be active (as in (31)) or passive (as in (32)); perfect, or, in principle, both perfect and progressive--

(34) The Arch has encouraged some new building downtown--the old downtown that it was presumably designed to anchor having drifted out into the county by the time the Arch was completed.

(NY 6/16/80, 108)

(35) John decided to see a doctor, his health having been steadily deteriorating.

The progressive alone does not occur:

(36) *John decided to see a doctor, his health being deteriorating.

Similarly, absolute phrases may be dependent upon embedded clauses:

(37) Ayla's musculature allows her great skill with the sling, and though she must practice secretly, hunting being forbidden to women under penalty of death, she quickly becomes a sharpshooter capable of firing two
(37) [continued]
lethal stones in rapid succession.
(Portland Oregonian 9/14/80, C4)

(38) I made a quick tour of the room, pausing for a few minutes to observe the source of much noise in one corner: a TV set turned on full blast, on whose screen an earnest man was talking about the nurture of radiated tortoises (Testudo radiata), the closeup of his face now and then supplanted by closeups of the tortoises themselves.
(NY 9/1/80, 38)

(39) Some of Chertok's clips were very funny, among them ... an eccentric dance done in blackface in 1929 by James Barton, his body vibrating one moment from head to foot, his legs spaghetti the next, his arms whirligigs the next...
(NY 7/21/80, 91)

(In this last example, the underlined absolutes are actually embedded within a larger absolute.) As these examples show, absolute phrases may be as freely ordered as free adjuncts with respect to their superordinate clause.

The subject noun phrase of an absolute may show either nominative or oblique case, if it is pronominal:

(40) ... as we strode along, I doing my best to keep pace with him, and him reading aloud from some political economist or other, he would drag out a handful of nuts and munch them.
(Visser 1972:1148)

Here, oblique case doesn't serve to mark a nonsubject function; rather, it indicates (irregularly) that the pronoun is subject of a nonfinite 'clause' or nexus; compare for him to go to school, Him, going to school!, and so on.

One problem of terminology and analysis arising in connection with both free adjuncts and absolutes is that of distinguishing present participles from gerunds. The distinction comes into question in cases
in which a preposition or subordinating conjunction introduces what
might be otherwise construed as a free adjunct:

(41) When (while) fighting in France he was taken prisoner.
     (Jespersen 1940:407)

(42) She looked pleadingly at her parents as though
     entreating forgiveness.
     (Visser 1972:1138)

(43) After leaving Interstate 75, I noticed a sign on a
     roadside eating place...
     (0, 19)

(44) ... I naturally tried to make my peace with the
     Gateway Arch in the years after its completion,
     despite having been handed a second bitter pill
     to swallow...
     (NY 6/16/80, 104)

When what looks like a free adjunct is, as in (41) and (42), introduced
by a subordinating conjunction, the verbal element heading the
'adjunct' is participial (Jespersen 1940:407; Curme 1931:276); the
subordinating conjunction in this case 'fills in' the semantic
relationship (left unspecified in true free adjuncts—see section 2)
holding between the 'adjunct' and its superordinate clause. But when
the supposed adjunct is, as in (43) and (44), introduced by a prepo-
sition, it must be considered a gerund. We can be assured of these
facts, because the full range of predicative expressions—past
participles, adjective phrases, prepositional phrases, predicative noun
phrases—is substitutable for the present participles in (41) and
(42), while only nonpredicative noun phrases are substitutable for the
gerunds in (43) and (44); compare (45) and (46).
(45) While stranded in enemy territory,
    While drunk,
    While at the beach,
    While president,
    he was taken prisoner.

(46) *After stranded in enemy territory,
    *After drunk,
    *After at the beach,
    *After president,
    *After dawn,
    I noticed a sign on a roadside eating place.

Absolute-like expressions can be introduced by with and without; the latter being prepositions, we would at first suppose chanting
and shouting and affecting 'im to be gerunds in (47) and (48);

(47) With the reeds now chanting and shouting, Bowie
released an assemblage of blats and growls and yells.
(NY 7/16/79, 81)

(48) He could put away an awful lot without it affecting 'im.
(Visser 1972:1158)

but a range of predicative expressions is substitutable for these
forms (as, for instance, in (49)), which are therefore participles.8

(49) With the reeds now united in harmony,
    With the reeds now silent,
    With the reeds now in utter cacophony,
    Bowie released an assemblage of blats and growls
    and yells.

(Notice that constructions like those in (47) and (48) cannot simply
be regarded as free adjuncts consisting of a (predicative) preposi-
tional phrase whose object has a postnominal modifier; this is because
such expressions needn't be 'controlled' by the subject of their
superordinate clause, as the full acceptability of sentences like
(50) and (51) shows.

(50) With the water so cold, there was no chance that
we would be allowed to swim.
With John at the wheel, there wouldn't have been any problem.

Since I wish to be precise about the difference between the constructions in (41)-(49) and the free adjunct and absolute constructions, I shall maintain the following terminological distinctions: 'adjuncts' introduced by subordinating conjunctions (as in (41), (42)) will be termed augmented adjuncts; those introduced by prepositions (as in (43), (44)), gerunds; and 'absolutes' introduced by prepositions\(^9\) (as in (47), (48)), augmented absolutes. The semantics and pragmatics of augmented adjuncts and gerund constructions are not a central concern here, because they lack the semantic versatility that is the focus of this study; nevertheless, these constructions yield helpful insights into the meaning and use of free adjuncts (see, for example, Chapters III and IV). Augmented absolutes will be given full consideration in Chapter V, because they are as semantically versatile as absolutes proper; for example, the preposition with in an augmented absolute like that in (47) does nothing to narrow down the range of logical roles which it may assume.

2. The problem of semantic versatility. Perhaps the principal peculiarity of free adjuncts and absolutes is that they may function semantically like a number of different types of adverbial clauses. Consider, for example, the free adjuncts in (52)-(54).

(52) The school is determined to avoid a scandal. The father is equally determined to find somebody to blame. The reader, being more experienced in such things, knows the truth: it was murder.

\(^{9}\) (\text{\textcopyright} NY 9/1/80, 92)
(53) Grabbing a newspaper from a guard, Tom went back out, wiped up the dog shit and deposited it and the day's news in a refuse can.
(OSI, 245)

(54) Transposed to a trumpet or saxophone, her creations would probably herald a new school.
(NY 7/16/79, 74)

The adjunct in (52) intuitively serves as a reason adverbial--because s/he is more experienced in such things; that in (53), as some sort of time adverbial--after he grabbed a newspaper from a guard, perhaps; and that in (54), as a conditional clause--if they were transposed to a trumpet or saxophone. Despite the absence of any overt subordinating conjunction in these sentences, users of English have no difficulty picking out the logical role of the free adjuncts; further examples would reveal that the range of logical roles which free adjuncts may be intuitively felt to assume is quite broad. Analogous remarks can be made about absolutes:

(55) Picasso, to himself and to many others, was a god.
That being the case, he could afford to be a monster.
(NY 6/16/80, 60)

(56) Reginald, his breakfast finished, took his daily morning stroll in Fleet Street.
(Visser 1972:1268)

(57) All this is... probable enough, the dates considered.
(Visser 1972:1270)

In (55), the absolute is felt to function as a reason adverbial; in (56), as a time adverbial; and in (57), as a sort of conditional clause. Though none of these sentences contains an explicit subordinator, we again have no trouble naming the logical relation holding between the absolute and the superordinate clause. This property of free adjuncts and absolutes--the ability to play the role of a number
of different sorts of adverbial clauses—constitutes their semantic versatility.\(^{10}\)

How can we provide a formal account of this semantic versatility? Are the various roles we ascribe to expressions like those underlined in (52)-(57) uniquely determined by linguistic rules—a product of our innate linguistic competence—or do they arise partly from more general cognitive abilities? The theoretical interest of these questions is great, for they inevitably lead us to a number of more fundamental issues: What is a linguistic rule? How do we distinguish between linguistic competence and broader capabilities of comprehension and reasoning? To what extent does meaning derive from language processing and nonlinguistic inference?

The object of this dissertation is to provide a formal semantic and pragmatic account of the semantic versatility of free adjuncts and absolutes in English, and to address some of the broader issues which this goal raises. Before outlining this account, I shall briefly review traditional thoughts on the semantic versatility of free adjuncts and absolutes.

3. Traditional thoughts on the semantic versatility of free adjuncts and absolutes. Despite the theoretical importance of the problem posed by the semantic versatility of free adjuncts and absolutes, these constructions have remained neglected throughout the formal syntactico-semantic literature of the past twenty years.\(^{11}\) Traditional grammarians, on the other hand, have devoted much attention to these constructions and their semantic heterogeneity. Two questions recurrently guide their discussion: What is the range of logical roles which may
be assumed by adjuncts and absolutes (i.e. what is the range of logical relations which they may bear to their superordinate clause)?

What determines which role a given free adjunct or absolute will play?

I shall briefly describe how these questions have been answered by Curme (1931), Kruisinga (1932), Jespersen (1940), Visser (1972), and Quirk, Greenbaum, Leech, and Svartvik (1972).

In their accounts of the inventory of logical roles which may be assumed by free adjuncts and absolutes, traditional grammarians show a fair degree of agreement. Regarding absolutes in particular, Curme (1931:154-157) suggests that six broad logical roles can be distinguished, according to whether an absolute is intuitively linked to its superordinate clause by a relation of:

a) time, e.g.
   
   My task having been finished, I went to bed; (p.154)

b) cause, e.g.
   
   The rain having ruined my hat, I had to get a new one; (p.155)

c) condition and exception, e.g.
   
   As yet few have done their full duty, present company excepted; (p.155)

d) attendant circumstance, e.g.
   
   He entered upon the new enterprise cautiously, his eyes wide-open; (p.156)

e) manner proper, e.g.
   
   He put on his socks wrong side out; (p.157)

or f) concession, e.g.

   Granted the very best intentions, his conduct was productive of great mischief. (p.157)
Since Curme actually takes (p.158) free adjuncts to be abridged absolute phrases, his taxonomy of logical roles is meant to hold for them as well as for unabridged absolutes.

Kruisinga (1932:274-275) subsumes the whole range of logical roles assumed by free adjuncts under the notion of attendant circumstances, observing that 'the use of free adjuncts in English is greatly promoted by the almost complete absence of conjunctions that can introduce a subordinate clause expressing attendant circumstances.' He reasons that when a free adjunct seems to bear a more specific type of relationship to its superordinate clause, it is simply because this relationship is among the more salient circumstances attending the event described; 'other circumstances, though in the background, are thought of' (p.276). With this caveat, Kruisinga exemplifies some of the more prominent circumstances which may emerge in the interpretation of a free adjunct:

(a) reason or cause, e.g.

Shy, reserved, and proud, I would have died rather than have breathed a syllable of my secret; (p.277)

(b) difference of time, e.g.

Finding Blanche determined, Father André presently took his leave; (1931:68)

(c) contrast, e.g.

Like all craftsmen of the kind, he is at the mercy of his material, which, abundant enough in some respects, is disappointingly scanty where the matters most provocative of curiosity are concerned; (p.278)

(d) alternative circumstances, e.g.

The young cavalier perused that letter again in memory. Genuine, or a joke of the enemy, it spoke wakening facts to him. (p.279)
Kruisinga assumes (p.280) that absolute phrases are a type of free adjunct, distinguished from related free adjuncts in having a subject; therefore his remarks on the logical roles played by free adjuncts apply to absolute phrases as well.

Jespersen (1940:61-64), while admitting that 'it is often difficult or even impossible to draw sharp boundaries between the several applications,' suggests that absolutes can be seen to play four sorts of logical roles, according as they are intuitively linked to their superordinate clause by a relation of:

a) cause or reason, e.g.

The wise men of antiquity... were afraid that--men being what they are--their discoveries might be put to bad or futile uses; (p.62)

b) condition, e.g.

Conciliation failing, force remains; but force failing, no further hope of reconciliation is left; (p.62)

c) time, e.g.

And the meal being over, he took Mr. Kaye into the other room; (p.63)

or d) descriptive circumstances, e.g.

He remained in town, his idea being that he wanted everything settled before his departure. (p.64)

(In his discussion of verbal free adjuncts (1940:406-411), Jespersen doesn't consider the range of logical roles which these may play; presumably, these would be the same as those assumed for the absolute construction.)

Visser (1972:1054-1056; 1132-1139; 1149-1158; 1252-1255; 1266-1271) discusses the range of logical roles played by free adjuncts and by
absolutes separately. With regard to free adjuncts, he tentatively distinguishes eight roles; these correlate with the relations of

a) attendant circumstance, e.g.

So they wandered carelessly through the farmland and along the beaches, being polite to the French people they met; (p.1134)

b) cause, reason, e.g.

He was thirty-seven when he died, having been born the year before my brother Germanicus; (p.1135)

c) time, e.g.

The king, hearing this, was stupefact; (p.1132)

d) condition, e.g.

This same thing, happening in wartime, would amount to disaster; (p.1137)

e) concession, e.g.

He is the more to be admired, that, labouring under such a difficulty, his verses are so numerous, so various, and so harmonious; (p.1137)

f) means, manner, e.g.

Brownie... was lanky and limp—so limp that Mother said he was becoming unnaturally elongated, pulling that cart up those hills; (p.1139)

g) hypothetical similarity, e.g.

He paused as if expecting her to answer; (p.1138)

and h) purpose, e.g.

We planted a hedge for preventing the cattle from straying. (p.1139)

(All of Visser's examples of adjuncts expressing hypothetical similarity are what I have called augmented adjuncts (see section 1); all of his examples of adjuncts of purpose are preposition-gerund combinations.) His categorization for absolutes is similar; it is based on
the relations of

a) attendant circumstance, e.g.

The Benbergs stood by, he clapping his hands and
watching her closely, she wiping a plate round and
round with a sodden cloth; (p.1152)

b) reason, ground, cause, or motive, e.g.

The bus being crowded, James had to stand; (p.1155)

c) time, e.g.

Gabriel having finished, the huge pudding was trans­
ferred to the table; (p.1157)

and d) condition, e.g.

Other things being equal, the chances of any man being
hit in action vary... with the rate of fire to which
he is exposed. (p.1158)

The most recent discussion of the semantic connections holding
between free adjuncts or absolutes and their superordinate clauses
is that of Quirk, Greenbaum, Leech, and Svartvik (1972:759-763). Like
Kruisinga, they assert that, in general, free adjuncts and absolutes
express attendant circumstances or contingency, but assume a more
specific sense in context; they suggest (p.762) that the relations
which free adjuncts and absolutes most commonly bear to their super­
ordinate clause are those of:

a) cause, e.g.

All our savings gone, we started looking for jobs;
(p.762)

b) time, e.g.

Cleared, this site will be very valuable; (p.759)

and c) circumstance, e.g.
A case in both hands, Mabel stalked out of the house. (p.759)

This seems to be the minimal categorization—all sources cited agree that at least these three roles may be assumed by a free adjunct or absolute.

Thus, the sources cited offer five roughly similar inventories of the logical roles which a free adjunct or absolute may play. These are summarized in Table 1 (see p.22).

The second question addressed by these researchers is, again: What determines which logical role a given free adjunct or absolute will play? Two lines of explanation are pursued in an attempt to answer this question; one is syntactic, the other pragmatic. Although neither sort of explanation is developed much, I shall here summarize the tentative conclusions which they have afforded.

Jespersen goes the furthest in his attempt to uncover syntactic correlates of the semantic versatility of absolutes. He offers the following observations: the causal relationship is most usual with absolutes having present participles, especially being, in their predicates; absolute phrases bearing the conditional relationship normally precede their superordinate clause, as do those bearing the temporal relationship; absolute phrases having past participles as constituents, as well as many of those having adjectival or adverbial phrases, seem to bear the temporal relationship to their superordinate clause (thus, he remarks (p.63) that 'dinner over is temporal, dinner being over (or finished) as a rule causal'); absolute phrases expressing circumstances are 'generally added after the main part of the sentence'
Table 1 - The Range of Logical Roles Played by Free Adjuncts and Absolutes According to Five Traditional Grammars

A free adjunct or absolute may be linked to its superordinate clause by a relation of:

<table>
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<tr>
<th></th>
<th>Reason</th>
<th>Attendant Circumstances</th>
<th>Condition</th>
<th>Concession</th>
<th>Manner</th>
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<tbody>
<tr>
<td></td>
<td>Time</td>
<td>Cause</td>
<td>Alternative Circumstances</td>
<td>Exception</td>
<td>'Contrast'</td>
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<tr>
<td>Curme (1931)</td>
<td>x</td>
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<td>Kruisinga (1932)</td>
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<td>Jespersen (1940)</td>
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<td>Visser (1972)</td>
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<td>(x)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>(x)&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>Quirk, et al. (1972)</td>
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</tbody>
</table>

<sup>a</sup>Excluded are 'hypothetical similarity' and 'purpose'; none of Visser's examples of expressions bearing these relations are free adjuncts in the sense assumed here.

<sup>b</sup>'(x)' indicates a logical role assumed for free adjuncts but not for absolutes.
(p.63), often having as constituents adverbial or prepositional phrases, or consisting of what Jespersen terms (p.60) 'condensed constructions'—quasi-idiomatic absolutes such as hat in hand, head first, and face down. In the same vein, Curme (1931:155-156) notes that the inversion of the subject and predicate constituents occurs occasionally within absolute phrases expressing a causal, conditional, or circumstantial relation, and appears commonly in absolute phrases expressing a concessive relation (this inversion is limited to a small number of participles, some of which have taken on a prepositional value: except (excepted), granted, given, during, pending, notwithstanding; or the value of a subordinating conjunction, when the subject of the absolute is a clause: given that, granted that, provided that); and, in agreement with Jespersen, he remarks that the predicative constituent of a nominative absolute phrase expressing attendant circumstances is commonly adverbial or prepositional. As interesting as these remarks may be, they are neither necessary nor sufficient correlates of the semantic diversity of absolutes, as is suggested by the tentative language in which they are proposed.

Quirk et al. (1972) adopt a different, pragmatic approach to accounting for the semantic heterogeneity of free adjuncts and absolutes. They ascribe this semantic versatility to what they call (p.760) 'the chameleon-like semantic quality of adapting to context,' a property which, they claim, is shared by many other English constructions: they liken free adjuncts and absolutes to nonrestrictive relative clauses and clauses introduced by the conjunction and—
all four

are capable of assuming, according to context, a more precise semantic role:

       The girl, who was upset by the activities of the ghost, decided to leave
       The girl was upset by the activities of the ghost, and decided to leave

Although the mode of clause connection does not say so, we infer that the girl's emotional state, as described in the relative clause and the initial clause of the coordinate sentence, was the REASON for her departure. Exactly the same point could be made about the equivalent non-finite clause:

       The girl, upset by the activities of the ghost, decided to leave (pp.759-760)

This insistence on the importance of context-dependent inferences for the semantic variability of free adjuncts and absolutes recalls Krusinga's (1932:276) assertion that basically all free adjuncts and absolutes express attendant circumstances, and that modulations of this sense arise only because some particular circumstance of the action or event described is more prominent than others.

This pragmatic approach is promising; it takes account of the fact that the relation holding between a free adjunct or absolute and its superordinate clause is basically 'open', subject to a range of evaluations based on language users' inferences in a given context.

This I think cannot be doubted. Consider, for instance, sentence (58):

       (58) Noticing that a crowd had gathered, Bill immediately called the fire department.

What relation is inferred to hold between the free adjunct and the superordinate clause in this sentence depends importantly on context. A causal relation might, at first glance, seem most plausible--Bill called the fire department because he saw the crowd, and expected some
kind of crisis; but in the context characterized in (59), a merely
temporal relation is inferred for (58), since a prior cause is
established for his calling the fire department.

(59) While Mary was at work, Bill and Jane smelled smoke
and, looking outside, saw that her house was burning
down. Jane screamed for Bill to do something.

Clearly, contextual inferences play an important role in the deter-
mination of the relationship holding between a free adjunct or absolute
and its superordinate clause.

I do, however, have two reservations about the pragmatic explana-
tion of the semantic versatility of free adjuncts and absolutes. First,
even if we grant that the relation holding between a free adjunct or
absolute and its superordinate clause may be a function of context,
we cannot rule out the possibility of other determinants. For example,
could there be aspects of the meaning of a free adjunct or absolute
(as well as, perhaps, of the meaning of the clause to which it is
attached) which systematically and recurrently determine the logical
role it plays, independently of context? Quirk et al. (1972:762)
themselves offer just such a semantic correlate of the versatility
of free adjuncts and absolutes: 'In -ing clauses, dynamic verbs
typically suggest a temporal link, and stative verbs a causal link.'
This modest observation suggests a third, semantic approach to
explaining how the logical role of a given free adjunct or absolute
is determined; that is, it suggests that there may be quite regular
semantic reasons for our intuitions about how free adjuncts and
absolutes function.
Second, it is not absolutely clear that the inferences we make about the logical role of a nonrestrictive relative clause or a coordinate clause have precisely the same status as those we make about the role played by a free adjunct or absolute. We might well infer that someone using any one of (60)-(62) is trying to establish some causal connection between the fact that John is an Englishman and the fact that he is brave.

(60) John, who is an Englishman, is brave.
(61) John is an Englishman, and he is brave.
(62) John, being an Englishman, is brave.

In the case of (60) and (61), this causal connection is merely suggested—we could reply to either of these sentences with (63), but hardly with (64).

(63) Are you implying that John's being an Englishman makes him brave?
(64) No, that's not what makes him brave.

An utterance of (62), on the other hand, seems to constitute an assertion of the causal connection; here, an appropriate reply would be (64) rather than (63). That is, (62) appears to differ from (60) and (61) in that an inference about the logical role of the free adjunct must be drawn if the sentence is to be understood at all—in that what's inferred in (62) is actually felt to be part of what is asserted.

In the following section, I outline my account of the semantic versatility of free adjuncts and absolutes; my central thesis is that both semantic and pragmatic factors may determine the logical role
which adjuncts and absolutes are felt to play.

4. **Plan of the dissertation.** The thesis which I shall defend in the ensuing chapters is that semantic and pragmatic factors jointly determine the relation felt to hold between a free adjunct or absolute and its superordinate clause. I shall argue (i) that in certain cases, a free adjunct or absolute may serve as the argument of an expression whose interpretation either fully determines its logical role or greatly limits the range of logical roles which it may be felt to play; and (ii) that when the logical role of a free adjunct or absolute isn't fully determined by the interpretation of some other expression, it may nevertheless be constrained to uniqueness by the inferences of language users. I show that such inferences may be based on a number of diverse factors, including semantic properties of the adjunct or absolute itself, semantic properties of the superordinate clause, and knowledge of the world.

Chapters II-V are devoted to those cases in which the interpretation of a sentence containing a free adjunct or absolute fully or partially determines the logical role which this is felt to play. In Chapter II, I demonstrate that free adjuncts can serve as arguments of modal verbs, and that when they do, the logical role they are felt to play is highly determinate. In sentences (65)-(71), the adjuncts are decidedly conditional in flavor. This is a consequence of their serving as arguments of the underlined modal verbs, whose interpretation admits no other understanding of the adjuncts.

(65) This same thing, happening in wartime, **would** amount to disaster.
    (Visser 1972:1137)
28

(66) Beth's only response is to look stricken. Who wouldn't be stricken listening to this crap? (NY 10/13/80, 189)

(67) Left to his own devices, he would do a lot of Q. and A. (NY 9/29/80, 107)

(68) ... dressed a little more elegantly, she would in no way have jarred with the tone of average middle-class society. (Visser 1972:1255)

(69) Unrestrained by Margery's presence, Frank would have been rude to Mrs. Rowlands. (Visser 1972:1255)

(70) It is not hard to envision how frightened a cow might be, hanging in a sling from a crane over a boat that was pitching and rolling at the edge of an apparently limitless expanse of roiling water. (CL, 26)

(71) Willie Nelson: You'd never use that on me. Slim Pickens: Sober I wouldn't. But when I get to the bottom of this bottle, I might. ('Honeysuckle Rose,' Warner Bros. Productions)

I show, however, that only certain sorts of adjuncts can serve as arguments of modals. I conclude that the distinction between those that can and those that cannot is exactly the difference between adjuncts with stage-level predicates and adjuncts with individual-level predicates (the stage/individual distinction being that drawn by Carlson 1977).

Chapter III deals with two intersections in the behavior of free adjuncts and time adverbs. First, I show that free adjuncts, like time adverbs, can serve as arguments of adverbs of frequency. The adjuncts in sentences (72) and (73) clearly have a temporal function;

(72) Because of their great size, obvious age, and relatively metropolitan setting, they are a landmark among citrus men around Winter Haven, who, giving directions, will often say something like, "Turn left at the stop
(72) [continued]
light. You can't miss it. You'll see a grove of big Seedlings on the corner."
(Q, 22)

(73) Asked to explain how it was that he didn't separate his characters into the good ones and the bad ones, Renoir's answer was always "Because everyone has his reasons," ... [the adjunct is unrelated—G. T. S.]
(NY 10/13/80, 174)

Like the time adverbs in (74) and (75), they serve as arguments of the underlined adverbs of frequency, whose semantics permits them no role other than a temporal one.

(74) When the weekend arrives, he usually heads for open water.
(NY 9/15/80, 36)

(75) When people walk past them [sc. the orange trees in the New York Botanical Garden—G. T. S.], however, they sometimes find them irresistible.
(Q, 6)

I additionally argue for the existence of an 'adverb of generalization' with no overt form, which, like frequency adverbs, takes a time adverb as one of its arguments, as in (76).

(76) When their old steel teapot develops a leak, Donald plugs up the hole with a wood screw.
(CL, 32)

This null adverb may take a free adjunct as an argument, in which case the adjunct is understood something like a whenever-clause, as in (77).

(77) Talking to Reagan, one gets the sense that he does not realize that he is evading, is not dealing with the issues. One gets the sense that an anecdote is his way of dealing with the issues.
(NY 9/29/80, 119)

Not all free adjuncts occur naturally as arguments of adverbs of frequency or generalization; only those with stage-level predicates
appear to.\textsuperscript{12}

The second topic treated in Chapter III is the interaction of free adjuncts with tense. I argue that the most satisfactory approach to all adjuncts not serving as the argument of a modal, frequency adverb, or adverb of generalization is to analyze them as belonging to the same category as those time adverbs which join with a simple tense or with the perfect to pick out some interval of time. Examples of adjuncts which I shall analyze in this way are those in (78)-(80).

\textbf{(78)} Being a superb dancer, she was in great demand for parties.  
\textit{(PM, 111)}

\textbf{(79)} Having previously had no reason to think of the residents of St. Louis as anything other than fair-minded Americans, I was naturally distressed to find that they were not able to respond with any graciousness at all to my suggestion...  
\textit{(NY 6/16/80, 104)}

\textbf{(80)} Prone in the muck, we worked systematically, following a small grid and sorting what we found.  
\textit{(CL, 140)}

In Chapter IV, I present a theory of the perfect which is consistent with the use of the perfect in free adjuncts, as well as a semantics for present participial phrases which accounts for the semantic peculiarities of present participial adjuncts, and which affords a treatment of the progressive as a predicative participial construction. Thus, in this chapter, the concentration is on the internal semantics of free adjuncts rather than on the semantic function of free adjuncts in the sentences within which they appear.\textsuperscript{13}

Chapter V is devoted to the formal semantics of absolutes in English. It is shown that, from a semantic point of view, absolutes
are similar to free adjuncts: augmented absolutes with stage-level predicates may serve as arguments of modals as well as of adverbs of frequency and generalization; and other sorts of absolutes may be convincingly analyzed as main tense adverbs.

(In the Appendix, the semantics for free adjuncts and absolutes developed in Chapters II-V is presented formally.)

In Chapter VI, I consider the means by which language users infer the logical role of a free adjunct or absolute in case it isn't fully determined by the semantics of English. I discuss in turn five factors which play an important role in such inferences: the presence of a stage-level vs. an individual-level predicate in an adjunct or absolute; the relative duration of the events or states of affairs to which an adjunct/absolute and its main clause relate; the order of an adjunct or absolute with respect to its superordinate clause; language users' knowledge of the world; and the presence of a 'connective adverb' in an adjunct/absolute or its superordinate clause. In addition, certain specialized functions of adjuncts and absolutes are examined.

5. **Some syntactic conventions.** Throughout this dissertation, I shall adhere to certain conventions in the statement of syntactic rules. These conventions are intended to make the syntactic rules more streamlined, but also to eliminate any undefined notions from their formulation.

Five basic conventions will be employed: the use of binary features representing subcategories of one or several categories of expressions; the use of morphological functions; the marking of main
verbs in verbal phrases, temporal abstracts,\textsuperscript{14} and sentences; the marking of subject noun phrases in temporal abstracts and sentences; and the use of syntactic subroutines.

(i) Binary features. In many kinds of situations, it will prove useful to distinguish a coherent subset of some category of expressions. This will be done with binary features; such features are thus to be thought of as sets of expressions. The features to be employed here are the following:

\begin{itemize}
  \item \texttt{[±Tense]} \texttt{[±Plural]}
  \item \texttt{[±Past]} \texttt{[±Object]}
  \item \texttt{[±Perfect]} \texttt{[±Adjunct]}
\end{itemize}

\texttt{[±Tense]} will specify two complementary subsets of the set \{x: x is a declarative sentence or temporal abstract\}; every syntactic rule giving rise to a sentence or temporal abstract will specify whether it is a member of \texttt{[+Tense]} or of \texttt{[-Tense]}. The feature \texttt{[±Tense]} will be useful for preventing unwanted iteration of rules of tensing; by stipulating that such rules apply to members of \texttt{[-Tense]} but yield members of \texttt{[+Tense]}, we can prevent multiple tensing of a single clause. (See Chapter III for discussion of the rules of tensing.)

\texttt{[±Past]} will specify two complementary subsets of the set \texttt{[+Tense]}; any rule giving rise to a member of \texttt{[+Tense]} will specify whether it is a member of \texttt{[+Past]} or of \texttt{[-Past]}. This feature will be used to insure the proper sequence of tense in adjuncts and absolutes.
[±Perfect] will specify two complementary subsets of the set {x: x is a declarative sentence, a temporal abstract, or an intransitive verb phrase}. Every rule giving rise to an expression in this set will specify whether it is a member of [+Perfect] or of [-Perfect]; all basic expressions in this set will automatically be members of [-Perfect]. The feature [±Perfect] will be used to prevent iteration of the perfect rule, which will operate on members of [-Perfect] to yield members of [+Perfect]. (See Chapter IV for discussion of this rule.)

The feature [±Plural] will determine two complementary subsets of the category T of noun phrases. Every rule giving rise to a noun phrase will specify whether it is subcategorized as [+Plural] or [-Plural]; both subcategories will in addition contain basic expressions—for example, _they_{4n+3} is a basic expression of [+Plural], and _he_{4n} a basic expression of [-Plural]. The membership of a noun phrase in one or the other subcategory determined by [±Plural] will be exploited in the statement of rules involving subject-verb agreement. (In the fragment presented in this dissertation, all singular noun phrases are third person; I thus ignore features of person in the statement of rules of subject-verb agreement.)

The feature [±Object] will determine two overlapping subsets of the category T of noun phrases. For any nonnegative integer n, the pronouns _he_4n, _she_4n+1, and _they_4n+3 will be members of [-Object], while _him_4n, _her_4n+1, and _them_4n+3 will be members of [+Object]; all other (basic or derived) noun phrases, including the pronoun _it_4n+2, will belong to both [+Object] and [-Object]. The feature [±Object]
will be useful for stating rules of verb-object and preposition-object combination: such rules will simply require a noun phrase argument in [+Object].

[±Adjunct] will determine two complementary subsets of the category TA of set-level time adverbs. Any rule producing an adverb of this category will specify whether it is a member of [+Adjunct] or of [-Adjunct]; all basic expressions of category TA will be members of [-Adjunct]. This feature will be used to insure that adjuncts and absolutes of category TA will be converted to the category MTA of main tense adverbs by a rule distinct from that converting other members of TA to MTA; this is necessitated by semantic considerations. (See Chapter III.)

(ii) **Morphological functions.** Morphological functions will be used to 'call' participles and finite forms of verbs in the derivation of participial phrases and tensed sentences. The use of such functions depends on the assumption that the lexical entry for a given verb will list its participles and finite forms, or at least determine such a list; additionally, holes in the paradigm of a verb will be indicated. Thus, the verbs [be], [go], [walk], and [must] might have the partial lexical entries in Table 2 (see p.35). Only one form in the lexical entry of a given verb will be regarded as a syntactically basic expression; the others will have no independent status in the syntax. For the vast majority of verbs, the base form ([be], [go], [walk]) will be the syntactically basic expression; in these cases, the participial and finite members of the lexical entry will only be introduced into larger expressions by syntactic
operations replacing bracketed main verbs (see (iii) below). (Modals, on the other hand, have no base forms; thus, the present tense form of [must] is by necessity the syntactically basic member of its maximally defective paradigm.) Syntactic operations will 'call' the participles and finite forms of a verb α by means of the following functions:

PRPL(α) is the present participle of α;
PSPL(α) is the past participle of α;
PRES1(α) is the third singular present form of α;
PRES2(α) is the third plural present form of α;
PAST1(α) is the third singular preterit form of α;
PAST2(α) is the third plural preterit form of α.

(A verb may, of course, be undefined for some or all of these functions --cf. Pullum and Wilson 1977.) In some cases, a syntactic operation may convert one nonbasic verb form to another, or back to its base form. For this reason, the functions listed above are defined for all expressions in a verb's lexical entry, so that, for example,

PSPL([be]) = PSPL([being]) = PSPL([been]) = PSPL([is]) = PSPL([are])
= PSPL([was]) = PSPL([were]) = [been].

Table 2 - Partial Lexical Entries for Four Verbs

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[be]</td>
<td>[being]</td>
<td>[been]</td>
<td>[is]</td>
<td>[are]</td>
<td>[was]</td>
<td>[were]</td>
</tr>
<tr>
<td>[go]</td>
<td>[going]</td>
<td>[gone]</td>
<td>[goes]</td>
<td>[go]</td>
<td>[went]</td>
<td>[went]</td>
</tr>
<tr>
<td>[walk]</td>
<td>[walking]</td>
<td>[walked]</td>
<td>[walks]</td>
<td>[walk]</td>
<td>[walked]</td>
<td>[walked]</td>
</tr>
<tr>
<td>ø</td>
<td>ø</td>
<td>ø</td>
<td>[must]</td>
<td>[must]</td>
<td>ø</td>
<td>ø</td>
</tr>
</tbody>
</table>
In addition, a function \texttt{BASE} will be introduced which is such that for any verb form \( a \), \( \text{BASE}(a) \) is the base form of \( a \). Thus, in the derivation of the past tense sentence (81) from the sentence (82), \( \text{PAST1}([\text{\{is\}}]) \) is substituted for \([\text{\{is\}}]\).

(81) (John) [was] happy
(82) (John) [is] happy

Similarly, in the derivation of the derived verb phrase (83) from sentence (84), \( \text{BASE}([\text{\{walks\}}]) \) is substituted for \([\text{\{walks\}}]\).

(83) [walk] home
(84) (he) [walks] home

Morphological functions will also be used to 'call' plural nominal forms. Thus, where \( a \) is a basic common noun, \( \text{PLUR}(a) \) is the plural form of \( a \).

As will be seen in (v) below, these eight morphological functions will figure importantly in the statement of a number of syntactic subroutines.

(iii) Main verb marking. All sentences, temporal abstracts, and verbal phrases will have their main verb enclosed in brackets. If \( a \) is a basic expression of any verbal category, it will be of the form \([a]\); for some \( b \). Rules combining a sentence, temporal abstract, or (basic or derived) verbal phrase \( \gamma \) with another expression will retain or delete the brackets in \( \gamma \) according as the main verb of \( \gamma \) is or is not to be the main verb of the resulting expression. Thus, the rule 337 combining an intransitive verb phrase \( \gamma \) with a verb-phrase adverb will retain the bracketing in \( \gamma \):
S37. If \( \alpha \in P_{IVS/IVS} \) and \( \beta \in P_{IVS} \), then \( F_{37}(\alpha, \beta) \in P_{IVS} \),
where \( F_{37}(\alpha, \beta) = \beta \alpha^7 \).

Example: \( F_{37}(\text{very dangerously}, [\text{drive}]) = [\text{drive}] \text{ very dangerously} \)

The main verb of the bare verb phrase is the same as the main verb of the adverbially modified verb phrase in this example. On the other hand, the rule S25 joining a verb with a sentential complement \( \phi \) will delete the bracketing in \( \phi \):

S25. If \( \alpha \in P_{IVS/t} \) and \( \phi \in P_t, [+\text{Tense}] \), then
\[ F_{25}(\alpha, \phi) \in P_{IVS}, \]
where \( F_{25}(\alpha, \phi) = [\alpha \text{ that } \phi^7] \) and \( \phi^7 \) is the result of deleting all brackets and parentheses from \( \phi \).

Example: \( F_{25}([\text{say}], (\text{John}) [\text{likes}] \text{ Mary}) = [\text{say}] \text{ that John likes Mary}^{15} \)

The main verb of the subordinate clause doesn't survive as the main verb of the resulting verb phrase in this example. A number of rules will refer to the main verb of a sentence, temporal abstract, or verbal phrase—those accomplishing subject-verb agreement and tense marking, as well as those introducing modals and perfect have and those converting intransitive verb phrases into infinitive and participial phrases.\(^{16}\)

(iv) **Subject marking.** All sentences and temporal abstracts will have their subject enclosed in parentheses; these will be introduced by the rules joining a noun phrase with an intransitive verb phrase to form a sentence. Rules operating on a sentence or temporal abstract will either retain or delete the parentheses around its subject
according as it is or is not to be regarded as the subject of the resulting expression. For example, the rules which introduce tense, modals, and perfect have into an expression $\phi$ will retain the parentheses around the subject of $\phi$; but as we have just seen, the rule S25 joining a verb with a sentential complement $\phi$ deletes the subject-parentheses of $\phi$. A number of rules will refer crucially to the subject of a sentence or temporal abstract: for example, rules introducing modals and perfect have will place these immediately after the subject of their sentential argument. It might seem that we could equivalently formulate such rules as placing auxiliary elements immediately before the (bracketed) main verb of their sentential argument; but such a formulation would yield the wrong results for sentences with preverbal adverbs, producing (86) from (85) instead of (87).

(85) (John) quickly [douses] the flame
(86) *(John) quickly [might] douse the flame
(87) (John) [might] quickly douse the flame

(v) Syntactic subroutines. In order to avoid repetition in stating the effects of the structural operations to be employed, and to capture the similarities between certain sorts of operations, a number of structural subroutines will be employed; the effects of a given structural operation will be stated in terms of one or several such subroutines. The subroutines to be employed are:
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>'right of subject'</td>
</tr>
<tr>
<td>DEL</td>
<td>'rebracketing'</td>
</tr>
<tr>
<td>NONF</td>
<td>'nonfinite'</td>
</tr>
<tr>
<td>RB</td>
<td>'perfect rebracketing'</td>
</tr>
<tr>
<td>DB</td>
<td>'debracketing'</td>
</tr>
<tr>
<td>PR3</td>
<td>'perfect rebracketing'</td>
</tr>
<tr>
<td>DP</td>
<td>'right-wrap'</td>
</tr>
<tr>
<td>RWRAP</td>
<td>'right-wrap'--Bach 1980</td>
</tr>
<tr>
<td>SSDEL</td>
<td>'n-subscript deletion'</td>
</tr>
<tr>
<td>AGR</td>
<td>'agreement'</td>
</tr>
<tr>
<td>SUB</td>
<td>'agreement'</td>
</tr>
<tr>
<td>PRET</td>
<td>'agreement'</td>
</tr>
<tr>
<td>ALLSUB</td>
<td>'agreement'</td>
</tr>
<tr>
<td>SUBJ</td>
<td>'subjunctive'</td>
</tr>
</tbody>
</table>

These are defined as follows: for any expressions $\alpha, \beta, \gamma$,

- **EN**($\alpha$) is the result of replacing every expression of the form
  $[5]$ in $\alpha$ with PSPL($[5]$) (and is undefined if some bracketed
  expression in $\alpha$ lacks a past participle form):

  $$\text{EN}(\text{[walk] home}) = \text{[walked] home};$$

- **ING**($\alpha$) is the result of replacing every expression of the form
  $[5]$ in $\alpha$ with PRPL($[5]$) (and is undefined if some bracketed
  expression in $\alpha$ lacks a present participle form):

  $$\text{ING}(\text{[walk] home}) = \text{[walking] home};$$

- **NONF**($\alpha$) is the result of replacing every expression of the form
  $[5]$ in $\alpha$ with BASE($[5]$) (and is undefined if some bracketed
  expression in $\alpha$ lacks a base form):

  $$\text{NONF}((\text{John}) \ [\text{walks}] \ \text{home}) = (\text{John}) \ [\text{walk}] \ \text{home};$$

- **DB**($\alpha$) is the result of deleting all brackets from $\alpha$:

  $$\text{DB}((\text{John}) \ [\text{walks}] \ \text{home}) = (\text{John}) \ \text{walks} \ \text{home};$$

- **DP**($\alpha$) is the result of deleting all brackets and parentheses from
  $\alpha$:

  $$\text{DP}((\text{John}) \ [\text{walks}] \ \text{home}) = \text{John \ walks \ home};$$
SSDELe(n) is the result of deleting the subscript n from every occurrence of he_n, him_n, his_n, she_n, her_n, it_n, its_n, they_n, them_n, and their_n in α: SSDELe((she) [likes] him) = (she) [likes] him;

PRET(α) is the result of replacing each expression of the form [δ] in α with PAST1([δ]) if [δ] is PRES1([δ]) and with PAST2([δ]) if [δ] is PRES2([δ]) (and is undefined if some expression of the form [δ] in α is such that PRES1([δ]), PRES2([δ]), PAST1([δ]), or PAST2([δ]) is undefined):

PRET((John) [is] happy) = (John) [was] happy;

SUBJ(α) is the result of replacing each expression of the form [δ] in α with PAST2([δ]) (and is undefined if some expression of the form [δ] in α is such that PAST2([δ]) is undefined):

SUBJ((John) [is] happy) = (John) [were] happy;

DEL(α, β) is the result of deleting every instance of α in β:

DEL(at-that-time_0, (John) [left] at-that-time_0) = (John) [left];

ROS(α, β) is the result of placing α immediately after the first parenthesized expression in β (and is undefined if β has no parenthesized expressions): ROS(often, (John) [walks] home) = (John) often [walks] home;

RB(α, β) is ROS(α, DB(NONF(β))): RB([will], (John) [walks] home) = (John) [will] walk home;

PRB(α, β) is ROS(V(α), DB(EN(β))), where V is the morphological function such that the first expression of the form [δ] in β is V([δ]) (and is undefined if β has no bracketed
expressions): \(\text{PR3([have], (John) [walks] home}) = (John) [has] walked home;\)

\(\text{RWRAP}(\alpha, \beta)\) is the result of placing \(\beta\) after the first word of \(\alpha\):

\(\text{RWRAP}([\text{persuade}] to leave, John) = [\text{persuade}] John to leave;\)

\(\text{AGR}(\alpha, \beta)\) is the result of replacing each expression of the form 

\([\delta] in \gamma with \text{PRES1}([\delta]) if \alpha \in [-\text{Plural}] and with \text{PRES2}([\delta])

if \alpha \in [+\text{Plural}] \) (\text{AGR} is undefined if \alpha \notin [-\text{Plural}] \)

[+\text{Plural}] or if there is some expression \([\delta] in \gamma such that

\text{PRES1}([\delta]) and \text{PRES2}([\delta]) are undefined):

\(\text{AGR(they}, [be] happy) = [are] happy;\)

\(\text{SUB}(\alpha, \beta, \gamma)\) is the result of replacing the first occurrence of \(\beta\)

in \(\gamma \) with \(\alpha \) (and is undefined if \(\gamma\) has no occurrences of \(\beta\)):

\(\text{SUB(John, him}, (Mary) [likes] him) = (Mary) [likes] John;\)

\(\text{ALLSUB(}\alpha, \beta, \gamma\) is the result of replacing every occurrence of \(\beta\)

in \(\gamma \) with \(\alpha \) : \(\text{ALLSUB}([\text{that she would leave, that} [\text{denied}]

\text{that she would leave when Bill claimed that she would leave.}\)

The uses of these subroutines should be obvious from the

examples. \(\text{EN and ING can be used to convert intransitive verb phrases into past and present participial phrases. NONF can be used to convert a finite clause into a nonfinite one as part of a derived verb phrase rule or to prepare a clause for the placement of a modal. DB can be used to debracket any expression whose main verb won't end up as the main verb of the expression of which it is a constituent. DP can be used to deparenthesize and debracket any expression whose subject and main verb won't become the subject and main verb of the} \)
expression of which it is a constituent (thus, rule S25 above can now be abbreviated as follows: ... where $F_{25}(\alpha, \phi)$ is a that $\phi'$ and $\phi'$ is DP($\phi$)). SSDEL$_n$ can be used in the statement of rules of quantification. PRET can be used to introduce past tense marking into a sentence. SUBJ can be used to introduce subjunctive mood into a conditional clause. DEL can be used to delete instances of the adverbial proform at-that-time$n$ (see Chapter III, section 1.2) as a concomitant of binding. POS can be used to insert adverbs into full clauses. Similarly, RB can be used in the placement of modals within a clause, and PRB can be used to place perfect have. RWRAP can be used to place a direct object in the appropriate spot within a complex transitive verb phrase (cf. Bach 1980). AGR can be used to effect subject-verb agreement as part of the rule combining a noun phrase with an intransitive verb phrase. SUB can be used in the statement of rules for binding term variables, and ALLSUB, in the statement of the rules effecting sequence of tense (see Chapter III, section 1.5).
Footnotes—Chapter I

1 Throughout this chapter and Chapter VI, I will rely heavily on naturally occurring example sentences. Many of these are from the following sources, whose abbreviations are as indicated.

The New Yorker (NY)


Robert van Gulik, Poets and Murder. Scribner's, New York. 1968. (PM)

2 By nonfinite I mean uninflected for tense, person, and number. I do not, however, wish to imply that this definition is universally valid—on the contrary, as Brian Joseph has pointed out to me, there may be no such definition. Indeed, this definition may not even be adequate for English, depending on how we analyze imperatives and whether or not we think they should count as finite. But as far as our present concerns go (English predicative phrases) go, we can take this as an ad hoc definition of nonfiniteness.

3 A careful reading of Poets and Murder (see footnote 1 above), a mystery novel, turned up 306 free adjuncts in 174 pages of text.

4 The free adjunct construction is native to English. Examples can be found in abundance from Old English through Modern English; an early example is (i). (See Visser 1972:1132f;1252f.)

(i) þæs ping gesonde, se ærwyrða bīscop Wlstan wæro swīðe gedrēf on hīs hīd. 'Seeing those things, the venerable bishop W. was very troubled in his heart.' (Peterborough Chronicle, year 1033)

5 For the standard statement of this constraint, see Pullum (1974); see also Chapter IV.
5Unrelated adjuncts show extremely diverse control properties. An unrelated adjunct may, as in (18)-(21), be controlled by some contextually salient individual who may or may not be referred to in the superordinate clause; it may be controlled by the speaker(s), as in (24) and (25); it may be controlled by the fact or event described by the superordinate clause, as in (26) and (27); or it may express an epistemic condition in whose light the superordinate clause is or would be true, as in (22) and (23). A formal semantics of 'control' in free adjuncts would clearly be a complicated undertaking: it would have to draw upon auxiliary theories of contextual salience, self-reference, propositional attitudes, and speech acts.

7In fact, Berent (1975:22), working within a transformational framework, asserts that the two constructions are derivationally related by Equi-NP Deletion. Ross (1975:112-113) and Cantrall (1974:21) also imply that free adjuncts arise through Equi-NP Deletion. As the examples in (18)-(27) show, this cannot be the case for all adjuncts; I doubt that it is for any adjunct, although to show this here would take us too far afield.

The slightly formal character of absolutes is perhaps responsible for the relatively small number—seventy—of absolutes found in Poets and Murder; cf. footnote 3.

The Modern English absolute construction stems from the Old English dative (occasionally accusative or nominative) absolute construction, which is widely assumed to derive from the Latin ablative absolute construction. Most often, it 'occurs in those Old English translations from Latin in which the writers allow themselves to be influenced by the syntax of the original' (Visser 1972:1073). An early example is (1).

(1) þyssum monnum þone bysceophad þeniendum wæs on seonon þe geseted & gedæmed, þat Suðseaxna mecg sceolde habban agenne bycop. 'With these men administering the episcopal office, it was settled and determined in synod that the country of the South Saxons should have its own bishop.' (Ælfred, Bede 448.11)

(See Jespersen (1940:45f) and Visser (1972:1073f).)

8Jespersen (1940:38-44) notes this peculiarity of these prepositions; oddly, he later declares (p.145): 'The in in combinations after without I take to be a gerund'. Cf. also Quirk, et al. (1972:762).

Williams (1975:253) erroneously regards gerundial constructions like those in (43) and (44) as participial.

9'Absolutes' appear not to be commonly introduced by subordinating conjunctions in Modern English; cf. Visser (1972:1158;1271-1277).
The term is that of Quirk, et al. (1972:759).

Perhaps generative linguists have generally just assumed that these constructions arise through the deletion of an underlyingly explicit subordinator. Postal (1970:490) casually refers to a rule of 'Since Subject Erasure', 'involved in the derivation of sentences such as [(i)] from structures similar to sentences like [(ii)]', as though it were self-evident that these sentences are to be transformationally linked.

(i) Having no boat, Harry was forced to swim.
(ii) Since he had no boat, Harry was forced to swim.

(Rabby (1975:32,fn2) analogously suggests, without argument, that Russian gerunds (functionally equivalent to free adjuncts) derive from deep structure APs labelled according to their logical role.) In Chapter VI, I argue against such syntactic approaches to the semantic versatility of free adjuncts and absolutes in English.

Chapter II and this part of III are an elaboration of Stump (1980a).

This chapter is an elaboration of Stump (1980b).

These are expressions with the form of sentences but which denote sets of time intervals. The existence of such a category of expressions will be motivated in Chapter III.

The subject parenthesization will be explained immediately below.

As David Dowty has pointed out to me, the bracketing of main verbs can probably be dispensed with if a recursive definition of the head of an expression is introduced into the syntax. Elegant though such an approach would be, I will employ bracketing here, in the interests of simplicity.
In this chapter, it is shown that free adjuncts can play exactly the same role in the interpretation of modal sentences as if-clauses, and that when they do, they are consigned to a very specific logical role by the rules of interpretation for modals; a formal semantics for free adjuncts in modal contexts is developed to elucidate this claim. In section 1, some basic rules for the syntax of free adjunct sentences are proposed, and the corresponding rules of interpretation are discussed. In section 2, it is shown that the class of free adjuncts is bifurcated with respect to the range of interpretations which they may assume in modal contexts. In section 3, it is demonstrated that this bifurcation is a reflection of the fact that adjuncts of one variety may condition the interpretation of a modal, while those of the complementary variety cannot; Kratzer’s theory of conditional necessity and possibility is crucially assumed. In section 4, an independent criterion for distinguishing the two sorts of adjuncts is uncovered; this criterion is based on Carlson’s stage/individual distinction. The formal rules of syntax and interpretation developed in this chapter appear in the general fragment for...
free adjuncts and absolutes presented in the Appendix.

1. Some basic rules for the syntax and interpretation of free
   adjuncts. Before we proceed to the semantics of free adjuncts in
   modal contexts, certain assumptions must be made explicit, and some
   fundamental commitments must be made regarding the syntax and inter-
   pretation of free adjuncts generally.

   In Chapters II-IV of this dissertation, I argue that free adjuncts
do not all belong to a single category of expressions, but that they
can in fact be sorted into at least three distinct categories¹ on the
basis of their combinatory properties and of the contributions they
make to the interpretation of expressions of which they are consti-
tuents. Nevertheless, we can naturally regard all adjuncts as ultima-
tely deriving from expressions of a single category. I call this
the category t' of primal adjuncts.

<table>
<thead>
<tr>
<th>Category name</th>
<th>Description</th>
<th>Basic expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>t'</td>
<td>the basic category of primal adjuncts</td>
<td>Λ</td>
</tr>
</tbody>
</table>

   The intuition behind this category is that free adjuncts, like
sentences, can be true or false. The adjunct in sentence (1), for
example, is intuitively true iff John is lying on the beach.

   (1) Lying on the beach, John would surely catch cold.

   The notion of primal adjuncts is meant to capture this intuition:
primal adjuncts have the form of predicative phrases (verbal, adject-
tival, prepositional, and nominal) but are analyzed as having an
implicit free variable in 'subject position'; in this way, they denote
truth values, like sentences. For example, the adjunct lying on the
beach in (1) is assigned the intensional logic translation (2); this adjunct is thus true at a given index iff \( a \) is lying on the beach at that index, where \( a \) is the value assigned to \( x \). \(^2\)

\[
(2) \text{lying-on-the-beach}^\prime(x)
\]

For purposes of simplicity, we can assume here that the implicit subject variable of a primal adjunct is obligatorily bound by the subject of the superordinate clause— that is, we can assume that the free adjunct in (1) is true iff John is lying on the beach. We would of course have to abandon this assumption if we wanted to account for the full range of control possibilities to which free adjuncts are subject, but this is a concern that goes beyond the scope of the present dissertation.

The category of primal adjuncts has no basic members; primal adjuncts always derive from predicative expressions. I assume the six categories of predicative expressions listed in (3); \(^3\)

<table>
<thead>
<tr>
<th>Category name</th>
<th>Description</th>
<th>Basic expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>INF</td>
<td>the basic category of infinitive phrases</td>
<td>( A )</td>
</tr>
<tr>
<td>PRPL</td>
<td>the basic category of present participial phrases</td>
<td>( A )</td>
</tr>
<tr>
<td>PSPL</td>
<td>the basic category of past participial phrases</td>
<td>( A )</td>
</tr>
<tr>
<td>ADJ</td>
<td>the basic category of adjective phrases</td>
<td>asleep, ready, fat, intelligent, ...</td>
</tr>
<tr>
<td>PP</td>
<td>the basic category of prepositional phrases (^b)</td>
<td>( A )</td>
</tr>
<tr>
<td>NOM</td>
<td>the basic category of predicative noun phrases</td>
<td>( A )</td>
</tr>
</tbody>
</table>

I additionally assume a supercategory PRED of predicative phrases, whose membership is the union of those of INF, PRPL, PSPL, ADJ, PP, \( A \),
and NO. With these assumptions, we can state a very simple rule for deriving primal adjuncts from predicative phrases as in (4). 5

(4) S1. If \( \alpha \in P_{\text{PRED}} \), then \( F_{1,n}(\alpha) \in P^t \), where

\[
F_{1,n}(\alpha) = \alpha.
\]

According to this rule, if lying on the beach is a predicative expression, then the result of applying \( F_{1,n} \) to lying on the beach (for any nonnegative integer \( n \)) is a primal adjunct; since \( F_{1,n} \) is just the identity function, the resulting adjunct is, in this case, simply lying on the beach.

The translation rule corresponding to (4) allows us to predict the meaning of a primal adjunct from that of the predicative phrase from which it derives. This rule can be stated as in (5).

(5) T1. If \( \alpha \in P_{\text{PRED}} \) and \( \alpha \) translates as \( \alpha' \), then \( F_{1,n}(\alpha) \) translates as \( \alpha'(x^n) \).

According to (5), if the participial phrase lying on the beach translates as lying-on-the-beach', then the primal adjunct deriving from this phrase translates as lying-on-the-beach'(x^_n); at a given index, this denotes either truth or falsehood.

Notice that (4) and (5) are not actually simple rules, but are instead rule schemata, whose instantiations are infinite in number owing to the infinite number of possible values for \( n \). We need an infinite number of values for \( n \) in order to guarantee acceptable interpretations for sentences with indefinitely many free adjuncts.

The category of adjuncts derived by means of schema (4) (and interpreted by means of (5)) is, again, the category from which all adjuncts ultimately issue. I shall argue in Chapters III and IV that
there are two other categories of adjuncts. However, to facilitate
discussion of the interpretation of free adjuncts in modal contexts,
I shall provisionally introduce yet a fourth category of adjuncts;\(^6\)
this is the category \(t/t\) of adsentential modifiers.

<table>
<thead>
<tr>
<th>Category name</th>
<th>Description</th>
<th>Basic expressions</th>
</tr>
</thead>
</table>
| \(t/t\)       | the category of adsen-
                   | tential modifiers      | necessarily,            |
                   |                       |                         | nevertheless, ...      |

The notion that free adjuncts may serve as adsentential modifiers
is a highly plausible one. The adjunct in (6), for example, seems to
play exactly the same sort of semantic role as the adverbs in (7) and
(8):

(6) Preferring to go dancing, Mary agrees to go skydiving.
(7) At the party, Mary agrees to go skydiving.
(8) Because she likes adventure, Mary agrees to go skydiving.

its meaning intuitively 'operates on' that of the superordinate clause
to produce some modulation of its meaning. The adjunct in (6) can
thus be tentatively regarded as an adsentential adjunct.

It is a simple matter to derive adsentential adjuncts from
primal adjuncts. We simply switch them from one category to the
other, with no change in form:

(9) \[ S_{13}. \text{If } \alpha \in P_{t}, \text{then } F_{13,n}(\alpha) \in P_{t/t}, \text{where} \]
    \[ F_{13,n}(\alpha) \text{ is } \alpha. \]

What's less clear is how the interpretation of an adsentential adjunct
depends on that of the corresponding primal adjunct.

Consider sentences (6)-(8) again. Intuitively, (6) and (8) have
an important property in common: in both sentences, the adverb speci-
that some auxiliary proposition (that Mary prefers to go dancing, that
she likes adventure) is relevant to the truth of the superordinate clause. (6) and (8) differ, however, in the explicitness of their adverbs: in (8), the subordinating conjunction because indicates precisely how the auxiliary proposition is relevant; (6), on the other hand, though strongly implying that there is some specific way in which the auxiliary proposition is relevant, doesn't explicitly indicate how—this must be inferred (in accordance with principles to be discussed in Chapter VI). An adequate translation of the adjunct in (6) should, I believe, reflect both of these facts.

One way to satisfy this requirement is to regard adsentential adjuncts as containing an implicit variable as their subordinator. That is, if we assume that subordinating conjunctions like because denote two-place relations between propositions (more exactly, functions of type \(<\langle s,t\rangle,\langle s,t\rangle,t\rangle\) ), we can introduce an intensional logic variable \(L\) over denotations of just this type, and regard adsentential adjuncts as having \(L\) as their implicit subordinator, so that the adjunct in (6) translates as (10), and (6) itself as (11).

\[
(10) \quad L('preferring-to-go-dancing'(x))
\]

\[
(11) \quad L('preferring-to-go-dancing'(x))('Mary-agrees-to-go-skydiving')
\]

This analysis captures the fact that adsentential adjuncts, like adsentential adverbial clauses, relate the proposition of their superordinate clause to some auxiliary proposition. But it also reflects the fact that these adjuncts do not explicitly indicate the precise nature of this relation: because \(L\) is a variable, it can be evaluated in a number of ways.
In fact, L can have as its value any kind of propositional relation whatsoever, including the highly unlikely relations denoted by the intensional logic expressions in (12).

(12) \( \lambda p \lambda q[p = q \lor p \neq q] \)

\( \lambda p \lambda q[\top \iff \top \lor p] \)

\( \lambda p \lambda q[[p \lor q] \iff [q \iff \Box[\top \land \text{John-owns-a-bicycle}]]] \)

In a given context, however, the range of **pragmatically admissible** values for L will always be drastically constrained, often to uniqueness. We have said that in the comprehension of sentences like (6), the exact nature of the relation between the auxiliary proposition and the proposition expressed by the superordinate clause must be inferred. Thus, in a given context of use, the pragmatically admissible values for L will be those determined by the inferences of language users. (In Chapter VI, the notion of the pragmatic admissibility of an assignment of values to variables will be discussed in detail in connection with a general hypothesis about inferential resolutions of semantic indeterminacy.)

The use of L to translate adsentential adjuncts is approximately the analysis I wish to advocate. One adjustment is probably desirable, however. If we carefully examine (present tense) sentences with adsentential adjuncts, we find that they usually intuitively entail the truth of both their adjunct (rather, the primal adjunct from which it derives) and their superordinate clause; the truth of each of (13)-(16) at some interval \( i \) would, for example, appear to entail the truth of both its adjunct and its main clause at \( i \).

(13) Lying on the beach, John notices the storm developing.
(14) In first gear, the truck reaches the top of the hill.

(15) Being a master of disguise, John is fooling everyone.

(16) Standing on a chair, John touches the ceiling.

Some examples don't have an entailment quite this strong; (17), for example, could seemingly be true at an interval $i$ even if during $i$, Mary pulled open the door and subsequently entered the room (in which case neither the adjunct nor the main clause would actually be true at $i$);

(17) Pulling the door open, Mary enters the room.

but even (17), if true at $i$, intuitively entails the truth of its adjunct and its main clause sometime during $i$. All (present tense) sentences with adjuncts of category $t/t$ appear to have at least an entailment of this sort. It's not absolutely clear how to interpret this fact. It may simply be that the pragmatically admissible values for $L$ happen always to be relations which are true of a pair $<p,q>$ of propositions at some interval $i$ only if $p$ and $q$ are each true sometime during $i$. On the other hand, it may be a semantic fact about (present tense) sentences with adsentential adjuncts that if they are true at some interval $i$, then their adjunct and their main clause are each true at some time during $i$. I know of no conclusive evidence deciding the issue; the fact that this property of sentences like (13)-(17) remains invariant in all contexts, however, at least suggests that a semantic account is appropriate.

We can provide a semantic account as follows. Let $K$ be a constant of intensional logic having the same denotation as (18) (where $L$ is, as above, a variable of type $<s,t>,<<s,t>,t>$; $p,q,r,s$ are variables
of type <s, t>; t, t₁ are variables over time intervals; t ⊆ t₁ is true iff the interval denoted by t is a subinterval of (and possibly identical to) that denoted by t₁; and now is a constant whose denotation at any index (or world-interval pair) <w, i> is i):

(18) \( \lambda L \lambda p \lambda q[[L(p)(q) \& \lambda t \lambda r \lambda s[L(t)(r)(s) + \forall t V t_1[[t \subseteq \text{now} \& t_1 \subseteq \text{now}] \& [\lambda t, \forall t \lambda AT(t, \forall r) \& AT(t, \forall s)]]]] \)

Observe that the result of applying K to L is an expression K(L) whose interpretation is exactly like that of L (i.e. its value may be any one of a range of functions of type <<s, t>, <s, t>, t>>) except that its values must always be relations which can be true of a pair <p, q> of propositions at some interval only if p and q are each true sometime during this interval. By using K(L) rather than L as the implicit subordinator in the translation of adsentential adjuncts, we can guarantee the desired entailment in sentences like (13)–(17). Thus, we revise our translation (10) of the adjunct in (6) as in (19), and consequently, the translation (11) of (6) itself as in (20).

(19) K(L)("preferring-to-go-dancing!(x))

(20) K(L)("preferring-to-go-dancing!(x))("Mary-agrees-to-go-skydiving")

We can now finally state the translation rule corresponding to the rule (9) converting primal adjuncts into adsentential adjuncts:

(21) T13. If \( \alpha \in P_t \), and \( \alpha \) translates as \( \alpha' \), then \( F_{1,n}(\alpha) \) translates as \( K(L_n)(\alpha') \).

Notice that (9) and (21), like (4) and (5), are actually rule schemata, instantiated by as many rules as there are nonnegative integers. Here, we need an infinite number of values for n in order
to guarantee acceptable interpretations for sentences with indefinitely many adjuncts of category t/t.

For now, sentences like (6) are generated by a general rule for combining adsentential modifiers with sentences (cf. rule S9 of P7Q):

(22) S36. If \( \alpha \in P_{t/t} \) and \( \phi \in P_t \), \([\beta \text{Tense}, \gamma \text{Past}, \delta \text{Perfect}]\),
then \( F_{36a}(\alpha, \phi) \in P_t \), \([\beta \text{Tense}, \gamma \text{Past}, \delta \text{Perfect}]\), where \( F_{36a}(\alpha, \phi) \) is \( \Gamma \alpha, \phi \).

Because members of t/t can also appear after the clause they modify, or after its subject, we can add two alternative structural operations to (22):

(22) [continued]

... , then \( F_{36b}(\alpha, \phi) \), \( F_{36c}(\alpha, \phi) \) \( \epsilon \ P_t \), \([\beta \text{Tense}, \gamma \text{Past}, \delta \text{Perfect}]\), where \( F_{36b}(\alpha, \phi) \) is \( \Gamma \phi, \alpha \) and \( F_{36c}(\alpha, \phi) \) is \( \text{ROS}(\Gamma \alpha, \phi) \).

The translation rule (23) corresponding to (22) is:

(23) T36. If \( \alpha \in P_{t/t} \), \( \phi \in P_t \), and \( \alpha, \phi \) translate as \( \alpha', \phi' \),
then \( F_{36a}(\alpha, \phi) \), \( F_{36b}(\alpha, \phi) \), and \( F_{36c}(\alpha, \phi) \) translate as \( \alpha'(\phi') \).

With the basic rules of syntax discussed in this section, we can assign (6) the partial syntactic analysis (24); this analysis induces (25) as a translation for (6), according to the rules we have discussed.

(24) preferring to go dancing, (Mary) [agrees] to go skydiving, t, 36a

(24) preferring to go dancing, (Mary) [agrees] to go go skydiving, t, 36a

preferring to go dancing, t/t, 13,0 (Mary) [agrees] to go skydiving, t

preferring to go dancing, t', 1,4
Although the interpretation induced by (25) is, from a strictly semantic point of view, highly indeterminate, the inferences of language users may constrain the range of pragmatically admissible values for \( L_0 \) and \( x_4 \) to uniqueness (thus, the only pragmatically admissible value for \( L_0 \) might be a relation of concession, and the only pragmatically admissible value for \( x_4 \) might be Mary). This phenomenon will be taken up in Chapter VI.

(In section 4 of the present chapter, certain considerations will lead to minor modifications of the inventory (3) of categories of predicative expressions, and of the statement of rules (4) and (5). In Chapter III, section 4, rules (9) and (21) will be abandoned --adventitious adjuncts will be assimilated into another category.)

With these preliminary remarks on the syntax and interpretation of free adjuncts behind us, we can now proceed to the semantics of free adjuncts in modal contexts.

2. The semantic bifurcation of free adjuncts in modal contexts. In this chapter, we will say that a free adjunct is in a modal context iff its superordinate clause is headed by a modal auxiliary verb, as for example in (26)-(29).

(26) a. Being a master of disguise, Bill would fool everyone.
   b. Wearing his new outfit, Bill would fool everyone.

(27) a. Having unusually long arms, John can touch the ceiling.
   b. Standing on a chair, John can touch the ceiling.
(28) a. Measuring almost a half-mile, this must be the longest piece of twine in town.
   b. Unraveled, this must be the longest piece of twine in town.

(29) a. Weighing only a few tons, the truck might reach the top of that hill.
   b. In first gear, the truck might reach the top of that hill.

As I shall now show, the class of free adjuncts is actually bifurcated with respect to the range of interpretations which they may assume in modal contexts.

Consider sentences (26)-(29) again. Careful examination reveals a striking difference between the _a_ sentences and the _b_ sentences. The _a_ sentences entail the actual truth of their adjuncts; none of (26a)-(29a) could be true unless its adjunct were also true. The _b_ sentences, on the other hand, don’t necessarily entail the current truth of their adjuncts; each has a reading on which it could be true at some interval even if there were no time during that interval at which its adjunct were true.

The _a_ sentences of (26)-(29) are just like the _b_ sentences, apart from their adjuncts. We must therefore regard this distinction in entailments as the reflection of some kind of important difference between two varieties of free adjuncts. In the discussion which follows, adjuncts like being a master of disguise and having unusually long arms, whose actual truth is uniformly entailed in sentences like (26)-(29), will be termed strong adjuncts; those like wearing his new outfit and standing on a chair, whose current truth can fail to be entailed in sentences like (26)-(29), will be called weak adjuncts.
As will be demonstrated in the present chapter and in Chapter III, this bifurcation of the class of free adjuncts is quite systematic.

In each of (26)-(29), the difference in entailment between the strong and the weak adjunct is clearly linked to the presence of a modal verb in the main clause; sentences like those in (30) and (31), which contain no modal in their main clause, uniformly entail the truth of their free adjunct. 8

(30) a. Being a master of disguise, Bill is fooling everyone.
   b. Wearing his new outfit, Bill is fooling everyone.

(31) a. Weighing only a few tons, the truck reaches the top of the hill.
   b. In first gear, the truck reaches the top of the hill.

In addition, the difference in entailments between the strong and the weak adjuncts in (26)-(29) is linked to an intuitive difference in logical role: the strong adjuncts are felt to function as adverbs of reason (because he is a master of disguise, since it weighs only a few tons), while the weak adjuncts are felt to serve as conditional clauses (if he wore his new outfit, if it were in first gear).

To see precisely what produces the difference in entailments between strong and weak adjuncts in sentences like (26)-(29) -- and to understand the apparently correlative difference in their intuitive logical role -- we need a finer appreciation of the semantics of modals. In the following section, I shall show that Kratzer's (1977, 1978, 1979) theory of modals affords us an important insight into the source of these differences.
3. **Explaining the entailment properties of strong and weak adjuncts in modal contexts.** In her recent paper 'Conditional Necessity and Possibility', Angelika Kratzer develops a novel theory about the meaning of modal expressions in conditional sentences. This theory yields a very satisfactory explanation of the entailment differences between strong and weak adjuncts in modal contexts. In this section, I shall briefly characterize her theory, and then discuss its implications for the analysis of free adjuncts.

3.1 **Kratzer's theory of conditional modality.** Traditionally, modals have been assumed to have several different kinds of meanings. *Must*, for example, has been thought to have (at least) a deontic, an epistemic, a dispositional, and a preferential meaning, as exemplified in (32)-(35).

\[
\begin{align*}
\text{(32) Deontic: } \text{Witnesses must swear to tell the truth.} \\
\text{(33) Epistemic: } \text{It must be snowing at higher elevations.} \\
\text{(34) Dispositional: } \text{Mary must lie down to keep from fainting.} \\
\text{(35) Preferential: } \text{We must have that hat.}
\end{align*}
\]

Kratzer (1977, 1978), however, argues that modals don't really have many different sorts of meanings; that *must*, for example, has a single, neutral interpretation which remains constant across sentences like (32)-(35), the apparent variance in its meaning being a consequence of the fact that its interpretation is relativized to a highly variable aspect of the context of use.

According to Kratzer's theory, the interpretation of a modal sentence is a function of more than just the meanings of the modal
verb and the sentence it modifies. To interpret a modal sentence used in some context, we must also consider the contribution of what Kratzer calls the conversational background of that context. A conversational background is, in model-theoretic terms, just a function from possible worlds to sets of propositions; every context of use will have one of these as one of its components. In some modal sentences, the conversational background is explicitly invoked; in sentences (36)-(39), for example, the underlined phrases each invoke a conversational background. In (36), this is the function which, for any possible world w, gives the set of propositions expressing what is legally prescribed in w; this might be called a deontic conversational background.

(36) In view of what is legally prescribed, witnesses must swear to tell the truth.

(37) In view of what is known, it must be snowing at higher elevations.

(38) In view of what her dispositions are, Mary must lie down to keep from fainting.

(39) In view of what our preferences are, we must have that hat.

In (37), the conversational background is a function which, for any world w, gives the set of propositions expressing what is known in w; this is thus an epistemic conversational background. Other sorts of conversational backgrounds may also be invoked, as in (38) and (39).

Modals, according to Kratzer, specify some logical relation between the meaning of the sentence they modify and the extension of the conversational background of the context in which they are used. Must, for example, specifies a relation something like logical
consequence; thus, sentence (36) is taken to mean, approximately, that the proposition expressed by (40) follows logically from the extension of the deontic conversational background which it invokes (i.e. the set of propositions expressing actual legal prescriptions); sentence (37), to mean that the proposition expressed by (41) follows logically from the extension of the epistemic conversational background which it invokes (the set of propositions expressing what is actually known); and so on.

(40) Witnesses swear to tell the truth.

(41) It is snowing at higher elevations.

Because a conversational background may have an inconsistent set of propositions as its extension, the relation specified by must actually has to be slightly more complicated than logical consequence. See Kratzer (1977:347ff); cf. also below.)

Sentences (32)-(35), unlike (36)-(39), don't explicitly indicate the nature of their conversational background; this will, however, be implicit in the context of their use. Thus, if (32) is understood deontically in some context, it is because this context implicitly contains a deontic conversational background; an epistemic understanding of (33) in some context implies a covert epistemic conversational background in this context; and so on. From one context to another, the modal verb remains invariant in interpretation; what varies is the conversational background relative to which it is interpreted.

Now, this general analysis of modal sentences has interesting consequences for the analysis of modal conditionals like (42)-(45), as Kratzer (1979) shows. In particular, it allows us to grasp the
function of the if-clause in such sentences.

(42) If they are convicted, defendants must appear in court for sentencing.

(43) If John is a native of Medford, he must resent the arrival of Californians in Oregon.

(44) If she exercises too hard, Mary must lie down to keep from fainting.

(45) If we have enough money, we must have that hat.

In these sentences, as in (32)-(35), the modal specifies a logical relation between the meaning of the sentence it modifies and a certain set of propositions. Here, however, the relevant set of propositions is not merely the extension of the contextually-specified conversational background—rather, it is the union of this set with the (unit set of the) proposition expressed by the if-clause.

An example might help make this clear. Let H be a conversational background whose extension is the set H' of propositions expressed by (46)-(49).

(46) Every native of the Pacific Northwest resents the arrival of Californians in his home state.

(47) Every native of Oregon is a native of the Pacific Northwest.

(48) Oregon is the home state of every native of Oregon.

(49) Every native of Medford is a native of Oregon.

Suppose now that sentence (43) is used in a context in which the conversational background is H. (43) will in this case be true—not because the proposition expressed by (50) follows from H' (it doesn't), but because it follows from the union of H' with the unit set of the proposition expressed by (51).
(50) John resents the arrival of Californians in Oregon.
(51) John is a native of Medford.

In this somewhat contrived example, must can be safely thought of as specifying a relation of logical consequence. But the proposition expressed by the if-clause of a sentence like (43) may turn out to be incompatible with the extension of the relevant conversational background (or, again, this extension may itself be inconsistent); this possibility complicates the kind of logical relation which a given modal may be thought to specify in the interpretation of a modal conditional.

An example will help to bring this out. Suppose that the extension B' of a deontic conversational background B consists of the propositions expressed by (52) and (53);

(52) No one drives down a one-way street the wrong way.
(53) Anyone driving down a one-way street the wrong way loses his license.

The union of B' with the unit set of the proposition expressed by (54) is an inconsistent set.

(54) John drives down a one-way street the wrong way.

Since any proposition follows logically from an inconsistent set of propositions, all of (55a-d), if used in a context with B as its conversational background, would be true under the assumption that must specifies a relation of simple logical consequence. This undesirable consequence shows that must cannot simply be taken to specify a relation of logical consequence between the proposition expressed by the sentence it modifies and the relevant set of propositions.
(55) If John drives down a one-way street the wrong way,
a. he must lose his license.
b. he must not lose his license.
c. his license must be displayed at the Tate Gallery.
d. he must be distinct from himself.

Parallel examples would support analogous conclusions for other modals.

One way to adjust the interpretation of must is as follows. Let schema (56) stand for any modal construction with must as its modal verb;

(56) If $S_1$, must $S_2$

let $p$ and $q$ be the propositions expressed by $S_1$ and $S_2$, respectively.

Suppose (56) is used in a context whose conversational background $A$ has extension $A'$. Then must specifies that $q$ follows from every maximal consistent subset of $A' \cup \{p\}$ which contains $p$. As the reader can demonstrate to him/herself, this adjusted interpretation for must will make (55a) true if used in a context whose conversational background has as its extension the set of propositions expressed by (52) and (53), but will make (55b-d) false, as desired.

Kratzer (1979:126) points out, however, that 'as soon as we consider sets of propositions which have a more respectable size, we cannot always be sure that all their consistent subsets can be extended to a maximal consistent subset.' For this reason, she proposes a slightly weaker relation for must. Thus, suppose that (56) is used in a context whose conversational background $A$ has extension $A'$, and that $p$ and $q$ are as above. Let $S$ be the set of all consistent subsets of $A' \cup \{p\}$ which contain $p$. Then must specifies that for every $s \in S$, there is a superset of $s$ in $S$ from
which q follows logically. As the reader may verify, this way of
interpreting must yields exactly the same results as the maximal-
consistent-subset analysis for those cases in which every s ∈ S
can be extended to a maximal consistent subset of A' U {p}; but it
also covers the cases in which some s ∈ S cannot be so extended.

Other modals can be analogously interpreted. Can, for example,
may be treated as follows. Let schema (57) stand for any modal
conditional with can as its modal verb;

(57) If S₁, can S₂

let p and q be the propositions expressed by S₁ and S₂, respectively.
Suppose that (57) is used in a context whose conversational background
A has extension A', and that S is the set of all consistent subsets of
A' U {p} which contain p. Then can specifies that there is some s ∈ S
such that q is compatible with all supersets of s in S.

Would and might, according to Kratzer, are interpreted just
like must and can, respectively. This may, at first, seem highly
implausible; but if we consider the differences between would and
must, and between might and can, we find that they are not differences
between the logical relations which these modals specify; rather,
they are differences (i) in the sorts of conversational backgrounds
with which these modals are conventionally associated, and (ii) in
the sorts of if-clauses with which these modals are conventionally
associated. For example, the very distinctive sort of conversational background usual for counterfactual conditionals is associated with
would and might, but not with must and can; see Kratzer (1979:128-133)
for a discussion of such conversational backgrounds.¹⁰ Would and
might, furthermore, can be used with if-clauses whose propositions are incompatible with 'common knowledge', or the presuppositions of language users; must and can require if-clauses whose propositions are compatible with what is presupposed (cf. Kratzer 1979:133-137). These conventional associations of certain modals with certain sorts of conversational backgrounds and conditional clauses are of great intrinsic interest; but as they are of marginal relevance to the specific problem of interpreting free adjuncts in modal contexts, I will have nothing more to say about them here.

Although other sorts of modals may be interpreted in accordance with Kratzer's theory, our present purposes can be satisfied most economically if we restrict our consideration to these four: must, can, would, and might.

In the light of Kratzer's theory, we can assume the following formal account of the syntax and interpretation of modals. Here, I diverge from Kratzer's own formal analysis in certain ways, all of them trivial. One reason for these departures is that I wish to have a single interpretation for each modal, valid in both conditional and nonconditional contexts; Kratzer's (1979) analysis involves two interpretations for each modal, no doubt in the interests of expository convenience.

Modals are regarded as basic expressions of a basic category MOD:

<table>
<thead>
<tr>
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<tr>
<td>MOD</td>
<td>the basic category of modals</td>
<td>[must], [can], [would], [might]</td>
</tr>
</tbody>
</table>

Expressions of category MOD translate as intensional logic expressions
of type \(<\langle s,\langle s,t\rangle,t\rangle,t\rangle,\langle s,t\rangle,t\rangle\rangle\), to be interpreted in the following manner.

\textit{must}'\  would' denote that function \(f\) of type \\
\(<\langle s,\langle s,t\rangle,t\rangle,t\rangle,\langle s,t\rangle,t\rangle,\langle s,\langle s,t\rangle,t\rangle,t\rangle\rangle\) such that for any index \(<w,i>\), any function \(h\) of type \(<s,\langle s,t\rangle,t\rangle,t\rangle\rangle\), and any proposition \(p\), \(f(h)(p) = 1\) (i.e. truth) at \(<w,i>\) iff for every set \(s\) in \(h(<w,i>)\), there is a superset of \(s\) in \(h(<w,i>)\) from which \(p\) follows logically.

\textit{can}'\  might' denote that function \(f\) of type \\
\(<\langle s,\langle s,t\rangle,t\rangle,t\rangle,\langle s,t\rangle,t\rangle,\langle s,\langle s,t\rangle,t\rangle,t\rangle\rangle\) such that for any index \(<w,i>\), any function \(h\) of type \(<s,\langle s,t\rangle,t\rangle,t\rangle\rangle\), and any proposition \(p\), \(f(h)(p) = 1\) at \(<w,i>\) iff there is some set \(s\) in \\
h(<w,i>) such that \(p\) is compatible with every superset of \(s\) in \(h(<w,i>)\).

In sentences like \((32)-(35)\), the modal is to be interpreted relative to the set of all consistent subsets of the extension of the conversational background of its context of use. We accomplish this as follows. We introduce a lexical rule \((58)\) which converts expressions of category \(\text{MOD}\) to expressions of category \(t//t\):

\((58)\) S16. If \(\alpha \in \text{P}_{\text{MOD}}\), then \(F_{16}(\alpha) \in \text{P}_{t//t}\), where \\
\(F_{16}(\alpha)\) is \(\alpha\).

T16. If \(\alpha \in \text{P}_{\text{MOD}}\) and \(\alpha\) translates as \(\alpha'\), then \(F_{16}(\alpha)\) translates as \(\alpha'(C(cb))\).

Here, \(cb\) is a constant (of type \(<s,\langle s,t\rangle,t\rangle\rangle\) which, in any context of use, is to denote the conversational background; \(C\) (a constant of type \(<\langle s,\langle s,t\rangle,t\rangle,\langle s,\langle s,t\rangle,t\rangle,t\rangle\rangle\rangle\) is to denote that function \(C'\)
such that for any function $g$ of type $<s, <s, t>, t>$ and any index $<w, i>$, $C'(g(<w, i>))$ is the set of all consistent subsets of $g(<w, i>)$. As the patient reader can verify to him/herself, (58) has the effect of relativizing the interpretation of a modal to all consistent subsets of the extension of a conversational background.

Modals which have undergone (58) combine with declarative sentences (of category $t$) by means of the following rule:

\[(59)\] S17. If $\alpha \in P_{t/1/1} t$ and $\phi \in P_{t'}$, $[-\text{Tense, } \varnothing \text{Perfect}]$, then $F_{17}(\alpha, \Phi) \in P_{t'}, [-\text{Tense, } \varnothing \text{Perfect}]$, where $F_{17}(\alpha, \Phi)$ is $RB(\alpha, \Phi)$.

Example: $F_{17}([\text{must}], (\text{John}) [\text{loses}] \text{ his license}) = (\text{John}) [\text{must]} \text{ lose his license}$

T17. If $\alpha \in P_{t//t}$, $\phi \in P_{t}$, and $\alpha, \phi$ translate as $\alpha', \phi'$, then $F_{17}(\alpha, \phi)$ translates as $\alpha'('\phi')$.

Example: $(\text{John}) [\text{must}] \text{ lose his license}$ translates as

$\text{must'}(C(cb))('\text{John-loses-his-license}')$

In conditionals like (42)-(45), the modal is to be interpreted relative to the set of all consistent subsets of $A' \cup \{p\}$ containing $p$, where $A'$ is the extension of the relevant conversational background and $p$ is the proposition expressed by the accompanying if-clause. We accomplish this in the following manner. Rule (60) joins a member of the category $t''$ of conditional clauses with a modal and a declarative sentence to form a modal conditional:

\[(60)\] S18. If $\alpha \in P_{MOD}$, $\phi \in P_{t''}$, and $\psi \in P_{t}$, $[-\text{Tense, } \varnothing \text{Perfect}]$, then $F_{18}(\alpha, \phi, \psi) \in P_{t}, [-\text{Tense, } \varnothing \text{Perfect}]$, where $F_{18}(\alpha, \phi, \psi)$ is $\Gamma_{\Phi}, \psi' \psi'$ and $\psi'$ is $RB(\alpha, \psi)$.
Example: $F_{18}([\text{must}], \text{if we have enough money, (we) [have] that hat})$

= \text{if we have enough money, (we) [must] have that hat}

T18. If $\alpha \in P^\text{MOD}$, $\phi \in P^\text{t''}$, $\psi \in P^\text{t}$, and $\alpha, \phi, \psi$ translate as $\alpha', \phi', \psi'$, then $F_{18}(\alpha, \phi, \psi)$ translates as $\alpha'(D(cb)(\text{'\phi'}).(\text{'\psi'}).$

Here, cb is as above. $D$ (a constant of type $\left\langle s, \left\langle\left\langle s, t\right\rangle, t\right\rangle\right\rangle$) is to denote that function $D'$ such that for any function $g$ of type $\left\langle s, \left\langle\left\langle s, t\right\rangle, t\right\rangle\right\rangle$, any proposition $p$, and any index $\langle w, i \rangle$, $D'(g)(p)(\langle w, i \rangle)$ is the set of all consistent subsets of the union of $g(\langle w, i \rangle)$ with the unit set of $p$ which contain $p$. Where $A'$ is the extension of a conversational background and $p$ is the proposition expressed by an if-clause, (60) has the effect of relativizing the interpretation of a modal to all consistent subsets of $A' \cup \{p\}$ that contain $p$. Sentence (45), for example, is assigned (61) as its translation by (60).

(61) must'$(D(cb)(\text{'\we-have-enough-money'}))(\text{'\we-have-that-hat'})$

We will now consider the applications of this analysis to the semantics of free adjuncts in modal contexts.

3.2 The roles of strong and weak adjuncts in modal sentences. Recall that the free adjuncts in sentences (26)-(29) (repeated here) were seen to be of two types: strong, those whose actual truth is entailed by the truth of any (present tense) sentence in which they occur (as in the a examples); and weak, those whose truth isn't always entailed in this way (as in the b examples). If we assume the foregoing analysis of modality in conditional sentences, then we can explain the
(26)  a. Being a master of disguise, Bill would fool everyone.

b. Wearing his new outfit, Bill would fool everyone.

(27)  a. Having unusually long arms, John can touch the ceiling.

b. Standing on a chair, John can touch the ceiling.

(28)  a. Measuring almost a half-mile, this must be the longest piece of twine in town.

b. Unraveled, this must be the longest piece of twine in town.

(29)  a. Weighing only a few tons, the truck might reach the top of that hill.

b. In first gear, the truck might reach the top of that hill.

entailment differences between strong and weak adjuncts.

Consider, first, sentences (26a,b). In the most likely understanding of (26b), the adjunct wearing his new outfit is felt to express a (counterfactual) condition; it serves exactly as a subjunctive if-clause would in the same position--to condition the interpretation of the modal would. Thus, we might translate (26b) as (62), in accordance with the formal account of modality adumbrated above.

\[
(62) \text{would'}(D(cb)("wearing-his-new-outfit'\(x\)))\("Bill-fools-everyone'\))
\]

In (26a), on the other hand, being a master of disguise doesn't express a condition on would. (26a) doesn't mean 'if Bill were a master of disguise, he would fool everyone'; indeed, there is no explicit condition on would in this sentence. The adjunct has some other, inferred role (most likely, that of a reason-adverbial: because he is a master of disguise); because its truth is entailed, we must furthermore
conclude that it is outside the scope of the modal. Thus, we might plausibly translate (26a) very differently from (26b), as in (63).

\[ (63) \quad K(L)(\text{"being-a-master-of-disguise"}(x))(\text{"would"}(C(cb))) \\
\quad \quad (\text{"Bill-fools-everyone"}) \]

(27a,b) are analogous. In the most probable reading of (27b), the adjunct standing on a chair has the intuitive function of a conditional clause: if he stands on a chair; it serves to condition the interpretation of the modal can. (27b) might therefore be translated as (64).

\[ (64) \quad \text{can'}(D(cb)(\text{"standing-on-a-chair"}(x)))(\text{"John-touches-the ceiling"}) \]

(27a), on the other hand, doesn't have the character of a conditional sentence; it isn't felt to mean 'if he has unusually long arms, John can touch the ceiling'. The role of the adjunct is instead an inferred one; furthermore, the entailment properties of the adjunct force us to regard it as having wider scope than the modal. Thus, (27a) might reasonably be translated as (65).

\[ (65) \quad K(L)(\text{"having-unusually-long-arms"}(x))(\text{can'}(C(cb))) \\
\quad \quad (\text{"John-touches-the ceiling"}) \]

Similar observations are true of (28a,b) and (29a,b): the weak adjunct can be understood to condition the interpretation of the modal in the manner of an if-clause, while the strong adjunct always assumes some other sort of role, and apparently has wider scope than the modal.

Thus, the entailment differences between strong and weak adjuncts are a reflection of the fact that only the latter may condition the interpretation of a modal, and so occur within its scope. Because a modal \( \alpha \) is always such that \( \alpha'(D(cb)(p))(q) \) fails to entail both \( \neg p \)
and vq, the truth of the adjuncts in (26b)-(29b) isn't necessary for the truth of the sentences themselves. In (26a)-(29a), on the other hand, the adjuncts have wider scope than the accompanying modals; the fact that their truth is necessary for the truth of (26a)-(29a) suggests that they are adjuncts of category t/t. (Recall the semantic properties of $K(L)$ discussed in section 1.)

Let me emphasize here that I am not suggesting that weak adjuncts in modal contexts always serve to condition the interpretation of the accompanying modal; examples (26b)-(29b) have been chosen to bring out this use of weak adjuncts, but it is by no means their only use in modal contexts. Sentence (66), for example, could be understood as a narrative sentence describing John's abilities on a particular occasion of standing on the chair.

(66) Standing on the chair, John can see over the fence.

In this case, the actual truth of the adjunct is entailed, even though it is a weak adjunct:

(67) $K(L)(\text{standing-on-the-chair}(x))(\text{can}(C(cb))(\text{John-sees-over-the-fence}))$

Thus, my claim is that weak adjuncts, but not strong ones, may condition the interpretation of a modal, and that this is the source of their entailment differences in modal contexts.

To provide a formal account of these entailment differences, we need very little apparatus that we haven't already proposed. Strong adjuncts in modal contexts may be uniformly regarded as adsentential modifiers with wide scope; sentences like (26a)-(29a) may therefore be analyzed with the rule (22) combining adsentential modifiers with
sentences (see section 1), as in the partial analyses (68)-(71).

(68) being a master of disguise, (Bill) [would] fool everyone, t, 36a
    being a master of disguise, t/t, 13,4 (Bill) [would] fool everyone, t, 17
    being a master of disguise, t', 1,6 [would], t///t, 16 (Bill) [fools]
    being a master of disguise, PRPL [would], MOD everyone, t

(69) having unusually long arms, (John) [can] touch the ceiling, t, 36a
    having unusually long arms, t/t, 13,4 (John) [can] touch the ceiling, t, 17
    having unusually long arms, t', 1,6 [can], t///t, 16 (John) [touches]
    having unusually long arms, PRPL [can], MOD the ceiling, t

(70) measuring almost a half-mile, (this) [must] be the longest piece of twine in town, t, 36a
    measuring almost a half-mile, t/t, 13,4 (this) [must] be the longest piece of twine in town, t, 17
    measuring almost a half-mile, t', 1,6 [must], t///t, 16 (this) [is] the longest piece of twine in town, t
    measuring almost a half-mile, PRPL [must], MOD

(71) weighing only a few tons, (the truck) [might] reach the top of that hill, t, 36a
    weighing only a few tons, t/t, 13,4 (the truck) [might] reach the top of that hill, t, 17
    weighing only a few tons, t', 1,6 [might], t///t, 16 (the truck) [reaches] the top of that hill, t
    weighing only a few tons, PRPL [might], MOD

As can be verified, these analyses induce the following translations for (26a)-(29a).

(72) \( K(L_4)('\text{being-a-master-of-disguise}'(x_6))('\text{would}'(C(cb))) ('\text{Bill-fools-everyone}') \)
(73) \[ \text{\textit{K}}(L_4) (\text{"having-unusually-long-arms'}(x_6)) (\text{"can'}(C(cb))) \\
(\text{"John-touches-the-ceiling'}) \]

(74) \[ \text{\textit{K}}(L_4) (\text{"measuring-almost-a-half-mile'}(x_6)) (\text{"must'}(C(cb))) \\
(\text{"this-is-the-longest-piece-of-twine-in-town'}) \]

(75) \[ \text{\textit{K}}(L_4) (\text{"weighing-only-a-few-tons'}(x_6)) (\text{"might'}(C(cb))) \\
(\text{"the-truck-reaches-the-top-of-that-hill'}) \]

(Sentences like (66) can be analogously analyzed and translated.)

In each of (72)-(75), the modal is analyzed as being unconditioned
--that is, its interpretation is assumed to be relativized only to the
set of all consistent subsets of some conversational background. In
the most likely reading of each of (26b)-(29b), on the other hand,
the interpretation of the modal is, as we have seen, conditioned by
the proposition expressed by the weak adjunct. Suppose we introduce
a supercategory \texttt{COND} containing all conditional clauses (of category
t") and all primal adjuncts; then if we replace 't" with 'COND' in
the statement of rule (60), we can use this to analyze (26b)-(29b),
as in the partial analyses (76)-(79).

(76) \text{wearing his new outfit, (Bill) [would] fool everyone,} \\
\quad \text{t, 54,0} \\
\begin{array}{c}
\text{Bill, T} \\
\text{[would], MOD} \\
\end{array}
\quad \text{wearing his new outfit, (he) [would] fool everyone,} \\
\quad \text{t, 18} \\
\quad \text{[would], MOD} \\
\quad \text{wearing his new outfit, t', 1,6} \\
\quad \text{(he) fools everyone,} \\
\quad \text{t} \\
\quad \text{wearing his new outfit, PRPL} \\

(77) \text{standing on a chair, (John) [can] touch the ceiling,} \\
\quad \text{t, 18} \\
\begin{array}{c}
\text{[can], MOD} \\
\text{standing on a chair, t', 1,6} \\
\end{array}
\quad \text{(John) [touches] the} \\
\quad \text{ceiling, t} \\
\quad \text{standing on a chair, PRPL}
Analyses (76)-(79) induce the following translations for (26b)-(29b).

(80) would'\(D(cb)('\text{wearing-his-new-outfit'}(x_6))('\text{Bill-fools-everyone}')\)

(81) can'\(D(cb)('\text{standing-on-a-chair'}(x_6))('\text{John-touches-the-ceiling}')\)

(82) must'\(D(cb)('\text{unraveled'}(x_6))('\text{this-is-the-longest-piece-of-twine-in-town}')\)

(83) might'\(D(cb)('\text{in-first-gear'}(x_6))('\text{the-truck-reaches-the-top-of-that-hill}')\)

In those readings of (26b)-(29b) which fail to entail the actual truth of their free adjunct, the intuitive role of the adjunct is felt to be completely determined by the way it conditions the interpretation of the accompanying modal. (80)-(83) represent these readings exactly, for they fail to entail (84)-(87), respectively, and the role they ascribe to the free adjuncts in the interpretation of (26b)-(29b) is entirely determinate.

(84) wearing-his-new-outfit'\(x_6)\)
(85) standing-on-a-chair'\(x_6)\)
(86) unraveled'\(x_6)\)
In all, this analysis of the interpretation of free adjuncts in modal contexts seems satisfying. However, we have so far failed to turn up any independent criterion for distinguishing strong and weak adjuncts; in the absence of such a criterion, the observation that strong adjuncts cannot condition the interpretation of modals is totally uninformative. In the next section, I will demonstrate that the two varieties of free adjuncts are inherently distinguished.

4. A semantic correlate of the distinction between strong and weak adjuncts. In this section, I shall show that Carlson's (1977) distinction between individual- and stage-level predicates is highly reliable as a correlate of the distinction between strong and weak adjuncts.

In searching for an independent semantic correlate of the distinction between strong and weak adjuncts, a reasonable first hypothesis is that the relevant correlate is aspectual in nature. Careful consideration reveals that strong adjuncts always derive from stative predicates, and that weak adjuncts often derive from nonstative predicates, as the examples in (88)-(89) suggest.

(88) Strong adjuncts:

Being something of an insomniac, Mary might be reading at this hour.

Jim, having a wooden leg, can't remain standing for long periods.

Measuring less than an inch, Larry's pet goldfish would easily fit into this jar.

(89) Weak adjuncts:

Walking to the store, Mary can stop by to talk to Jane.
Noticing the snake, Bill might run off. 
John would probably have an accident, driving this sort of car.

Nevertheless, it appears that the stative/nonstative distinction is at best an approximation of the property distinguishing strong and weak adjuncts, for although all free adjuncts deriving from nonstative predicates are weak, there are at least four sorts of cases in which adjuncts deriving from stative predicates are also weak. First, free adjuncts derived from statives of the stand-sit-lie class are weak, not strong; in the sentences in (90), the actual truth of the free adjunct needn't be entailed.\textsuperscript{12}

(90) The stand-sit-lie class:
Lying on the beach, you can get a better tan than at home.

Sitting in the garden, Al might spot the turkey.

Second, free adjuncts derived from stative perception predicates are weak, not strong; the adjuncts in (91), like those in (90), show the distinctive entailment properties of weak adjuncts in modal contexts.

(91) Stative perception predicates:
Seeing this rainbow, Hank would flip.

Larry, hearing this song, can get very sentimental.

Third, all stative adjective phrases that are acceptable as free adjuncts are weak rather than strong, as the examples in (92) show:

(92) Stative adjective phrases:

Alone, she might not seem so formidable.

Sick in bed, John wouldn't be of much help.
Finally, most predicative prepositional phrases give rise to weak adjuncts, though they are stative.

(93) Prepositional phrases:

In his maroon suit and white shoes, he must look like a real salesman.

On a stage, he can be very winning.

These four kinds of cases show quite conclusively that stativity cannot be the property which determines whether an adjunct will be weak or strong. More generally, the existence of sentence pairs like that in (94) seems to dash all hopes that any kind ofaspectual correlate of the distinction between strong and weak adjuncts can be found.

(94) Asleep, Rover is harmless.
    (weak)

Being asleep, Rover is harmless.
    (strong)

There is, however, a correlate of a completely different sort. As I shall now show, the distinction which Greg Carlson has drawn between individual-level and stage-level predicates appears to be what determines whether a given adjunct is weak or strong.

4.1 Carlson's ontology of stages and individuals. In his dissertation, Reference to Kinds in English, Carlson shows that two very broad classes of predicates can be distinguished in English on both distributional and semantic grounds. Among the diagnostic environments which distinguish these two varieties of predicates is that in (95) (cf. p.208ff):

(95) Mary saw John _____.
Generally, if a predicate is acceptable in this sort of environment, it is what Carlson terms a stage-level predicate; examples are listed in (96).

(96) Stage-level predicates:

- drunk
- alone
- asleep
- sick in bed
- naked
- walk(ing) to the store
- ly(ing) on the beach
- carry(ing) a load of over 100 lbs.
- driv(ing) this sort of car
- wear(ing) his new outfit
- stand(ing) on a chair
- notic(ing) the snake
- sit(ting) in the garden
- hear(ing) this song
- in his maroon suit and white shoes
- on a stage
- be(ing) a bastard
- be(ing) silly
- be(ing) arrested
- be(ing) awarded the Medal of Honor

Individual-level predicates, on the other hand, cannot occur acceptably in environments of this sort; the predicates listed in (97), for example, do not appear naturally in environment (95).

(97) Individual-level predicates:

- be(ing) a master of disguise
- be(ing) a sailor
- be(ing) something of an insomniac
- weigh(ing) over 200 lbs.
- hav(ing) unusually long arms
- hav(ing) a wooden leg
- stand(ing) over six feet tall
- intelligen
t- be(ing) intelligen
- American
- be(ing) American
- fat
- be(ing) fat
As Carlson demonstrates, the distinction between stage-level and individual-level predicates is a profound one in English; in fact, he argues that stage-level and individual-level predicates are predicates of ontologically distinct sorts of entities.

Three sorts of entities are distinguished in the ontology developed by Carlson: kinds, objects, and stages. *Kinds* are entities of the sort denoted by bare plural noun phrases: the noun phrase *dogs*, for example, names the kind of thing that dogs are. *Objects* are entities of the sort denoted by proper names: *Fido* names the object Fido. Anything that is a kind or an object is, in Carlson's terminology, an *individual*. *Stages* are "spatially and temporally bounded manifestation[s]" (p.115) of individuals; these are, intuitively, the spatiotemporal slices of an individual that show up as part of some event or state of affairs. (English doesn't have any expressions which directly denote stages, but stages do, according to Carlson, figure extensively in the interpretation of complex expressions.) Objects of a certain kind are said to realize that kind; stages of a certain individual, to realize that individual.

According to Carlson, individual-level and stage-level predicates are predicates of individuals and stages, respectively, as their names imply. This claim may embody some intuition--the predicates in (96) do, after all, seem to express highly temporary, accidental properties, while those in (97) seem to express more inherent, essential sorts of properties; but the original motivation for Carlson's claim that individual-level and stage-level predicates express ontologically distinct sorts of properties was that it afforded a highly satisfactory
account of the semantics of bare plural noun phrases in English.

It has traditionally been assumed that bare plurals have (at least) two kinds of meanings--one existential, as in (98a), the other generic, as in (98b).

(98) a. Dogs chewed up that newspaper.
    b. Dogs are intelligent.

This has led some formally-minded researchers to postulate two sorts of logical representations for bare plurals--one involving an existential quantifier, the other a 'generic quantifier'. Carlson, however, shows that in opaque or multiply-quantified contexts, the bare plural behaves very unlike any kind of quantified expression, resisting any reliable quantificational paraphrase and uniformly failing to participate in ambiguities of scope; this and related facts lead him to the conclusion that bare plurals are not interpreted as quantified expressions, but are instead just names. He shows, furthermore, that the subject of sentences (98a,b) actually has a single, constant meaning--that the existential character of (98a) and the genericity of (98b) are in fact to be attributed to their respective predicates. Chew up that newspaper is a stage-level predicate, as the diagnostic environment (95) shows: as such, it can't be directly applied to kinds, rather only to stages; accordingly, (98a) is interpreted as a predication of some stage of the kind denoted by dogs, as in (99) (where R denotes the relation between a stage and the individual(s) it realizes, $x^S$ is a variable over stages, and tense is ignored).

(99) $\forall x^S[R(x^S, \text{dogs}')] \& \text{chew-up-that-newspaper}'(x^S)$

Be intelligent, on the other hand, is an individual-level predicate,
as (95) suggests: it can apply directly both to objects and to kinds; thus, (98b) is interpreted as a direct predication of the kind denoted by dogs, as in (100).

(100) be-intelligent'(dogs')

According to these interpretations, the meaning of dogs plays a constant role in (98a,b); it is clearly the predicates whose meaning determines the existential or generic flavor of these sentences.

Carlson points out that sentences which have proper names as their subjects also vary in character depending on whether their predicate is individual-level or stage-level; sentence (101a), for example, refers to a specific event, while (101b) expresses a 'generic' fact about Fido.

(101) a. Fido chewed up that newspaper.
     b. Fido is intelligent.

This difference is explicitly accounted for in the way Carlson interprets these sentences; their translations are (102a,b).

(102) a. Vx[R(x, Fido') & chew-up-that-newspaper'(x)]
     b. be-intelligent'(Fido')

Carlson's system thus provides a unitary explanation of the intuitive variance in meaning in (98) and (101); this variance is shown to be strictly a function of whether the predicate involved is stage-level or individual-level.

Carlson's distinction between individual-level and stage-level predicates is also useful in accounting for other sorts of facts. He shows that certain constructions admit only stage-predicates: existential there sentences (pp.211ff) of the form of (103) allow
stage-level but not individual-level predicates, as (104) suggests;

(103) **there** Copula Noun phrase Predicate

(104) There was a dog \{chewing up that newspaper. \*being intelligent.\}

similarly, as (105) shows, progressive *be* combines only with stage-
level predicates (cf. pp.185ff).14

(105) Fido is \{chewing up that newspaper. sitting on the new chair. *being intelligent. *weighing 30 lbs.\}

Predicate nominals, on the other hand, are always15 individual-level.

To provide a formal account of these notions, we will introduce
a categorial distinction between stage-level and individual-level
intransitive verb phrases, and between stage- and individual-level
predicative phrases (thus revising the inventory of categories of
predicative expressions assumed in section 1). Here, I depart from
Carlson's analysis in certain minor ways.

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<th>Description</th>
<th>Basic expressions</th>
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<td>[walk], [dance], [laugh], ...</td>
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<td>INFs</td>
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<td>PRPLs</td>
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<td>ADJs</td>
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<td>asleep, ready, available, ...</td>
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<td>pps</td>
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### Basic Expressions

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</tr>
<tr>
<td>PSPL^1</td>
<td>the basic category of individual-level past participial phrases</td>
<td>( A )</td>
</tr>
<tr>
<td>ADJ^1</td>
<td>the basic category of individual-level adjective phrases</td>
<td>( \text{intelligent, fat, American, ...} )</td>
</tr>
<tr>
<td>PP^1</td>
<td>the basic category of individual-level prepositional phrases</td>
<td>( A )</td>
</tr>
<tr>
<td>NOM</td>
<td>the basic category of individual-level predicative noun phrases(^{16})</td>
<td>( A )</td>
</tr>
</tbody>
</table>

\[ \text{PRED}^S \text{ is to be the supercategory of stage-level predicative phrases; the membership of this supercategory is the union of those of } \text{INF}^S, \text{PRPL}^S, \text{PSPL}^S, \text{ADJ}^S, \text{and PP}^S. \text{ PRED}^i \text{ is the supercategory of individual-level predicative phrases, whose membership is the union of those of } \text{INF}^i, \text{PRPL}^i, \text{PSPL}^i, \text{ADJ}^i, \text{PP}^i, \text{and NOM.} \]

Members of \( \text{PRED}^S \) will be interpreted as sets of stages; members of \( \text{PRED}^i \), as sets of individuals. So that this difference will be reflected in the translations of expressions of these categories, we will, following Carlson, employ a sorted intensional logic. (The formal definition of this logic appears in the Appendix.) The variables \( x_n^S, x_n^O, x_n^K \), and \( x_n^i \) are thus to be the \( n \)th variables over stages, objects, kinds, and individuals, respectively, for any nonnegative integer \( n \). Similarly for variables of higher types.
Noun phrases will always denote individual-level property-sets; as a consequence, no stage-level verb phrase will ever be interpreted as actually belonging to the property-set denoted by its subject. For this reason, stage-level verb phrases will have to be converted to individual-level verb phrases by rule (107) before they can join with a subject.

(107) S20. If $\alpha \in P_{IV}s$, then $F_{20}(\alpha) \in P_{IV}i$, [-Perfect], where $F_{20}(\alpha)$ is $\alpha$.

The corresponding translation rule gives an expression denoting the set of individuals having a stage in the denotation of $\alpha$:

(108) T20. If $\alpha \in P_{IV}s$ and $\alpha$ translates as $\alpha'$, then $F_{20}(\alpha)$ translates as $\lambda x^iVx^s[R(x^i,x^i) & \alpha'(x^i)]$.

Thus, for example, $F_{20}([\text{see}] \text{Mary}) = [\text{see}] \text{Mary}$, which translates as $\lambda x^iVx^s[R(x^i,x^i) & \text{see-Mary'}(x^i)]$.

The rule for combining a noun phrase with an individual-level verb phrase is completely straightforward:

(109) S19. If $\alpha \in P_T$, [-Object], and $\beta \in P_{IV}i$, [\gamma Perfect], then $F_{19}(\alpha, \beta) \in P_T$, [-Tense, $\gamma$Perfect], where $F_{19}(\alpha, \beta)$ is $f(\alpha) \beta'$ and $\beta'$ is AGR($\alpha, \beta$).

Example: $F_{19}(\text{John}, [\text{be}] \text{intelligent}) = (\text{John}) [\text{is}] \text{intelligent}$

T19. If $\alpha \in P_T$, $\beta \in P_{IV}i$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{19}(\alpha, \beta)$ translates as $\alpha'('\beta')$.

Example: $F_{19}(\text{John}, [\text{be}] \text{intelligent})$ translates as $\text{be-intelligent'}(\text{John'})$

4.2 Be in Carlson's system. The introduction of a distinction between stage-level and individual-level verbal expressions affords a very
precise understanding of different uses of be in English. I will briefly discuss these here.

4.2.1 \( \text{Be}_{1} \in \text{P}_{\text{IV}} \cap \text{PRED} \). As we have seen, stage-predicates with bare plural subjects induce a kind of 'existential reading', as in (98a); individual-level predicates like be intelligent induce a 'generic reading'. This should lead us to suppose that the sort of 'reading' produced by a predicate when it has a bare plural subject will be yet another indicator of whether it is stage-level or individual-level. This is in fact true for most cases. There is, however, one well-defined class of predicates which are individual-level, but induce 'existential readings': these are predicates consisting of be plus some stage-level predicative phrase. According to the evidence of the diagnostic environment (95), existential there sentences, and progressive sentences, the predicates in (110) are individual-level rather than stage-level (even though they contain stage-level adjective or prepositional phrases); yet, they induce an 'existential reading' in a bare plural sentence like Dogs were on a stage.

(110) be(ing) drunk
be(ing) alone
be(ing) asleep
be(ing) sick in bed
be(ing) naked
be(ing) in his maroon suit and white shoes
be(ing) on a stage

Carlson thus translates the \( \text{be}_{1} \) in (110) as (111) (p.410);

(111) \( \lambda P S A x^i A y^S [ R( x^S, x^i ) \& P^S( x^S ) ] \)

this guarantees that the result of applying \( \text{be}_{1} \) to a stage-level predicative phrase will be an individual-level predicate, but one which nevertheless yields the same kind of 'existential reading' as
a stage-level predicate. This translation is of course impossible to justify on the evidence of sentences like (112) and (113); these would (correctly) receive the translations (114) and (115) even if \textit{be}_1 were assumed to be a semantically empty expression of category IV^S/PRED^S, owing to the availability of rule (108) (and to the fact that \textit{asleep in that room} and \textit{on the table} are stage-level).

(112) Dogs are asleep in that room.
(113) Sack lunches are on the table.
(114) \(\forall x^S[R(x^S, \text{dogs}')] \land \text{asleep-in-that-room'}(x^S)]\)
(115) \(\forall x^S[R(x^S, \text{sack-lunches}')] \land \text{on-the-table'}(x^S)]\)

But the absence of predicates like those in (110) from the 'see John drunk', progressive, and existential \textit{there} constructions strongly suggests that they are not stage-level; Carlson's translation for \textit{be}_1 makes it clear how this could be so.

\textit{Be}_1 is regarded as an expression of category IV^I/PRED^S. By rule (116), it is combined with stage-level predicative expressions of three different categories to produce individual-level intransitive verb phrases.

(116) S23. If \(\alpha \in \text{P}_{IV^I/PRED^S}\) and \(\beta \in \text{P}_{PRPL^S, P_{ADJS, PRPS}}\), or
\(\text{P}_{PPS}\), then \(F_{23}(\alpha, \beta) \in \text{P}_{IV^I, [-Perfect]}\), where
\(F_{23}(\alpha, \beta) = \Gamma \alpha \beta\).

Examples: \(F_{23}([\text{be}], \text{walking home}) = [\text{be}] \text{ walking home}\)
\(F_{23}([\text{be}], \text{awake}) = [\text{be}] \text{ awake}\)
\(F_{23}([\text{be}], \text{in the barrel}) = [\text{be}] \text{ in the barrel}\)

T23. If \(\alpha \in \text{P}_{IV^I/PRED^S}\), \(\beta \in \text{P}_{PRED^S}\), and \(\alpha, \beta\) translate as \(\alpha', \beta'\), then \(F_{23}(\alpha, \beta)\) translates as \(\alpha'('\beta')\).
Examples: F₂₃([be], walking-home) translates as 
\[ \lambda x^i Vx^s[R(x^s, x^i) \land \text{walking-home}'(x^s)] \]
F₂₃([be], awake) translates as 
\[ \lambda x^i Vx^s[R(x^s, x^i) \land \text{awake}'(x^s)] \]
F₂₃([be], in the barrel) translates as 
\[ \lambda x^i Vx^s[R(x^s, x^i) \land \text{in-the-barrel}'(x^s)] \]

In Chapter IV, I shall argue that be₁ is, among other things, the be of the progressive; there are, however, at least three be's distinct from be₁.

4.2.2 Be₂ ∈ PTVᵢ/PREDᵢ. Members of PREDᵢ may appear in predicative constructions, as in (117)-(120).

(117) John is intelligent. (intelligent ∈ P_ADJᵢ)
(118) John is a sailor. (a sailor ∈ P_NOMᵢ)
(119) John is from Wales. (from Wales ∈ P_PPᵢ)
(120) John is loved by many. (loved by many ∈ P_PSPLᵢ)

The be₂ in (117)-(120) cannot be identified with be₁, because the latter is of the wrong category to combine with individual-level predicative expressions such as intelligent, a sailor, from Wales, and loved by many. Accordingly, we assign be₂ to category IVᵢ/PREDᵢ.

By rule (121), be₂ combines with four sorts of individual-level predicative phrases to produce individual-level verb phrases:

(121) S24. If \( \alpha \in P_{TVᵢ/PREDᵢ} \) and \( \beta \in P_{ADJᵢ}, P_{NOMᵢ}, P_{PPᵢ}, \) or \( P_{PSPLᵢ} \), then \( F_{2₄}(\alpha, \beta) \in P_{IVᵢ}, [\text{-Perfect}] \), where 
\( F_{2₄}(\alpha, \beta) \) is \( \Gamma(\alpha \beta) \).

Examples: \( F_{2₄}([\text{be}], \text{intelligent}) = [\text{be}] \text{ intelligent} \)
(121) [continued]

Examples: 
\[ F_{24}([\text{be}, \text{a sailor}]) = [\text{be}] \text{ a sailor} \]
\[ F_{24}([\text{be}, \text{from Wales}]) = [\text{be}] \text{ from Wales} \]
\[ F_{24}([\text{be}, \text{loved by many}]) = [\text{be}] \text{ loved by many} \]

T24. If \( \alpha \in P_{TV}^i/PRED^i, \beta \in P_{PRED}^i, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then \( F_{24}(\alpha, \beta) \) translates as \( \alpha'('\beta') \).

\( \text{Be}_2 \) is probably genuinely without semantic content; that is, it is apparently to be translated as (122).

(122) \( \lambda p^i[\nu p^i] \)

If \( \text{be}_2 \) translates in this way, then (121) assigns \([\text{be}] \text{ intelligent}, [\text{be}] \text{ a sailor}, [\text{be}] \text{ from Wales}, \) and \([\text{be}] \text{ loved by many} \) the translations \text{intelligent'}, \text{a-sailor'}, \text{from-Wales'}, \) and \text{loved-by-many'} , respectively.

The careful reader will have noted that some expressions consisting of \text{be} plus a predicative phrase do occur as stage-level predicates—among them, \text{be a bastard}, \text{be silly}, \text{be arrested}, and \text{be awarded the Medal of Honor}. These instances of \text{be} are distinct from both \( \text{be}_1 \) and \( \text{be}_2 \); observe, for example, that they may cooccur with \( \text{be}_1 \), as in (123) and (124).

(123) He is \( \text{1} \) being polite.

(124) He is \( \text{1} \) being forced to sign the contract.

4.2.3 \( \text{be}_3 \in P_{TV}^i/PRED^i \). The \( \text{be}_3 \) in \text{be a bastard}, \text{be a hero}, \text{be polite}, \text{be silly}, \text{be obnoxious}, and so on, is the 'active \text{be}' postulated by Partee (1977:305-310).\(^{18}\) As she shows, expressions resulting from the combination of \( \text{be}_3 \) with some predicative expression are syntactically and semantically very different from normal copulative phrases.

(i) They behave like active predicates in that they may occur in the
progressive:

\[ \{ \text{being fat} \} \]

\[ \{ \text{being along} \} \]

\[ \{ \text{being a bastard} \} \]

\[ \{ \text{being obnoxious} \} \]

(ii) They require animate subjects:

(126) John

The river \{ is noisy today. \]

John

*The river \{ is being noisy today. \]

(iii) Their subjects are understood agentively;

(127) Be polite!

John is trying to be polite.

John is deliberately being polite.

We persuaded John to be polite.

that is, be\_3 has a meaning something like that of act (like):

(128) John \{ is \} \{ being \} \{ acting \} silly.

(129) John \{ is \} \{ being \} \{ acting like \} a jerk.

For this reason, be\_3 doesn't combine readily with predicative phrases expressing properties that an individual can't help having:

(130) *Be healthy!

*John is trying to be healthy.

*John is deliberately being healthy.

*We persuaded John to be healthy.

An additional property which distinguishes be\_3 but which, to my knowledge, hasn't been pointed out before is that (iv) be\_3 combines most readily and perhaps exclusively with individual-level predicates (even though the resulting combination is itself a stage-level predicate):


This last fact suggests an interesting analysis of \( \text{be}_3 \) which I shall just sketch but not attempt to defend here. Consider sentence (132).

(132) John is being a real pain in the neck.

This can, intuitively, be paraphrased with (133),

(133) John is being the kind of person who is a real pain in the neck.

or, in Carlson's idiom, with (134) (where the progressive is for the moment ignored, and \( R' \) denotes the relation between an object and the kind(s) it realizes).

(134) \( \forall x^S [R(x^S, \text{John'})] \land \forall x^k [\forall x^O \Box[\text{real-pain-in-the-neck'}(x^O) \\
\rightarrow R'(x^O, x^k)] \land R(x^S, x^k)] \)

(134) suggests a translation like (135) for \( \text{be}_3 \):

(135) \( \lambda P^i \lambda x^S \forall x^k [\forall x^O \Box[P^i(x^O) \leftrightarrow R'(x^O, x^k)] \land R(x^S, x^k)] \)

According to (135), \( \text{be}_3 \) doesn't shift stage-level properties to the individual level (as \( \text{be}_1 \) does), but rather has just the reverse property of shifting an individual-level property down to the stage level; that is, \( \text{be}_3 \) is an expression of category \( IV^S/PRED^i \), not of \( IV^i/PRED^S \). This analysis embodies property (iv) above, and explains why the result of combining \( \text{be}_3 \) with a predicative phrase has all the
properties of stage-level predicates, e.g. (i). This analysis doesn't account for properties (ii) and (iii); these, however, are probably to be regarded as conventionally implicated aspects of the meaning of be, rather than as part of its asserted meaning.

4.2.4 $\text{be}_4 \in \text{P}_{\text{IV}S/pred}$. The be in be arrested, be awarded the Medal of Honor, be forced to sign the contract, be thrown into the river, and so on, is, of course, the be of the passive. To understand why these passive be-phrases are stage-level predicates, it's important to recognize that there are intuitively at least two sorts of transitive verb phrases (cf. Carlson, pp.186ff): those like chase, which appear to denote relations between stages (cf. the 'existential reading' of dogs in Harry chased dogs all day), and those like love, which seem to denote relations between individuals (cf. the fact that Harry loves dogs expresses a generic fact about dogs). To capture this intuition, we introduce two categories of transitive verb phrases:

<table>
<thead>
<tr>
<th>Category name</th>
<th>Description</th>
<th>Basic expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{TV}^S$</td>
<td>the basic category of stage-level transitive verb phrases</td>
<td>[chase], [hit], [kiss], ...</td>
</tr>
<tr>
<td>$\text{TV}^i$</td>
<td>the basic category of individual-level transitive verb phrases</td>
<td>[love], [admire], [fear], ...</td>
</tr>
</tbody>
</table>

Members of $\text{TV}^S$ are interpreted as functions from stages to sets of stages. The rule (136) combining a member of $\text{TV}^S$ with a noun phrase produces a stage-level intransitive verb phrase:

\[(136) \quad S_{27}. \text{ If } \alpha \in \text{P}_{\text{TV}^S} \text{ and } \beta \in \text{P}_T, [+\text{Object}], \text{ then } F_{27}(\alpha, \beta) \in \text{P}_{\text{IV}S}, \text{ where } F_{27}(\alpha, \beta) \text{ is } \text{RIVRAP}(\alpha, \beta). \]

Example: $F_{27}([\text{hit}], \text{John}) = [\text{hit}] \text{John}$
(136) [continued]

T27. If $a \in P_{TV^i}$, $b \in P_T$, and $a, b$ translate as $a', b'$, then $F_{27}(a, b)$ translates as

$$
\lambda \Phi_l \lambda x^S \Phi_l(y^S \cdot R(y^S, y^i) \cdot a'(y^S)(x^S))(b').
$$

Example: $F_{27}([\text{hit}], \text{John})$ translates as

$$
\lambda x^S y^S [R(y^S, \text{John}') \cdot \text{hit}'(y^S)(x^S)]
$$

Members of $TV^i$ are interpreted as functions from individuals to sets of individuals. The rule (137) combining members of $TV^i$ with noun phrases yields an expression of category $IV^i$:

(137) S28. If $a \in P_{TV^i}$ and $b \in P_T$, $[+\text{Object}]$, then $F_{28}(a, b) \in P_{IV^i}$, $[-\text{Perfect}]$, where $F_{28}(a, b)$ is $\text{WRAP}(a, b)$.

Example: $F_{28}([\text{love}], \text{John}) = [\text{love}] \text{John}$

T28. If $a \in P_{TV^i}$, $b \in P_T$, and $a, b$ translate as $a', b'$, then $F_{28}(a, b)$ translates as

$$
\lambda \Phi_l \lambda x^0 \Phi_l(y^i[a'(y^i)(x^0)])(b').
$$

Example: $F_{28}([\text{love}], \text{John})$ translates as $\lambda x^0 [\text{love}'(\text{John}')(x^0)]$

Now if, following Bach (1980), we assume that the passive is a rule operating on transitive verb phrases to produce past participial phrases with passive meaning, we plainly need rules for each of the different categories of transitive verb phrases. The passive rules for stage-level transitive verb phrases are (138) and (139).

(138) S41. If $a \in P_{TV^i}$, then $F_{41}(a) \in P_{PPL^i}$, where $F_{41}(a)$ is $\text{DB}(\text{EN}(a))$.

Example: $F_{41}([\text{knock} \text{ over}) = \text{knocked over}$
T41. If \( \alpha \in \text{P}_{TV} \) and \( \alpha \) translates as \( \alpha' \), then
\[ F_{41}(\alpha) \text{ translates as } \lambda x^S y^S [\alpha'(x^S)(y^S)] . \]

Example: \( F_{41}([\text{knock} \overline{\text{over}}]) \text{ translates as } \lambda x^S y^S [\text{knock-over}'(x^S)(y^S)] \)

(139) S42. If \( \alpha \in \text{P}_{TV} \) and \( \beta \in \text{P}_{T} \), [+Object], then
\[ F_{42}(\alpha, \beta) \in \text{P}_{PSPL} \), where \( F_{42}(\alpha, \beta) \) is \( \overline{\alpha \ ' by} \beta \) and
\( \alpha' \) is \( \text{DB(EN}(\alpha)) \).

Example: \( F_{42}([\text{knock} \overline{\text{over}}, \text{John}] = \text{knocked over by John} \)

T42. If \( \alpha \in \text{P}_{TV} \) and \( \beta \in \text{P}_{T} \), \( \alpha, \beta \) translate as \( \alpha', \beta' \),
then \( F_{42}(\alpha, \beta) \) translates as
\[ \lambda x^S [\beta'(y^S, y^S) \& x'^S(x^S)(y^S)] \].

Example: \( F_{42}([\text{love}], \text{John}) \text{ translates as } \lambda x^S y^S [R(y^S, \text{John'}) \& \text{knock-over}'(x^S)(y^S)] \)

Similarly, the passive rules for individual-level transitive verb phrases are (140) and (141).

(140) S43. If \( \alpha \in \text{P}_{TV} \), then \( F_{43}(\alpha) \in \text{P}_{PSPL} \), where
\( F_{43}(\alpha) \) is \( \text{DB(EN}(\alpha)) \).

Example: \( F_{43}([\text{love}] = \text{loved} \)

T43. If \( \alpha \in \text{P}_{TV} \) and \( \alpha \) translates as \( \alpha' \), then
\[ F_{43}(\alpha) \text{ translates as } \lambda x^S y^S [\alpha'(x^S)(y^O)] . \]

Example: \( F_{43}([\text{love}] \text{ translates as } \lambda x^S y^S [\text{love}'(x^1)(y^O)] \)

(141) S44. If \( \alpha \in \text{P}_{TV} \) and \( \beta \in \text{P}_{T} \), [+Object], then
\( F_{44}(\alpha, \beta) \in \text{P}_{PSPL} \), where \( F_{44}(\alpha, \beta) \) is \( \overline{\alpha \ ' by} \beta \) and
\( \alpha' \) is \( \text{DB(EN}(\alpha)) \).

Example: \( F_{44}([\text{love}, \text{John}] = \text{loved by John} \)
(141) [continued]

T44. If \( a \in P_{TV} \), \( \beta \in P_T \), and \( a, \beta \) translate as \( a', \beta' \), then \( F_{44}(a, \beta) \) translates as

\[ \lambda x^1 [\beta' (\gamma \circ [a'(x^2)] (\gamma^0))] \cdot \]

Example: \( F_{44}([love], John) \) translates as \( \lambda x^1 [love'(x^1)](John') \)

The stage-level past participial phrases produced by (138) and (139) join with be^_passive to form stage-level intransitive verb phrases. This fourth be, unlike be^_1 and be^_3, doesn't change the 'level' of the expression it joins with; it is of category IV^S/PRED^S. Like be^_2, it is semantically empty.

(142) S22. If \( a \in P_{TV} / PRED^S \) and \( \beta \in P_{PSPL}^S \), then

\( F_{22}(a, \beta) \in P_{TV}^S \), where \( F_{22}(a, \beta) \) is \( \gamma a \beta \).

T22. If \( a \in P_{TV} / PRED^S \), \( \beta \in P_{PRED}^S \), and \( a, \beta \) translate as \( a', \beta' \), then \( F_{22}(a, \beta) \) translates as \( a'(\beta') \).

The individual-level participial phrases produced by rules (140) and (141) join with be^_3 (\( e P_{TV}^S / PRED^i \)) to form individual-level intransitive verb phrases. (See rule (121) above.)

In this analysis, the phrase be arrested is stage-level: because [arrest] is an expression of category TV^S, \( F_{41}([arrest]) \) and \( F_{22}([be], arrested) \) are both stage-level. Note, however, that not all passive intransitive verb phrases are stage-level in this account: be loved, for example, is individual-level because [love] is a member of TV^i, and hence \( F_{43}([love]) \) and \( F_{24}([be], loved) \) are individual-level expressions. This is correct: be loved satisfies none of the diagnostics for stage-predicates, as (143)-(145) show.

(143) *Mary saw John being loved.
There was a man being loved.

Jane is being loved.

The object of this rather circuitous discussion of be has been to show that the following four be's, which we would like to be able to distinguish because of the varying ways in which they interact with Carlson's stage/individual distinction, can be distinguished on independent grounds.

\[
\begin{align*}
&\text{be}_1 \in \text{BIVi/PRED}s \\
&\text{be}_2 \in \text{BIVi/PREDi} \\
&\text{be}_3 \in \text{BIVs/PREDi} \\
&\text{be}_4 \in \text{BIVs/PREDs}
\end{align*}
\]

With the complexities of the distinction between stage-predicates and individual-level predicates in mind, we can now appreciate its applicability to the semantics of free adjuncts.

4.3 The stage/individual distinction as a semantic correlate of the weak/strong distinction. The importance of the distinction between stage-level and individual-level predicates for the semantics of free adjuncts is that it appears to coincide precisely with the difference between weak and strong adjuncts. Observe that if the predicates listed in (96) are used as free adjuncts, they uniformly show the entailment properties of weak adjuncts;

(96) Stage-level predicates:

- drunk
- alone
- asleep
- sick in bed
- naked
- walking to the store
- lying on the beach
(96) [continued]

- carrying a load of over 100 lbs.
- driving this sort of car
- wearing his new outfit
- standing on a chair
- noticing the snake
- sitting in the garden
- hearing this song
- in his maroon suit and white shoes
- on a stage
- being a bastard
- being silly
- being arrested
- being awarded the Medal of Honor

The predicates in (97) and (110), on the other hand, give rise only to strong adjuncts.

(97) Individual-level predicates:

- being a master of disguise
- being a sailor
- being something of an insomniac
- weighing over 200 lbs.
- having unusually long arms
- having a wooden leg
- standing over six feet tall
- being fat
- being intelligent
- being American

(110) being drunk
- being alone
- being aslleep
- being sick in bed
- being naked
- being in his maroon suit and white shoes
- being on a stage

A comparison of the distinction between stage-level and individual-level predicates and the distinction between statives and nonstatives reveals the precision with which the former correlates with the difference between strong and weak adjuncts: the fact that all adjuncts with nonstative predicates are weak follows from the fact
that nonstatives are in general stage-level; and the fact that the stative predicates exemplified in (90)-(93) give rise to weak rather than strong adjuncts follows from the fact that these predicates are, in Carlson's system, stage-level. Such facts unequivocally point to the conclusion that strong adjuncts are inherently distinguished from weak adjuncts in that they ultimately derive from individual-level rather than stage-level predicates.

Now that we have found an independent correlate of the distinction between strong and weak adjuncts, we are faced with an interesting choice of analyses. We could suppose, on the one hand, that there is a category distinction between strong and weak primal adjuncts; if such were the case, we could block the derivation of sentences in which a strong adjunct serves as the first argument of a modal by requiring that any adjunct undergoing rule (60) belong to the category of weak primal adjuncts. On the other hand, we might assume that there is no syntactic distinction between strong and weak primal adjuncts; and that sentences in which a strong adjunct serves as the first argument of a modal are derivable, but are unacceptable for pragmatic reasons. The former analysis requires a category distinction between two sorts of expressions with significant distributional similarities and denotations of the same logical type; clearly, this analysis is to be eschewed if the syntactic differences between these sorts of expressions can be explained on pragmatic grounds. In Chapter VI, I argue that they can; I therefore assume that all primal adjuncts, strong and weak, belong to a single category. Since we have
divided the supercategory PRED of predicative expressions into the
two supercategories PREDs and PREDi, two rules are now necessary to
convert predicative expressions to the single category t' of primal
adjunct; these supersede rule (4) in section 1 (and its translation
rule (5)).

(146) S1. If \( \alpha \in P_{\text{PRED}s} \), then \( F_{1,n}(\alpha) \in P_{t'} \), where
\( F_{1,n}(\alpha) \) is \( \alpha \).

T1. If \( \alpha \in P_{\text{PRED}s} \) and \( \alpha \) translates as \( \alpha' \), then
\( F_{1,n}(\alpha) \) translates as \( \forall x^s[R(x^s,x^i_n) \& \alpha'(x^s)] \).

(147) S2. If \( \alpha \in P_{\text{PRED}i}, \not\in P_{\text{ADJ}i} \), then \( F_{2,n}(\alpha) \in P_{t'} \),
where \( F_{2,n}(\alpha) \) is \( \alpha \).

T2. If \( \alpha \in P_{\text{PRED}i} \) and \( \alpha \) translates as \( \alpha' \), then
\( F_{2,n}(\alpha) \) translates as \( \alpha'(x^0_n), \alpha'(x^k_n), \) or \( \alpha'(x^i_n) \),
according as \( \alpha' \) is of sorted type \(<o,t'>\), \(<k,t'>\), or
\(<[o,k],t'>\), respectively.

\((147)\) is stated so as to prevent individual-level adjective
phrases from being converted into free adjuncts; such phrases do
not in fact occur as adjuncts. Sentences (148a)-(151a), in which
individual-level adjective phrases appear as the sole predicates of
free adjuncts, are unacceptable, while (148b)-(151b), in which stage-
level adjective phrases appear instead, are fine. Note, however, that
copulative predicates deriving from individual-level adjective phrases
are perfectly acceptable in free adjuncts, as (148c)-(151c) show and
as (147) predicts.

(148) a. *Intelligent, b. Rising, c. Being intelligent, \}\{John answered all the
questions.
What we have seen in this chapter is that a free adjunct may be felt to play the role of an if-clause in modal contexts precisely because it conditions the interpretation of the accompanying modal in the manner of a conditional clause; thus, according to my argument, the conditional flavor of the adjunct in (152) is entirely a product of the semantics of (152).

(152) Thus, written as a deletion rule, Gapping might look like (28)...
(Williams 1977:110)

We have also seen that only certain sorts of adjuncts can function like that in (152); the distinction between those that can and those that can't--between weak and strong adjuncts, in the terminology used here--was shown to correlate with the entirely independent distinction between stage-level and individual-level predicates. In Chapter III, we will see more differences in the semantic behavior of weak and strong adjuncts.

One thing which we haven't explained yet is why strong adjuncts intuitively have such a restricted logical role; confronted with (26a)-(29a), for example, most speakers would immediately construe the underlined adjuncts as having the function of reason adverbials.
(26a) **Being a master of disguise**, Bill would fool everyone.

(27a) **Having unusually long arms**, John can touch the ceiling.

(28a) **Measuring almost a half-mile**, this must be the longest piece of twine in town.

(29a) **Weighing only a few tons**, the truck might reach the top of that hill.

In Chapter VI, I shall argue that this is a pragmatic rather than a semantic fact about strong adjuncts.
Footnotes—Chapter II

1 These are the categories t’, TA, and MTA.

2 Throughout this study, I will employ the convention of abbreviating the translation of a complex expression such as the participial phrase \textit{lying on the beach} with a hyphenated, primed expression: \textit{lying-on-the-beach’}. (This is a departure from Montague’s use of the prime: in PTQ, primed expressions are always constants of intensional logic.) The convention employed here is necessitated by the length of many of the example sentences.

3 This categorization of predicative expressions will be revised in section 4 of this chapter.

Here and throughout, a \textit{basic category} is one which cannot be defined in terms of other categories by means of a slash. It isn’t necessarily a lexical category.

4 Note here that I take prepositional phrases to be predicative expressions, unlike Montague, who, in PTQ, takes them to be adverbal in nature. While I don’t wish to argue that all prepositional phrases are predicative, it is clear that some are: \textit{John is in his white suit}, \textit{Larry is under the garbage can}; it is this predicative use of prepositional phrases that is of interest here. (I should note in passing that the adverbal use of a prepositional phrase may be reducible to the predicative use: for example, \textit{Mary is playing in the yard} might be analyzed as (i) rather than as (ii).

\[
\begin{align*}
(\text{i}) & \quad \text{playing'(Mary') } \& \text{ in-the-yard'(Mary')} \\
(\text{ii}) & \quad \text{in-the-yard'('playing')'(Mary')} 
\end{align*}
\]

Geis (1974) has argued extensively for just such an analysis of locative prepositional phrases.

5 This rule will be restated as two distinct rules in section 4 of this chapter.

6 This will be abandoned in Chapter III, section 4.

7 Montague’s framework, as set forth in ‘Universal Grammar’, doesn’t allow individual syntactic rules to have alternative structural operations. But since such rules can always be restated as sets of rules with single structural operations, we can simply regard them as an informal abbreviatory device posing no serious metatheoretical problems.

8 I certainly do not wish to imply, however, that the presence of a modal verb in the main clause of a sentence is necessary in order for to fail to entail the truth of its free adjunct. It’s not hard
to find sentences which would disprove such a claim:

(i) Wearing his new outfit, John often fools everyone.
(ii) In first gear, the trick sounds funny.

I do wish to claim, however, that the absence of a modal in the main clause of p is necessary in order for p to entail the truth of its (weak) adjunct on all readings.

Sentences like (i) and (ii), which, like (26)-(29), can produce differences in entailment between strong and weak adjuncts, will be discussed in Chapter III.

9Propositions are, as usual, taken to be sets of possible worlds; a proposition p is thus true in a world w iff w is a member of p. A proposition p follows logically from a set A of propositions iff p is true in every world in which every member of A is true. A set A of propositions is consistent iff there is a world in which all members of A are true. A proposition p is compatible with a set A of propositions iff \( A \cup \{ p \} \) is consistent.

10She shows that Lewis' (1973) account of counterfactuals is actually a special case of her own account of conditional necessity: his systems of spheres can, without modification, be regarded as simply a special sort of conversational background, and her truthconditions for would-conditionals, if relativized to a conversational background of this sort, are provably equivalent to his truthconditions for counterfactuals, if one ignores those conditionals which are, in Lewis' system, vacuously true.

11This analysis is based on the assumption that, in modal conditionals, if-clauses have no meaning beyond the proposition they express—essentially, that if has no meaning in such sentences; the admissibility of this assumption is disputable, however. One might be willing to treat if as a semantically empty expression in sentences like (42)-(45) on the grounds that they can be interpreted perfectly adequately under this assumption. According to this position, if serves to signal the occurrence of a conditional clause without contributing in any way to its meaning, much as a complementizer serves to signal the occurrence of a sentential complement. In defense of this position, one could cite subjunctive conditionals like (i), whose antecedent clause is indistinguishable in meaning from that of (ii) even though it lacks if:

(i) Had Mary seen the morning paper, she would have known all about the fire.
(ii) If Mary had seen the morning paper, she would have known all about the fire.

in (i), inversion takes the place of if as the signal of a conditional clause. But the fact that (42)-(45) can be interpreted satisfactorily
under the assumption that if is semantically empty would not be an argument in favor of this assumption if there were some piece of meaning whose presence correlated recurrently with that of if. M. L. Geis (ms) has suggested that if correlates systematically with the meaning 'in the event that'/'in any event in which' on the evidence of indicative conditionals; (iii), he argues, is synonymous with both (iva,b).

(iii) I will leave if you leave.
(iv) a. I will leave in the event that you leave.
   b. I will leave in any event in which you leave.

Notwithstanding Geis' extensive arguments for regarding if-clauses as relative clauses like those in (iva,b), I admit I have certain reservations about his claim. In particular:

(a) It's not clear how the equivalence of (i) with (ii) can be accounted for if Geis' claim is accepted; without independent motivation, an 'if-deletion' transformation would beg the question.

(b) It's not clear that Geis' paraphrase for if is valid for all kinds of conditionals—in particular, modal conditionals like those in (42)-(45): (va,b) seem odd as paraphrases for (ii);

(v) a. ??In the event that Mary had seen the morning paper, she would have known all about the fire.
   b. ??In any event in which Mary had seen the morning paper, she would have known all about the fire.

and, more importantly, it's not obvious that the meaning ascribed to if can be used to derive an acceptable model-theoretic interpretation for conditionals like (ii).

(c) Geis' claim apparently precludes the identification of conditional if with 'whether if', an identification not ruled out under the assumption that if is semantically empty and merely serves as a signal of certain sorts of clauses. Nevertheless, the intuitive appeal of Geis' analysis is not negligible.

The question of how to analyze if raises what I believe to be one of the most critical problems for compositional semantics, namely the problem of redundancy. In the analysis of modal-free conditionals like (vi), it seems hard to avoid ascribing some sort of semantic content to if—perhaps the content suggested by Geis;

(vi) Mary knows Bill if Jane does.

in the analysis of (42)-(45), on the other hand, the modal tells us all we need to know about the logical role of the conditional clause, and thus makes if redundant (and hence eliminable, as in (i)). How can such redundant elements be incorporated into the semantic
composition of an expression? That is, how can two or more expressions make the same contribution to the meaning of an expression of which they are part—a contribution which any one of them could make independently? This problem is all the more serious because it arises so commonly—as, for example, in the double negative construction; thus, it's not obvious how to provide an account of the synonymy of (viiia-c) which is compositional but in which not and no each have a constant interpretation.

(vii) a. I don't have any money.
   b. I have no money.
   c. I don't have no money. [= a, b in some dialects]

In the absence of a theory of redundancy, we are more or less forced to treat if as a semantically empty expression in conditionals like (42)-(45), given the assumed treatment of modals.

12 Of course, the stand-sit-lie class of predicates isn't unambiguously stative in the traditional syntactic sense—cf. the acceptability of such predicates in the progressive. See Dowty (1979:173ff).

13 Of course, bare plurals and proper names denote property-sets of entities, strictly speaking.

14 An exception is what Carlson (p.184) calls the 'comparative progressive':

   (i) Kids are getting smarter.

15 An apparent exception are predicates like be a good citizen in He's being a good citizen. These, however, constitute a special construction. Vide infra.

16 There is no NOM because predicative noun phrases are always individual-level, as mentioned above.

17 An additional fact about the predicates in (110) suggesting that they are individual-level predicates will be discussed in Chapter III.

18 Cf. also Dowty's (1979:115,185) discussion.

19 Here I ignore verbs like seek, which are intensional with respect to object position. See Carlson, pp.189ff.

20 The complexity of T2 in (147) is a consequence of the decision to introduce sorted types into the intensional logic employed here. If a translates as an expression denoting a set of objects (i.e. of sorted type <o,t'>), an object-level variable must be supplied as its implicit 'subject' if the resulting translation is to be defined. Analogously, a variable of the appropriate sorted type is necessary if the translation of a denotes a set of kinds (i.e. is of sorted type
<k,t'>) or a set of individuals (i.e. is of type <[o,k],t'>). See the Appendix for a formal account of the sorting of entities into kinds, objects, individuals, and stages.
CHAPTER III
TENSE AND THE INTERPRETATION OF
FREE ADJUNCTS

In this chapter, it is shown that free adjuncts can play exactly
the same role as temporal adverbial clauses in a variety of constructions. In section 1, some preliminary assumptions regarding the
semantics of tensed sentences and time adverbs are made explicit. In
section 2, it is shown that weak adjuncts may restrict the interpretation of a relative frequency adverb in the manner of a time adverb.
In section 3, it is shown that weak adjuncts can restrict the interpretation of a certain kind of generic sentence, again in the fashion
of a time adverb. In section 4, it is shown that both strong and
weak adjuncts may function as 'main tense adverbs', joining with tense
to pick out a single interval. The rules of syntax and interpretation
employed here appear in the fragment presented in the Appendix.

1. Preliminaries. In this section I shall briefly explain a number
of assumptions behind my account of the interaction of free adjuncts
with tense. In 1.1, I shall review some basics of interval semantics;
in 1.2, I shall distinguish two categories of time adverbs; in 1.3,
I shall set forth the basic rules of syntax and semantics for tensed
sentences; in 1.4, I shall discuss the assumed syntax and semantics
of temporal adverbial clauses; in 1.5, I shall discuss sequence of
tense; and in 1.6, I shall give a short summary of the system of
tense and time adverbs developed here.

1.1 Interval semantics. In the fragment developed here for the
syntax and semantics of free adjuncts and absolutes, interpretations
are assumed to be relativized to intervals of time rather than to
moments or points in time. The reasons for taking intervals rather
than moments as basic are by now familiar; I refer the reader to
Bennett & Partee (1972) and to Dowty (1979:138g) for arguments in
favor of this position.

The definitions assumed for intervals and for various temporal
relations are essentially those of Dowty (1979:139f,353f). Where T
is the set of moments and \( \leq \) is the standard dense linear ordering of
T, an interval is defined as a subset \( i \) of T such that if \( m_1, m_3 \in i \)
and \( m_1 \leq m_2 \leq m_3 \), then \( m_2 \in i \). (A moment may thus be regarded as a
kind of interval if unit sets are identified with their members.)
Where \( i_1, i_2 \) are intervals, \( i_1 \) is a subinterval of \( i_2 \) iff \( i_1 \subseteq i_2 \).

The version of intensional logic employed in the fragment developed
here includes expressions referring directly to intervals, as well
as the following complex expressions, where \( \tau, \xi \) denote intervals
and \( \phi \) denotes a truth value: now, moment, past(\( \tau \)), pres(\( \tau \)), fut(\( \tau \)),
\( \tau \leq \xi \), \( \tau < \xi \), and AT(\( \tau, \phi \)). Their interpretation may be informally
characterized as follows (see the Appendix for a formal statement
of their semantics): at any interval \( i \),

- now denotes \( i \);
- moment denotes the characteristic function of the set of unit
  sets of members of T;
The structure of an interpretation will be augmented by an indication that some interval is to be the speaker's interval—one which contains the moment of utterance. This enrichment of the structure of models is necessary for the interpretation of certain expressions—NOW, PRES(\(\xi\)), FUT(\(\xi\)), and NONPAST(\(\xi\))—at any interval \(i\), relative to the speaker's interval \(i'\),

\begin{align*}
\text{NOW} & \text{ denotes } i'; \\
PRES(\(\xi\)) & \text{ is true iff } i'' \subseteq i', \text{ where } i'' \text{ is the denotation of } \xi; \\
FUT(\(\xi\)) & \text{ is true iff } i' < i'', \text{ where } i'' \text{ is the denotation of } \xi; \\
\text{NONPAST}(\(\xi\)) & \text{ is true iff there is no subinterval } i'' \text{ of the denotation of } \xi \text{ such that } i'' < i'.
\end{align*}

The speaker's interval is also necessary to characterize the notion of an index of possible utterance: a world-interval pair \(<w,i>\) is an index of possible utterance iff \(i\) is the speaker's interval. Hereafter, example sentences will always be assumed to be interpreted at indices of possible utterance.
The introduction of expressions referring to time intervals makes it convenient to introduce a new primitive type into the system of types of expressions of intensional logic: to the type of entity-denoting expressions and the type of truth value-denoting expressions, we add the type of interval-denoting expressions. A new set of complex types results from this addition by the familiar recursive definition (i.e. given any types $a, b, <a, b>$ and $<s, a>$ are also types); thus, expressions of type $<i, t>$ denote sets of intervals, those of type $<s, i, t> >, t>$ denote sets of properties of intervals, and so on. (See Dowty 1979:326.)

Throughout, the following variable conventions are to be assumed:

$t, t_n$ are to be $v_{0, i}, v_{n, i}$, respectively, where $n$ is any positive integer;

$I, I_n$ are to be $v_{0, <i, t>}, v_{n, <i, t>}$, respectively;

$p_t, q_t$ are to be $v_{0, <s, i, t>}, v_{1, <s, i, t>}$, respectively;

$M_i$ is to be $v_n, <i, i, t>$.

1.2 Two categories of time adverbs. Throughout this chapter, I assume the existence of two categories of time adverbs. This category distinction reflects a distinction between two very different sorts of roles which a time adverb may play in the interpretation of a sentence.

In sections 2 and 3 of this chapter, it will be seen that a time adverb may function as the argument of certain expressions, and that the purpose of such a time adverb is simply to specify a set of time intervals; for this reason, we can assume that a time adverb serving this purpose has a set of time intervals as its denotation. Adverbs
of this sort will belong to a basic category TA of expressions with
denotations of type \( <i,t> \):

<table>
<thead>
<tr>
<th>Category name</th>
<th>Description</th>
<th>Basic expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA</td>
<td>the basic category of set-level time adverbs</td>
<td>yesterday, today, tomorrow, ...</td>
</tr>
</tbody>
</table>

The adverbs yesterday, today, and tomorrow, like most time
adverbs, do not shift in reference from one time to another; that is,
even if they occur within the scope of some nonpresent tense, they
always pick out a set of intervals standing in a certain relation to
the speaker's interval. For example, in the interpretation of (1),
today can only pick out the set of subintervals of the day containing
the speaker's interval; (1) cannot be interpreted to mean that John
discovered that Mary was here on the day of John's discovery.

(1) John discovered that Mary was here today.

Similarly, yesterday and tomorrow in (2) and (3) are interpreted rela-
tive to the speaker's interval, not relative to the time of John's
discovery.

(2) John discovered that Mary was here yesterday.

(3) John discovered that Mary will be here tomorrow.

Thus, as members of category TA, today, yesterday, and tomorrow denote
the sets of intervals represented by (4a-c):

(4) a. \( \lambda t V t_1[\text{day}'(t_1) \& \text{NOW} \leq t_1 \& t \leq t_1] \) (= today')

b. \( \lambda t V t_1[[\text{day}'(t_1) \& \lambda t_2[\text{today}'(t_2) + [t_1 < t_2 \& \lambda t_3[[t_1 < t_3 \& t_3 < t_2] + \text{today}'(t_3)]]]) \& t \leq t_1] \)

c. \( \lambda t V t_1[[\text{day}'(t_1) \& \lambda t_2[\text{today}'(t_2) + [t_2 < t_1 \& \lambda t_3[[t_2 < t_3 \& t_3 < t_1] + \text{today}'(t_3)]]]) \& t \leq t_1] \)
At a given interval, (4a) denotes the set of subintervals of the day containing the speaker's interval; (4b) denotes the set of subintervals of the day before the day containing the speaker's interval; and (4c), the set of subintervals of the day after the day containing the speaker's interval.

Some time adverbs, such as during the past summer, do shift in reference from one time to another; for example, sentence (5) can be understood to mean that John discovered that Mary was here during the summer before John's discovery.

(5) John discovered that Mary was here during the past summer.

Thus, as a member of category TA, during the past summer translates as (6).

(6) $\lambda tV_{t_1}[[\text{summer'}(t_1) \& t_1 < \text{now}] \& \lambda t_2[[\text{summer'}(t_2) \& t_2 < \text{now}] + [t_2 < t_1 \vee t_2 = t_1]] \& t \subseteq t_1$]

In the following subsection (1.3), it will be shown that time adverbs may also serve as functioners, joining with tense to characterize the interval at which some sentence is true. In this function, time adverbs are regarded as denoting functions from properties of time intervals to sets of time intervals. Thus, I introduce a category MTA of main tense adverbs with denotations of this type:

<table>
<thead>
<tr>
<th>Category name</th>
<th>Description</th>
<th>Basic expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTA</td>
<td>the category TAB/TAB of main tense adverbs</td>
<td>at-that-time, since noon</td>
</tr>
</tbody>
</table>

(The category definition TAB/TAB will be explained momentarily.) As members of MTA, the adverbs today, yesterday, and tomorrow have the denotations of (7a-c), where today', yesterday', and tomorrow' are
(4a-c), respectively:

\[(7)\]

a. $\lambda t \alpha t[today'(t) \& P^t(t)]$

b. $\lambda t \alpha t[yesterday'(t) \& P^t(t)]$

c. $\lambda t \alpha t[tomorrow'(t) \& P^t(t)]$

Similarly, as a member of MTA, during the past summer translates as

\[(8)\]

(\textit{where during-the-past-summer'} is (6)):

\[(8)\] $\lambda t \alpha t[\text{during-the-past-summer'}(t) \& P^t(t)]$

There appear to be members of MTA which do not have counterparts in category TA (e.g. since-adverbials); on the other hand, all members of category TA have counterparts of category MTA. This relation can be captured by means of the following category-changing rule. 4

\[(9)\]

S67. If $\alpha \in P_{TA}$, [-Adjunct], then $F_{67}(\alpha) \in P_{MTA}$, where $F_{67}(\alpha)$ is $\alpha$.

T67. If $\alpha \in P_{TA}$ and $\alpha$ translates as $\alpha'$, then $F_{67}(\alpha)$ translates as $\lambda t \alpha t[\alpha'(t) \& P^t(t)]$.

A set of proforms of the form \textit{at-that-time}, occur as basic expressions of category MTA; such proforms translate as in (10).

\[(10)\] \textit{at-that-time} translates as $\lambda t \alpha t[t = t_n \& P^t(t)]$

These proforms play an important role in the derivation of temporal adverbial clauses, as will be seen in section 1.4.2.

1.3 The semantics of tensed sentences. In the fragment developed here, a special category of expressions is widely used in the derivation of tensed sentences. I call this the category TAB of temporal abstracts:
Expressions in this category have the superficial form of tensed sentences, but they denote sets of time intervals. Thus, the expression (11), as a member of category TAB, has the denotation of (12);

(11) John walked home.

(12) \( \lambda t[\text{past}(t) \& \text{AT}(t, \text{John-walks-home'})] \)

that is, it denotes the set of past intervals at which John walked home.

The assumption of this category is motivated by two considerations: (i) the need to generate sentences with multiple main tense adverbs, such as Yesterday John saw Mary while he was walking home, and (ii) the fact that certain operators are most elegantly analyzed as applying to arguments which are tensed but which denote sets of time intervals. Sentences with multiple main tense adverbs will be discussed in section 1.3.2 below; the expressions taking temporal abstracts as arguments will be discussed in sections 2 and 3 of this chapter.

1.3.1 Rules of tense. Tenseless sentences are converted to tensed sentences indirectly in this fragment: first, they are converted to temporal abstracts, which then become tensed sentences. The three rules for changing a tenseless sentence into a temporal abstract are:

(13) **Past tense rule:**

\[ S55. \text{ If } \phi \in P_{\text{t}}, \text{ [-Tense, } \beta\text{Perfect}], \text{ then } \]
(13) [continued]

\[ \text{F}_{55}(\phi) \in \text{P}_{\text{TAB}}, [+\text{Tense}, +\text{Past}, \theta\text{Perfect}], \text{where} \]
\[ \text{F}_{55}(\phi) \text{ is PRET}(\phi). \]

Example: \( \text{F}_{55}((\text{John} \text{ [is] happy}) = (\text{John}) \text{ [was] happy} \)

T55. If \( \phi \in \text{P}_t \) and \( \phi \) translates as \( \phi' \), then \( \text{F}_{55}(\phi) \)
translates as \( \lambda t[\text{past}(t) \& \text{AT}(t, \phi')]. \)

Example: \( \text{F}_{55}((\text{John} \text{ [is] happy}) \) translates as
\[ \lambda t[\text{past}(t) \& \text{AT}(t, \text{John-is-happy'})] \]

(14) Present tense rule: 5

S56. If \( \phi \in \text{P}_t, [-\text{Tense}, \theta\text{Perfect}], \text{then} \]
\[ \text{F}_{56}(\phi) \in \text{P}_{\text{TAB}}, [+\text{Tense}, -\text{Past}, \theta\text{Perfect}], \text{where} \]
\[ \text{F}_{56}(\phi) \text{ is } \phi. \]

Example: \( \text{F}_{56}((\text{John} \text{ [is] happy}) = (\text{John}) \text{ [is] happy} \)

T56. If \( \phi \in \text{P}_t \) and \( \phi \) translates as \( \phi' \), then \( \text{F}_{56}(\phi) \)
translates as \( \lambda t[\text{PRES}(t) \& \text{AT}(t, \phi')]. \)

Example: \( \text{F}_{56}((\text{John} \text{ [is] happy}) \) translates as
\[ \lambda t[\text{PRES}(t) \& \text{AT}(t, \text{John-is-happy'})] \]

Many sentences deriving from abstracts produced by (14) are acceptable only as narrative presents; specifically, these will be sentences with 'interval predicates' (Dowty 1979:184), such as John walks home today, Now, Mary notices the signal, and so on.

(15) Future tense rule: 5

S57. If \( \phi \in \text{P}_t, [-\text{Tense}, \theta\text{Perfect}], \text{then} \]
\[ \text{F}_{57}(\phi) \in \text{P}_{\text{TAB}}, [+\text{Tense}, -\text{Past}, \theta\text{Perfect}], \text{where} \text{F}_{57}(\phi) \]
is \( \text{RB}([\text{will}], \phi). \)

Example: \( \text{F}_{57}((\text{John} \text{ [is] happy}) = (\text{John}) \text{ [will] be happy} \)
(15) [continued]

\[ T_{57}. \text{If } \phi \in P_t \text{ and } \phi \text{ translates as } \phi', \text{ then } F_{57}(\phi) \text{ translates as } \lambda t[FUT(t) \& AT(t, \phi')]. \]

Example: \( F_{57}((\text{John}) \text{ is} \text{ happy}) \) translates as \( \lambda t[FUT(t) \& AT(t, \text{John-is-happy'})] \)

The rule converting a temporal abstract to a tensed sentence is

(16):

(16) \( S_{58}. \) If \( \alpha \in P_{TAB}, [\beta \text{Tense}, \gamma \text{Past}, \delta \text{Perfect}], \) then \( F_{58}(\alpha) \in P_t, [\beta \text{Tense}, \gamma \text{Past}, \delta \text{Perfect}], \) where \( F_{58}(\alpha) \) is \( \alpha. \)

Example: \( F_{58}((\text{John}) \text{ will be happy}) = (\text{John}) \text{ will be happy} \)

\[ T_{58}. \text{If } \alpha \in P_{TAB} \text{ and } \alpha \text{ translates as } \alpha', \text{ then } \]

\( F_{58}(\alpha) \) translates as \( Vt[\alpha'(t)]. \)

Example: \( F_{58}((\text{John}) \text{ will be happy}) \) translates as \( \lambda t[FUT(t) \& AT(t, \text{John-is-happy'})] \)

Thus, in this system, the sentence (17) derives as in (18), and is assigned the translation (19).

(17) John was smart.

(18) (John) \text{[was]} smart, t, 58

(John) \text{[is]} smart, TAB, 55

(John) \text{[is]} smart, t, 19

John, T \text{[be]} smart, IV, 24

[be], IV/PRED \text{[be], IV/PRED \text{ smart, ADJ}}^i

(19) \text{Vt}\text{[past}(t) \& AT(t, \text{smart'}(\text{John}'))]}

1.3.2 Main tense adverbs. Main tense adverbs join with temporal abstracts to produce temporal abstracts, as their category definition
TAB/TAB implies. The rule for joining a main tense adverb with a temporal abstract is (20).\(^5\)

\[(20)\] S59. If \(\alpha \in P_{MTA}\) and \(\beta \in P_{TAB}\), \([\gamma: tense, \delta Past, \zeta Perfect]\), then \(F_{59a}(\alpha, \beta)\), \(F_{59b}(\alpha, \beta) \in P_{TAB}\), \([\gamma Tense, \delta Past, \zeta Perfect]\), where \(F_{59a}(\alpha, \beta)\) is \(\Gamma_\alpha, \beta^\gamma\) and \(F_{59b}(\alpha, \beta)\) is \(\Gamma_\beta, \alpha^\gamma\).

Examples: \(F_{59a}(\text{yesterday}, (\text{John}) \text{ [was] happy}) = \)
\(\text{yesterday, (John) [was] happy}\)
\(F_{59b}(\text{tomorrow}, (\text{John}) \text{ [will] be happy}) = \)
\((\text{John}) \text{ [will] be happy tomorrow}\)

T59. If \(\alpha \in P_{MTA}\), \(\beta \in P_{TAB}\), and \(\alpha, \beta\) translate as \(\alpha', \beta'\), then \(F_{59a}(\alpha, \beta)\), \(F_{59b}(\alpha, \beta)\) translate as \(\alpha'(\beta')\).

Example: \(F_{59b}(\text{tomorrow}, (\text{John}) \text{ [will] be happy})\) translates as
\(\lambda t[\text{tomorrow}'(t) \& [\text{FUT}(t) \& \text{AT}(t, \text{John-is-happy}')]]\)

(20) feeds rule (16), so that sentence (21) can be derived as in (22) and assigned the translation (23).

(21) John was asleep yesterday.

(22) \((\text{John}) \text{ [was] asleep yesterday, t, 58}\)
\((\text{John}) \text{ [was] asleep yesterday, TAB, 59b}\)
\(\text{yesterday, MTA, 67}\)
\(\text{yesterday, TA}\)
\(\text{John, T}\)
\(\text{[be] asleep, IV^1, 23}\)
\([\text{be}], \text{IV^1/PRED^5 asleep, ADJ^S}\)

(23) \(\text{vt[\text{yesterday}'(t) \& \text{past}(t) \& \text{AT}(t, \text{Vx^S[R(x^S, John])}\}
\& \text{asleep}'(x^S))]]\)
One advantage of this analysis is that it allows sentences with multiple main tense adverbs to be derived easily. Thus, assuming that in the morning is an expression of category MTA translating as (24), we can analyze sentence (25) as in (26), and thereby assign it the translation (27); (27) induces the desired interpretation for (25).

(24) $\lambda P^t \forall t V t_1[[\text{morning'}(t_1) \& t \leq t_1] \& P^t(t)]$

(25) Yesterday, John saw Mary in the morning.

(26) yesterday, (John) [saw] Mary in the morning, t, 58

yesterday, MTA, 67 (John) [saw] Mary in the morning, TAB, 59a

yesterday, TA in the morning, MTA (John) [saw] Mary, TAB, 55

yesterday, TA in the morning, MTA (John) [saw] Mary, TAB, 55

(John) [sees] Mary, t, 19

John, T [see] Mary, IVi, 20

[see] Mary, IVs, 27

[see], TVs Mary, T

(27) $V t[yesterday'(t) \& V t_1[[\text{morning'}(t_1) \& t \leq t_1] \&$

$[\text{past}(t) \& AT(t, V x^S[R(x^S, John')] \& V y^S[R(y^S, Mary')]$

& see'($x^S$, $y^S$))])])

Thus, the possibility of iterating rule (20) is one advantage of deriving tensed sentences from temporal abstracts. Further advantages of this analysis will be seen in sections 2 and 3.

Rules S55-S59 freely produce sentences like (28)-(30):

(28) John will leave yesterday.

(29) John left tomorrow.

(30) John is happy yesterday.
These kinds of sentences are not regarded as syntactically ill-formed, but as contradictory; these are assigned the translations (31)-(33), which are provably contradictory.

(31) $V_t[\text{yesterday}'(t) \& [\text{FUT}(t) \& \text{AT}(t, V\text{x}^S[R(x^S, \text{John}') \& \text{leave}'(x^S)])]]$

(32) $V_t[\text{tomorrow}'(t) \& [\text{past}(t) \& \text{AT}(t, V\text{x}^S[R(x^S, \text{John}') \& \text{leave}'(x^S)])]]$

(33) $V_t[\text{yesterday}'(t) \& [\text{PRES}(t) \& \text{AT}(t, \text{happy}'(\text{John}'))]]$

1.3.3 Shifting and nonshifting tenses. The attentive reader may wonder why I have used 'PRES($t$)' and 'FUT($t$)' in the translation rules for the present and future tenses, but 'past($t$)' in the translation rule for the past tense. (Recall from 1.1 that 'PRES($t$)' and 'FUT($t$)' are always interpreted relative to the speaker's interval, but that the denotation of 'past($t$)', 'pres($t$)', and 'fut($t$)' depends on their scope relative to other tenses.) This difference is motivated by the following facts: on the one hand, present tense and future tense sentences can be embedded under other tenses but still be interpreted relative to the speaker's interval; on the other hand, there is no clear evidence that past tense sentences must ever be interpreted relative to the speaker's interval when they are embedded under other tenses.

To see this, first consider sentence (34).

(34) John will claim that Mary is hitting Bill.

For some speakers, sentence (34) has an interpretation according to which John will claim that Mary is hitting Bill right now, not at the time of his claim; if analyzed as in (35), (34) is assigned the
translation (36), which induces precisely this interpretation.

(35)  (John) [will] claim that Mary is hitting Bill, t, 56
      (John) [will] claim that Mary is hitting Bill, TAB, 57
      (John) [claims] that Mary is hitting Bill, t, 19
      John, T [claim] that Mary is hitting Bill, IV, 20
      [claim] that Mary is hitting Bill, IVs, 25
      [claim], IVs/t (Mary) [is] hitting Bill, t, 58
      (Mary) [is] hitting Bill, TAB, 56
      (Mary) [is] hitting Bill, t, 19

(36)  \( \text{Vt[FUT(t) & AT(t, Vx^s[R(x^s, John') & claim'(x^s,}
      ^\text{Vt_1[PRES(t_1) & AT(t_1, Mary-is-hitting-Bill')])}]}} \)

If 'pres' were substituted for 'PRES' in (36), then this interpretation could not be induced: since 'pres(t)', like 'past(t)', does shift in denotation when within the scope of some other tense, the translation resulting from this substitution would induce the distinct interpretation that John will claim that Mary is hitting Bill at the time of his claim. (This, of course, is also a possible interpretation for (34); see section 1.5 below.) Thus, the present tense can have a nonshifting interpretation within the scope of future tense. (I should note, however, that some speakers don't accept a nonshifting interpretation for the subordinate clause of (34). In fact, some embedded present tense clauses are universally acknowledged to lack a nonshifting interpretation; sentence (37), for example, can apparently only mean that John will claim that Mary is his wife at the time of his claim— not at the speaker's interval.

(37)  Next year, John will claim that Mary is his wife.
It isn't clear to me why speakers should vary in their interpretation of sentences like (34), nor why (34) should have a nonshifting interpretation while (37) does not.)

Roughly similar facts hold for present tense sentences within the scope of past tense. The factive sentence (38), for example, has the entailment that Mary is walking home right now;

(38) John discovered that Mary is walking home.

If (38) is derived as in (39), then it is assigned the translation (40), which captures this entailment.

\[
\text{(39) (John) \[discovered\] that Mary is walking home, t, 58}
\]

(John) [discovered] that Mary is walking home, TAB, 55

(John) [discovers] that Mary is walking home, t, 19

John, T [discover] that Mary is walking home, IV\textsuperscript{i}, 20

[discover] that Mary is walking home, IV\textsuperscript{s}, 25

[discover], IV\textsuperscript{s}/t (Mary) [is] walking home, t, 58

(Mary) [is] walking home, TAB, 56

(Mary) [is] walking home, t, 19

(40) Vt[past(t) & AT(t, Vx\textsuperscript{s}[R(x\textsuperscript{s}, John') & discover'(x\textsuperscript{s},
\textsuperscript{Vt}\textsuperscript{t}PRES(t\textsuperscript{t}) & AT(t\textsuperscript{t}, Mary-is-walking-home'))]])

If 'pres' were substituted for 'PRES' in (40), the resulting translation would fail to capture the relevant entailment. Thus, the present tense has a nonshifting interpretation within the scope of past tense as well. (38) is, nevertheless, different from (34): (38) seems to carry the implication (implicature?) that Mary was already walking home at the time of John's discovery; (34) has nothing analogous to this component of (38)'s meaning.)
(Note here that without rule (14) to introduce 'PRES(5)' into the translation of a present tense sentence, the embedded clauses in sentences (34) and (33) couldn't be assigned a nonshifting interpretation. Thus, (14) is not as expendable as it may appear.)

Now consider sentence (41).

(41) John claimed that Mary will hit Bill.

This sentence has the interpretation that John claimed that Mary will hit Bill sometime later than the speaker's interval; it cannot mean that John claimed that Mary would hit Bill sometime later than the time of his claim, but possibly before the speaker's interval. If (41) is analyzed as in (42), the rules discussed above assign it the proper interpretation, namely that represented by translation (43).

(42) (John) [claimed] that Mary will hit Bill, t, 58

       (John) [claimed] that Mary will hit Bill, TAB, 55

       (John) [claims] that Mary will hit Bill, t, 19

       John, T [claim] that Mary will hit Bill, IV^i, 20

       [claim] that Mary will hit Bill, IV^S, 25

       [claim], IV^S/t (Mary) [will] hit Bill, t, 58

       (Mary) [will] hit Bill, TAB, 57

       (Mary) [hits] Bill, t, 19

(43) Vt[past(t) & AT(t, Vx^S[R(x^S, John')] & claim'(x^S,

   "Vt1[FUT(t_1) & AT(t_1, Mary-hits-Bill')]])])

If 'fut' were substituted for 'FUT' in (43), (41) would receive the wrong interpretation, namely that of sentence (44). (See section 1.5 for an account of sentences like (44).) Thus, future tense sentences do not shift in denotation when embedded in a past tense sentence.
(44) John claimed that Mary would hit Bill.

Future tense sentences embedded within a future tense sentence are problematic. Consider sentence (45).

(45) John will claim that Mary will hit Bill.

If the embedded future tense sentence has a nonshifting interpretation, (45) should be able to mean that John will claim that Mary will hit Bill sometime later than the speaker's interval but possibly before the time of John's claim. My intuitions about this sentence are not entirely firm, but I don't believe that such an interpretation is possible; if (45) has any acceptable interpretation, it is one according to which John will claim that Mary will hit Bill subsequently to his claim. It is unclear to me why this should be so, especially in the light of the clearly nonshifting interpretation of the embedded future tense sentence in (41). I leave this puzzle unresolved.7

In spite of the complications connected with sentences like (45), it is clear that both present and future tense sentences are sometimes interpreted relative to the speaker's interval when they are embedded under some other tense. It is unclear, however, that past tense sentences must ever be interpreted in this way. Sentences (46) and (47) will bring this out.

(46) John will claim that Mary hit Bill.

(47) John claimed that Mary hit Bill.

Sentence (46) has the interpretation that John will claim that Mary hit Bill sometime before his claim, possibly after the speaker's interval; this is the interpretation induced by the translation (49) assigned to (46) by the rules above in connection with the derivation.
If (46) had an additional interpretation on which the embedded past tense clause were interpreted relative to the speaker's interval, (46) would be able to mean that John will claim that Mary hit Bill sometime before the speaker's interval. Notice, however, that (46) would, under such an interpretation, be true in a proper subset of the set of situations in which (49) is true; it is thus impossible to establish that (46) has an interpretation on which its embedded clause has a nonshifting denotation.

Sentence (47) has the interpretation that John claimed that Mary hit Bill sometime before his claim; this is the interpretation represented by translation (51), which is assigned to (47) on the analysis in (50). If (47) had an interpretation on which the embedded clause were interpreted relative to the speaker's interval, (47) could mean that John claimed that Mary hit Bill sometime before the speaker's interval but possibly later than the time of his claim. (47) plainly
lacks such an interpretation. Thus, there is no clear evidence that past tense sentences ever have a nonshifting denotation.

In section 1.5, the sequence of tense phenomenon will be discussed; there, the shifting present tense interpretation of the subordinate clause in sentences like (52) and (34), as well as the shifting future tense interpretation of the subordinate clause in sentences like (44) and (45), will be accounted for.

(52) John claimed that Mary was hitting Bill.

(34) John will claim that Mary is hitting Bill.

(44) John claimed that Mary would hit Bill.

(45) John will claim that Mary will hit Bill.

1.4 The semantics of temporal adverbial clauses. Throughout this chapter, I shall stress similarities in the semantics of free adjuncts and temporal adverbial clauses (or what I shall simply call 'temporal adverbials'). Therefore, as a preliminary to the discussion of tense and free adjuncts, I shall briefly outline the assumed semantics for
temporal adverbial clauses, which incorporates two important assumptions: (a) that temporal adverbial clauses belong to both of the categories of time adverbs discussed in section 1.2 above—the category TA of set-level time adverbs and the category MTA of main tense adverbs; and (b) that the superficial tense-marking of a temporal adverbial clause has semantic content (pace Smith (1975), who proposes to treat temporal adverbials as underlyingly tenseless, showing tense-marking purely as the result of a tense-copying transformation).

1.4.1 Some problems in the analysis of temporal adverbial clauses.
Before proceeding to the details of the assumed analysis of temporal adverbial clauses, I shall briefly discuss a few general problems involved in their analysis, and how these problems are dealt with below.

Temporal adverbial clauses are, again, assumed to belong both to category TA and to category MTA. As members of the former category, they in general translate into intensional logic expressions fitting schema (53):

\[ \lambda t_1 \forall (t, t_1) \& \phi' \]

Here, \( \alpha' \) represents some expression denoting a two-place relation between intervals. The identity of \( \alpha' \) is determined by the subordinating conjunction in the temporal adverbial: in the translation of a before-adverbial, \( \alpha' \) denotes a relation of precedence; in the translation of an after-adverbial, a relation of subsequence; in the translation of a when-adverbial, the identity relation; and so on. \( \phi' \) represents a sentence of intensional logic; in the translation of a given temporal adverbial, this serves to restrict possible values for \( t_1 \). Thus, the adverbial clause when Mary sang, as a set-denoting
expression, translates as (an expression equivalent to) (54).

\[(54) \lambda t V_1 [t = t_1 \& [\text{past}(t_1) \& \text{AT}(t_1, \text{Mary-sings'})]]\]

(54) denotes the set of intervals identical to some past interval at which Mary sang. Similarly, the adverbial clause \textit{while Mary sang} translates as (55).

\[(55) \lambda t V_1 [[t \leq t_1 \& \sim \text{moment}(t_1)] \& [\text{past}(t_1) \& \text{AT}(t_1, \text{Mary-sings'})]]\]

(55) denotes the set of subintervals of a nonminimal interval at which Mary sang. The adverbials \textit{before Mary sang} and \textit{after Mary sang} translate as (expressions equivalent to) (56) and (57).

\[(56) \lambda t V_1 [[t < t_1 \& M(t, t_1)] \& [\text{past}(t_1) \& \text{AT}(t_1, \text{Mary-sings'})]]\]

\[(57) \lambda t V_1 [[t_1 < t \& M(t, t_1)] \& [\text{past}(t_1) \& \text{AT}(t_1, \text{Mary-sings'})]]\]

Here, \(M\) is a 'context variable' of type \(<i,<i,t>\>; the value which it takes in a given context further restricts the relation between the values of \(t\) and \(t_1\); in most cases, this is a relation implying some degree of temporal proximity. Thus, (56) denotes the set of intervals preceding some other interval \(i\) at which Mary sang and additionally bearing to \(i\) the relation \(M\); (57) denotes the set of intervals following some interval \(i\) at which Mary sang and also bearing relation \(M\) to \(i\). (The exactness of these translations will be taken up in section 1.4.5.) As members of category TA, temporal adverbials undergo rule S67 (see (9) in section 1.2) to become main tense adverbs; as members of category MTA, the adverbials \textit{when Mary sang}, \textit{while Mary sang}, \textit{before Mary sang}, and \textit{after Mary sang} thus translate as in (58a-d).
In this way, temporal adverbials undergo the rule joining main tense adverbs with temporal abstracts (rule (20) in section 1.3.2).

Now, Geis (1970: Ch. 3) has shown that temporal adverbial clauses are of two different kinds. To appreciate the difference, consider sentences (59) and (60).

(59) John left when Jane said that Mary was leaving.

(60) John left while Jane said that Mary was leaving.

Sentence (59) is ambiguous: it can mean either that John left at the time of Jane's assertion or at the time at which Mary was allegedly leaving. That is, the temporal adverbial in (59) can be interpreted like either (61) or (62).

(61) \( \lambda tVt_1[t = t_1 \& [\text{past}(t_1) \& \text{AT}(t_1, \text{Mary-sings})]] \)

(62) \( \lambda tVt_1[t = t_1 \& Vt_2[\text{past}(t_2) \& \text{AT}(t_2, Vx^S[R(x^S, Jane') \& \text{say}'(x^S, \lnot[\text{past}(t_1) \& \text{AT}(t_1, \text{Mary-is-leaving})])])] \)

Sentence (60), on the other hand, is not analogously ambiguous: it can only be understood to mean that John left during Jane's assertion. That is, the temporal adverbial in (60) can be interpreted as (63) is,
but not as (64) is.

\[(63) \lambda tVt[[t \leq t_1 \land \neg \text{moment}(t_1)] \land \text{past}(t_1) \land \\
AT(t_1, \text{Jane-says-that-Mary-was-leaving'})]]\]

\[(64) \lambda tVt[[t \leq t_1 \land \neg \text{moment}(t_1)] \land \text{past}(t_2) \land \\
AT(t_2, \forall x^s[R(x^s, \text{Jane'}) \land \text{say'}(x^s, \neg \text{past}(t_1) \land \\
AT(t_1, \text{Mary-is-leaving'})])]]\]

The analogy of the **when**-adverbial in (59) to the relative construction in (65) is an instructive one.

(65) John left at the time at which Jane said that Mary was leaving.

The ambiguity of (65) is clearly correlated with the presence of two possible 'extraction sites' for the prepositional phrase **at which**:

... the time at which [Jane said that [Mary was leaving __]]

since (59) and (65) are ambiguous in exactly the same way, it is tempting to derive the **when**-adverbial in (59) by a rule of unbounded extraction; this is in fact exactly what Geis proposes. The **while**-adverbial in (60), on the other hand, is less clearly analogous to a relative construction: there is only one possible 'extraction site' in (60), and that's in the highest clause of the temporal adverbial; thus, the **while**-adverbial might arise by a rule of bounded movement.

In the fragment developed here, movement rules—bounded or unbounded—are not employed. Nevertheless, the two sorts of movement rules do have distinct analogues in the assumed framework: unbounded dependencies are captured by rules of variable binding; constructions showing 'bounded dependencies' are directly generated. Accordingly, **when**-adverbials (sometimes) derive in a manner distinct from
while-adverbials, as in the transformational approach to their description.

When combining with a sentence $\phi$, the subordinating conjunction when may bind all occurrences of the adverbial proform $\text{at-that-time}_n$ in $\phi$ (for some nonnegative integer $n$); these instances of $\text{at-that-time}_n$ are concomitantly deleted. Under this analysis, the adverbial when Jane said that Mary was leaving can result from the combination of when with (66), in which case a translation equivalent to (61) is produced;

(66) (Jane) [said] that Mary was leaving $\text{at-that-time}_0$, $t$, 58

(Jane) [said] that Mary was leaving $\text{at-that-time}_0$, TAB, 59b

$\text{at-that-time}_0$, MTA (Jane) [said] that Mary was leaving, TAB, 55

(Jane) [says] that Mary was leaving, $t$, 19

or it can result from the combination of when with (67), in which case a translation equivalent to (62) is produced.

(67) (Jane) [said] that Mary was leaving $\text{at-that-time}_0$, $t$, 58

(Jane) [said] that Mary was leaving $\text{at-that-time}_0$, TAB, 55

(Jane) [says] that Mary was leaving $\text{at-that-time}_0$, $t$, 19

Jane, $T$ [say] that Mary was leaving $\text{at-that-time}_0$, IV$i$, 20

[say] that Mary was leaving $\text{at-that-time}_0$, IV$S$, 25

[say], IV$S/t$ (Mary) [was] leaving $\text{at-that-time}_0$, $t$, 58

(Mary) [was] leaving $\text{at-that-time}_0$, TAB, 59b

$\text{at-that-time}_0$, MTA (Mary) [was] leaving, TAB, 55

(Mary) [is] leaving, $t$, 19

(The rules necessary for producing such derivations and for assigning them the appropriate translations will be discussed in section 1.4.2.)
Since **before**- and **after**-adverbials can be shown to pattern semantically with **when**-adverbials rather than with **while**-adverbials, they too are regarded as expressions whose derivation may involve the binding of free occurrences of the variable \( \text{at-that-time}_n \).

Unlike **when**, **before**, and **after**, **while** does not bind occurrences of \( \text{at-that-time}_n \); if it did, sentences like (60) would be assigned as many distinct interpretations as sentences like (59). What is necessary is some means of guaranteeing that the result of combining **while** with a sentence \( \phi \) denotes the set of subintervals of the interval at which (the tenseless form of) \( \phi \) is true. One way of doing this is to introduce **while** syncategorically with tense. Under this approach, the adverbial **while Jane said that Mary was leaving** can only be derived by combining **while** with (68) (with concomitant tensing).

\[
(68) \ (\text{Jane}) \ [\text{says}] \ that \ \text{Mary was leaving}
\]

Translation (63) results from this combination; (64) cannot arise as a translation for **while Jane said that Mary was leaving** under this analysis.

This analysis correctly accounts for the differences between **when**-adverbials and **while**-adverbials. For example, it predicts that sentence (69) should be three ways ambiguous, but that (70) should lack an analogous ambiguity; these predictions are correct.

\[
(69) \ \text{John left when Bill said that Mary confessed that she was leaving.}
\]

\[
(70) \ \text{John left while Bill said that Mary confessed that she was leaving.}
\]

It might at first seem that no fewer than six rules are necessary to introduce **while** syncategorically with tense--two for each tense
(depending on the presence or absence of a time adverb). However, only four rules are in fact necessary; I shall briefly explain why this is so.

When its superordinate clause is in the past or present tense, a while-clause itself has the same superficial tense-marking:

\[(71) \text{John left while Mary was singing.}\]
\[(72) \text{John leaves while Mary is singing.}\]

Given the meaning of while, it is perfectly reasonable to suppose that the superficial tense-marking of the adverbial clauses in (71) and (72) accurately reflects their true tense—that the adverbials in (71) and (72) have the set-level translation (73) and (74):

\[(73) \lambda t \forall t, \exists_{t} (t \subseteq t' \land \neg \text{moment}(t') \land \text{past}(t') \land \text{AT}(t', \text{Mary-is-singing}'))\]
\[(74) \lambda t \forall t, \exists_{t} (t \subseteq t' \land \neg \text{moment}(t') \land \text{PRES}(t') \land \text{AT}(t', \text{Mary-is-singing}'))\]

In future tense sentences, however, while-adverbials show superficially present rather than future tense marking:

\[(75) \text{John will leave while Mary is singing.}\]
(Cf. ?John will leave while Mary will be singing.)

The meaning of while clearly rules out the possibility that the adverbial in (75) is to be interpreted as present relative to the speaker's interval—that is, it cannot translate as (74). How is it to be analyzed?

An obvious tack to take would be to say that the adverbial in (75) has a shifting present tense denotation—that is, that it translates as in (76), and is understood to pick out a future set of
intervals because it is within the scope of the future tense of the superordinate clause.

\[(76) \lambda t V t_1 [[t \subseteq t_1 \& \langle \text{moment}(t_1) \rangle \& [\text{pres}(t_1) \& \text{AT}(t_1, \text{Mary-is-singing}')]\]

I don't believe this solution would be acceptable, however. As Dowty (1979:323) has shown, it is incorrect to assume that tense and time adverbs have scope relative to each other, since they work in unison to pick out a single interval; the assumption that the subordinate clause of (75) is within the scope of future tense would clearly be inconsistent with this fact.

An alternative approach would be to assume that the subordinate clause of (75) is semantically future in tense, despite its superficial present-tense marking; that it translates as (77).

\[(77) \lambda t V t_1 [[t \subseteq t_1 \& \langle \text{moment}(t_1) \rangle \& [\text{FUT}(t_1) \& \text{AT}(t_1, \text{Mary-is-singing}')]\]

This solution would be consistent with the syncategorematic nature of tense and time adverbs. It would, however, force us to say that while Mary is singing is ambiguous between a future tense interpretation (that induced by (77)) and a present tense interpretation (that of (74)) even though these interpretations are always in complementary distribution: the future interpretation is only found in the environment of a superordinate clause in the future tense, while the present tense interpretation is restricted to the environment of a superordinate clause in the present tense.

A preferable alternative would be to assume that an adverbial like while Mary is singing is semantically indeterminate between a
present tense and a future tense interpretation--that it is simply 'nonpast'. This is what I shall assume; the adverbial clause in sentences (72) and (75) thus has a single interpretation, namely that induced by (73).

\(\lambda tVt_1[[t \leq t_1 \& \neg \text{moment}(t_1)] \& [\text{NONPAST}(t_1) \& \text{AT}(t_1, \text{Mary-is-singing}']]]\)

For this reason, only four rules are necessary for introducing while syncategorematically with tense: two past tense rules (with and without time adverbs) and two nonpast tense rules.

While is, again, an exception to the rule which joins a temporal subordinating conjunction with a tensed sentence \(\phi\) and binds instances of \(\text{at-that-time}_n\) in \(\phi\). Nevertheless, \textit{when}, \textit{before}, and \textit{after} are allowed to undergo the four rules which join a temporal subordinator with a tenseless sentence \(\phi\) and simultaneously introduce tense into \(\phi\). This is necessary because adverbials like \textit{when Mary sings}, \textit{before Mary sings}, and \textit{after Mary sings} have an interpretation analogous to that of \textit{while Mary is singing}; in sentences (79)-(81), for example, the adverbial clauses cannot be interpreted as present relative to the speaker's interval, but must (according to arguments parallel to those given above for \textit{while}) have a 'nonpast' interpretation.

(79) John will leave \textit{when} Mary sings.

(80) John will leave \textit{before} Mary sings.

(81) John will leave \textit{after} Mary sings.

We now turn to the formal statement of the rules for temporal adverbials.
1.4.2 Rules for temporal adverbial clauses without main tense adverbs.

The subordinating conjunctions before, after, when, and while are assumed to be basic expressions of the category TSC:

<table>
<thead>
<tr>
<th>Category name</th>
<th>Description</th>
<th>Basic expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSC</td>
<td>the basic category of temporal subordinating conjunctions</td>
<td>before, after, when, while</td>
</tr>
</tbody>
</table>

These expressions translate as in (82a-d):

(82) a. before translates as $\lambda P^t \lambda t V t_1[[t < t_1 \& M(t,t_1)] \& P^t(t_1)]$

b. after translates as $\lambda P^t \lambda t V t_1[[t_1 < t \& M(t,t_1)] \& P^t(t_1)]$

c. when translates as $\lambda P^t \lambda t V t_1[t = t_1 \& P^t(t_1)]$

d. while translates as $\lambda P^t \lambda t V t_1[[t \subseteq t_1 \& \neg \text{moment}(t_1)] \& P^t(t_1)]$

Before, after, when, and while combine with sentences to produce temporal adverbial clauses of category TA; this combination is accomplished by a number of rules.

The first such rule joins a temporal subordinator with a tensed sentence $\phi$ and binds all instances of at-that-time in $\phi$ (for some $n$); the bound instances of at-that-time are concomitantly deleted. As was seen in section 1.4.1, while is an exception to this rule.

(83) S68. If $\alpha \in P_{\text{TSC}}$, $\alpha \neq \text{while}$, and $\phi \in P_t$, [+Tense],

then $F_68_n(\alpha, \phi) \in P_{\text{TA}}, [-\text{Adjunct}]$, where $F_68_n(\alpha, \phi)$ is $\Gamma \alpha \phi \Gamma$ and $\phi$' is $\text{DEL(at-that-time}, \text{DP}(\phi))$.

According to (83), the when-adverbial in sentence (59) may be analyzed in two ways (excluding cases of vacuous binding of at-that-time):
these analyses are (84) and (85).

(59) John left when Jane said that Mary was leaving.

(84) when Jane said that Mary was leaving, TA, 68,0

when, TSC (Jane) [said] that Mary was leaving at-that-time

[as in (66) in 1.4.1]

(85) when Jane said that Mary was leaving, TA, 68,0

when, TSC (Jane) [said] that Mary was leaving at-that-time

[as in (67) in 1.4.1]

The translation rule (36) corresponding to (33) abstracts over the variable $t_n$ in the translation of \underline{at-that-time}_n:

(36) T68. If $a \in P_{TSC}$, $\phi \in P_t$, and $a, \phi$ translate as $a', \phi'$, then $F_{68,n}(a, \phi)$ translates as $a'(\hat{t}_n[\phi'])$.

Thus, (84) and (85) receive distinct interpretations according to the respective translations which (86) assigns them:

(87) $\lambda tV t_1[t = t_1 \& V t_2[t_2 = t_1 \& \text{past}(t_2) \& AT(t_2, \text{Jane-says-that-Mary-was-leaving'})]]$

(88) $\lambda tV t_1[t = t_1 \& V t_2[\text{past}(t_2) \& AT(t_2, V x^S[R(x^S, \text{Jane'}) \& say'(x^S, ^tV t_3[t_3 = t_1 \& \text{past}(t_3) \& AT(t_3, \text{Mary-is-leaving'})]]])]]$

(The reader will have noted that (87) and (88) are equivalent to (61) and (62), respectively.)

As an expression of category TA, when Jane said that Mary was leaving (however it is derived) can be converted to category MTA by rule (9) (see section 1.2) and thus enter into the derivation of sentences like (59). (59) thus receives the two analyses in (89) and
These distinct analyses correspond to the distinct translations (91) and (92), respectively:

\[(91) \; V_t[V_{t_1}[t = t_1 \& V_{t_2}[t_2 = t_1 \& \text{past}(t_2) \& AT(t_2, Jane-says-that-Mary-was-leaving')]]) \& \text{past}(t) \& AT(t, John-leaves')]\]

\[(92) \; V_t[V_{t_1}[t = t_1 \& V_{t_2}[\text{past}(t_2) \& AT(t_2, Vx^s[R(x^s, Jane')] \& \text{say}'(x^s, V_{t_3}[t_3 = t_1 \& \text{past}(t_3) \& AT(t_3, Mary-is-leaving')]])]) \& \text{past}(t) \& AT(t, John-leaves')]\]

These translations induce the desired interpretations for (59). Rules (83) and (86) thus suffice for the union of when, before, and after with tensed sentences.

The rules which introduce temporal subordinators syncategorematically with tense (without time adverbs) are (93) and (94).
(93) \text{S69. If } \alpha \in P_{\text{TSC}} \text{ and } \phi \in P_t, [-\text{Tense}], \text{ then} \\\ F_{69}(\alpha, \phi) \in P_{\text{TA}}, [-\text{Adjunct}], \text{ where } F_{69}(\alpha, \phi) \text{ is} \\\ \Gamma_{\alpha \phi} \text{ and } \phi' \text{ is } \text{DP(PRET(\phi))}. \\ \ \text{Example: } F_{69}(\text{while, (Mary) [is] singing}) = \text{while Mary was singing} \\ \ \text{T69. If } \alpha \in P_{\text{TSC}}, \phi \in P_t, \text{ and } \alpha, \phi \text{ translate as } \alpha', \phi', \text{ then } F_{69}(\alpha, \phi) \text{ translates as } \alpha'(\check{t}[\text{past}(t) \& \text{AT}(t, \phi')]). \\ \ \text{Example: while Mary was singing translates as} \\ \ \lambda t V_1[[t \subseteq t_1 \& \sim \text{moment}(t_1)] \& [\text{past}(t_1) \& \text{AT}(t_1, \text{Mary-is-singing'})]] \\ \ \text{(94) \text{S70. If } \alpha \in P_{\text{TSC}} \text{ and } \phi \in P_t, [-\text{Tense}], \text{ then} \\ \ F_{70}(\alpha, \phi) \in P_{\text{TA}}, [-\text{Adjunct}], \text{ where } F_{70}(\alpha, \phi) \text{ is} \\ \ \Gamma_{\alpha \phi} \text{ and } \phi' \text{ is } \text{DP(\phi)}. \\ \ \text{Example: } F_{70}(\text{while, (Mary) [is] singing}) = \text{while Mary is singing} \\ \ \text{T70. If } \alpha \in P_{\text{TSC}}, \phi \in P_t, \text{ and } \alpha, \phi \text{ translate as } \alpha', \phi', \text{ then } F_{70}(\alpha, \phi) \text{ translates as} \\ \ \alpha'(\check{t}\text{[NONPAST}(t) \& \text{AT}(t, \phi')]). \\ \ \text{Example: while Mary is singing translates as} \\ \ \lambda t V_1[[t \subseteq t_1 \& \sim \text{moment}(t_1)] \& [\text{NONPAST}(t_1) \& \text{AT}(t_1, \text{Mary-is-singing'})]] \ \ \ \text{Given that while is an exception to rule (83), the only way of} \ \ \ \text{deriving sentence (60) is as in (95).} \\ \ \text{(60) John left while Jane said that Mary was leaving.}
(95) (John) [left] while Jane said that Mary was leaving, t, 58

while Jane said that Mary was leaving, MTA, 67 (John) [left], TAB, 55
while Jane said that Mary was leaving, TA, 69 (John) [leaves], t, 19
while, TSC (Jane) [says] that Mary was leaving, t, 19

This derivation corresponds to the translation (96) for (60).

(96) \[Vt[Vt_1[[t \leq t_1 \land \omega\text{moment}(t_1)] \land [\text{past}(t_1) \land AT(t_1, Jane\text{-says\text{-that\text{-Mary-was\text{-leaving}}})]] \land [\text{past}(t) \land AT(t, John\text{-leaves})]]\]

As is easily verified, (96) induces the proper interpretation for (60).

Sentence (97) is derived as in (98).

(97) John will leave while Mary is singing.

(98) (John) [will] leave while Mary is singing, t, 58

while Mary is singing, MTA, 67 (John) [will] leave, TAB, 57
while Mary is singing, TA, 70 (John) [leaves], t, 19
while, TSC (Mary) [is] singing, t, 19

Analyzed in this way, (97) is assigned the interpretation induced by (99).

(99) \[Vt[Vt_1[[t \leq t_1 \land \omega\text{moment}(t_1)] \land [\text{NONPAST}(t_1) \land AT(t_1, Mary\text{-is\text{-singing})}] \land [\text{FUT}(t) \land AT(t, John\text{-leaves})]]\]

Because the \underline{while}-adverbial in (97) is analyzed as 'nonpast' rather than present in tense, (99) represents a noncontradictory interpretation, as desired.
As was pointed out in 1.4.1, rule (94) must be employed in the analysis of certain when-, before-, and after-adverbials. To appreciate this, consider example (100).

(100) John will leave when Mary sings.

If rule (85) is employed in the analysis of its adverbial clause, this sentence is assigned analysis (101) and translation (102);

(101) \(\text{(John) \[ \text{will} \] leave when Mary sings, t, 58}\\\text{(John) \[ \text{will} \] leave when Mary sings, TAB, 59b}\\\text{when Mary sings, MTA, 67}\\\text{when Mary sings, TA, 68,4}\\\text{when, TSC}\\\text{(Mary) \[ \text{sings} \] at-that-time, t, 58}\\\text{(Mary) \[ \text{sings} \] at-that-time, TAB, 59b}\\\text{at-that-time, MTA}\\\text{(Mary) \[ \text{sings} \], TAB, 56}\\\text{(Mary) \[ \text{sings} \], t, 19}\\\text{(102) Vt\[ Vt_1[t = t_1 \& Vt_2[t_2 = t_1 \& [PRES(t_2) \& AT(t_2, \text{Mary-sings'})]] \& [FUT(t) \& AT(t, \text{John-leaves'})]]}\\\text{unfortunately, (102) is provably contradictory, since no interval will ever satisfy both 'FUT(\(t\))' and 'PRES(\(t\))'. If rule (94) is instead employed in the analysis of when Mary sings, as in (103), then (100) is assigned translation (104), which is noncontradictory.\\\text{(103) when Mary sings, MTA, 67}\\\text{when Mary sings, TA, 70}\\\text{when, TSC}\\\text{(Mary) \[ \text{sings} \], t, 19}\\\text{(104) Vt\[ Vt_1[t = t_1 \& [\text{NONPAST}(t_1) \& AT(t_1, \text{Mary-sings'})]] \& [FUT(t) \& AT(t, \text{John-leaves'})]]}
Since (100) clearly has a noncontradictory interpretation, derivations like (103) are allowed; analogous derivations are necessary for the analysis of the temporal adverbials in sentences like (105) and (106).

(105) John will leave before Mary sings.
(106) John will leave after Mary sings.

Rule (93) can also be employed in the analysis of when-, before-, and after-adverbials like those in (107)-(109);

(107) John left when Mary arrived.
(108) John left before Mary arrived.
(109) John left after Mary arrived.

(93), however, doesn't give rise to any interpretations that can't be produced by means of (83).

1.4.3 Temporal adverbial clauses with main tense adverbs. In the two preceding subsections, we have looked at relatively simple temporal adverbial clauses. Somewhat more complicated are adverbial clauses like those in (110)-(112); here, the subordinate clauses are themselves modified by main tense adverbs.

(110) Before Jane arrived yesterday, John left.
(111) When Jane said that Mary arrived yesterday, John left.
(112) While Mary was singing yesterday, John left.

Because the rule which combines main tense adverbs with temporal abstracts may iterate, sentences (110) and (111) may be analyzed and translated by rules that have already been discussed. Sentence (110) is derived as in (113), and translates as (114).
The analysis presented here predicts a four way ambiguity for (111) corresponding to the four possible analyses for the adverbial clause when Jane said that Mary arrived yesterday:

(115) when Jane said that Mary arrived yesterday, TA, 68,0

when, TSC (Jane) [said] that Mary arrived yesterday at-that-time₀, t, 58

(Jane) [said] that Mary arrived yesterday at-that-time₀, TAB, 59b

at-that-time₀, MTA (Jane) [said] that Mary arrived yesterday, TAB, 55

(Jane) [says] that Mary arrived yesterday, t, 19

Jane, T [say] that Mary arrived yesterday, IV¹, 20

[say] that Mary arrived yesterday, IV², 25

[say], IV₃/t (Mary) [arrived] yesterday, t, 58

(Mary) [arrived] yesterday, TAB, 59b

yesterday, MTA, 67 (Mary) [arrived], TAB, 55

yesterday, TA (Mary) [arrives], t, 19
(This corresponds to the interpretation in which (a) yesterday indicates the time of Mary's alleged arrival, and (b) the when-adverbial denotes the set of intervals at which Jane spoke.)

\[ (116) \] when Jane said that Mary arrived yesterday, TA, 68,0

\[ \begin{align*}
\text{when, TSC} \quad & (\text{Jane}) \ [\text{said}] \text{ that Mary arrived at-that-time}_0 \text{ yesterday}, t,58 \\
\text{(Jane)} \ [\text{said}] \text{ that Mary arrived at-that-time}_0 \text{ yesterday}, \text{TAB, 59b} \\
\text{yesterday, MTA, 67} \quad & (\text{Jane}) \ [\text{said}] \text{ that Mary arrived at-that-time}_0, \\
\text{yesterday, TA} \\
\text{(Jane) \ [says] that Mary arrived at-that-time}_0, t, 19 \\
\text{Jane, T} \ [\text{say}] \text{ that Mary arrived at-that-time}_0, \text{ IVi, 20} \\
\text{[say], IVs/t} \quad & (\text{Mary}) \ [\text{arrived}] \text{ at-that-time}_0, t, 58 \\
\text{(Mary) \ [arrived] \text{ at-that-time}_0, \text{TAB, 59b}} \\
\text{at-that-time}_0, \text{MTA} \quad & (\text{Mary}) \ [\text{arrived}], \text{TAB, 55} \\
\text{(Mary) \ [arrives], t, 19} \\
\end{align*} \]

(This analysis corresponds to the interpretation in which (a) yesterday indicates the time of Jane's speaking, and (b) the when-adverbial denotes the set of intervals at which Mary allegedly arrived.)
(117) when Jane said that Mary arrived yesterday, TA, 68,0
when, TSC (Jane) [said] that Mary arrived at-that-time\textsubscript{0} yesterday, t, 58
(Jane) [said] that Mary arrived at-that-time\textsubscript{0} yesterday, TAB, 59b
yesterday, MTA, 67 (Jane) [said] that Mary arrived at-that-time\textsubscript{0} yesterday, TA
yesterday, TA at-that-time\textsubscript{0}, MTA (Jane) [said] that Mary arrived,
TAB, 55
(Jane) [says] that Mary arrived, t, 19
Jane, T [say] that Mary arrived, IV\textsuperscript{4}, 20
[say] that Mary arrived, IV\textsuperscript{5}, 25
[say], IV\textsuperscript{5}/t (Mary) [arrived], t, 58
(Mary) [arrived], TAB, 55
(Mary) [arrives], t, 19

(This analysis corresponds to the interpretation of (111) in which
(a) yesterday indicates the time of Jane's speaking, and (b) the
when-adverbial denotes the set of intervals at which Jane spoke.)

(118) when Jane said that Mary arrived yesterday, TA, 68,0
when, TSC (Jane) [said] that Mary arrived at-that-time\textsubscript{0} yesterday, t, 58
(Jane) [said] that Mary arrived at-that-time\textsubscript{0} yesterday, TAB, 55
(Jane) [said] that Mary arrived at-that-time\textsubscript{0} yesterday, t, 19
Jane, T [say] that Mary arrived at-that-time\textsubscript{0} yesterday, IV\textsuperscript{4}, 20
[say] that Mary arrived at-that-time\textsubscript{0} yesterday, IV\textsuperscript{5}, 25
[say], IV\textsuperscript{5}/t (Mary) [arrived] at-that-time\textsubscript{0} yesterday, t, 58
(Mary) [arrived] at-that-time\textsubscript{0} yesterday, TAB, 59b
yesterday, MTA, 67 (Mary) [arrived] at-that-time\textsubscript{0}, TAB, 59b
yesterday, TA at-that-time\textsubscript{0}, MTA (Mary) [arrived], TAB, 55
(Mary) [arrives], t, 19
(This corresponds to the interpretation in which (a) yesterday indicates the time of Mary’s alleged arrival, and (b) the when-adverbial denotes the set of intervals at which Mary allegedly arrived.)

The judgement is admittedly somewhat delicate, but my intuition is that these are all possible ways of interpreting the adverbial clause in sentence (111).

While-adverbials with time adverbs, such as that in (112), are derived differently.

(112) While Mary was singing yesterday, John left.

Since we have assumed that while, unlike before, after, and when, does not bind occurrences of at-that-time, but is instead introduced syncategorematically with tense, we must postulate additional rules for the combination of while with a sentence and a main tense adverb:12

(119) S71. If \( \alpha \in P_{TSC}, \beta \in P_{MTA}, \) and \( \phi \in P_t, [-Tense], \)
then \( F_{71}(\alpha, \beta, \phi) \in P_{TA}, [-Adjunct], \) where \( F_{71}(\alpha, \beta, \phi) \)
is \( \Gamma \alpha' \beta' \) and \( \phi' \) is \( DP(\text{PRET}(\phi)). \)

Example: \( F_{71}(\text{while}, \text{yesterday}, (\text{Mary}) [\text{is}] \text{ singing}) = \)

\( \text{while Mary was singing yesterday} \)

T71. If \( \alpha \in P_{TSC}, \beta \in P_{MTA}, \phi \in P_t, \) and \( \alpha, \beta, \phi \) translate as \( \alpha', \beta', \phi' \), then \( F_{71}(\alpha, \beta, \phi) \) translates as
\( \alpha'([\beta'([\text{past}(t) \& \text{AT}(t, \phi')])]). \)

Example: while Mary was singing yesterday translates as
\( \lambda t V_{t_1}[t \_ t_1 & \_ \_ \text{moment}(t_1) \_ \_ \text{yesterday'}(t_1) \_ \_ \text{past}(t_1) \_ \_ \text{AT}(t_1, \text{Mary-is-singing'})]. \)

(120) S72. If \( \alpha \in P_{TSC}, \beta \in P_{MTA}, \) and \( \phi \in P_t, [-Tense], \)
then \( F_{72}(\alpha, \beta, \phi) \in P_{TA}, [-Adjunct], \) where \( F_{72}(\alpha, \beta, \phi) \)
(120) [continued]

is $\alpha' \beta'$ and $\phi'$ is DP($\phi$).

Example: $F_{65}$(while, tomorrow, (Mary) [is] singing) =

while Mary is singing tomorrow

T72. If $\alpha \in P_{TSC}$, $\beta \in P_{MTA}$, $\phi \in P_{c}$, and $\alpha, \beta, \phi$ trans-
late as $\alpha', \beta', \phi'$, then $F_{T72}(\alpha, \beta, \phi)$ translates as

$\alpha'('\beta'(\xi[\text{NONPAST}(t) \& AT(t, \phi)]))$.

Example: while Mary is singing tomorrow translates as

\[\lambda tV_{t_1}[t \leq t_1 \& \neg \text{moment}(t_1) \& [\text{tomorrow}'(t_1) \&
\\& \text{NONPAST}(t_1) \& AT(t_1, \text{Mary-is-singing}')]])\]

Assuming rules of this sort, we can analyze sentence (112) as in (121):

(121) while Mary was singing yesterday, (John) [left], t, 58

while Mary was singing yesterday, (John) [left], TAB, 59a

while Mary was singing yesterday, MTA, 67 (John) [left], TAB, 55

while Mary was singing yesterday, TA, 71 (John) [leaves], t, 19

while, TSC yesterday, MTA, 67 (Mary) [is] singing, t, 19

yesterday, TA

Analysis (121) produces translation (122) for sentence (112):

(122) $V_{t_1}[V_{t_1}[t \leq t_1 \& \neg \text{moment}(t_1) \& [\text{yesterday}'(t_1) \&
\\& \text{past}(t_1) \& AT(t_1, \text{Mary-is-singing}')]]) \&
\& [\text{past}(t) \& AT(t, \text{John-leaves}')]]$

This translation induces the desired interpretation for (112). Sent-
tences with 'nonpast' while-clauses with main tense adverbs are
assigned analogous derivations and translations.

Just as rule (94) was shown in section 1.4.2 to be necessary for
the analysis of certain when-, before-, and after-adverbials without
main tense adverbs, (120) can, by analogous arguments, be shown to be necessary for deriving certain when-, before-, and after-adverbials with main tense adverbs; I thus allow (120) to apply freely to all temporal subordinators. (As with (93), (119) can harmlessly apply in the derivation of all sorts of temporal adverbial clauses, since it never gives rise to an interpretation that isn't accessible by means of (83).)

1.4.4 Remarks on some unacceptable temporal adverbial clauses. The rules proposed in 1.4.2,3 for the derivation of temporal adverbial clauses allow a number of kinds of unacceptable sentences to be generated; examples are (123)-(127).

(123) *John will leave when Mary arrived.
(124) *John left after Mary is singing.
(125) *John will leave after Mary arrived.
(126) *John left before Mary arrives.
(127) *John will leave when Mary will arrive.

I shall briefly explain what I believe to be the reasons for this unacceptability.13

The unacceptability of sentences like (123) and (124) is, I believe, to be attributed to their semantics: according to the rules presented above, (125) and (124) should have only contradictory interpretations. (123), for example, is translated as (128) by the present system of rules:

\[
(128) Vt[Vt_1[t = t_1 \& Vt_2[t_2 = t_1 \& [\text{past}(t_2) \& \\
\text{AT}(t_2, \text{Mary-arrives'})]]] \& [\text{FUT}(t) \& \\
\text{AT}(t, \text{John-leaves'})]]
\]
because no interval could ever satisfy both 'FUT(\(\tau\))' and '\(\text{past}(\tau)\)' (at an index of possible utterance), (128) induces a contradictory interpretation for (123). The unacceptability of a wide range of sentences can be accounted for in this way.

The unacceptability of (125) and (126), however, cannot obviously be explained in this manner. The translations assigned to (125) and (126) by the rules presented here do not induce contradictory interpretations:

\[(129) \ Vt[Vt_1[[t_1 < t \& M(t,t_1)] \& Vt_2[t_2 = t_1 \& [\text{past}(t_2) \& \text{AT}(t_2, \text{Mary-arrives}')]]] \& [\text{FUT}(t) \& \text{AT}(t, \text{John-leaves}')]]
\]

\[(130) \ a. \ Vt[Vt_1[[t < t_1 \& M(t,t_1)] \& Vt_2[t_2 = t_1 \& [\text{PRES}(t_2) \& \text{AT}(t_2, \text{Mary-arrives}')]]] \& [\text{past}(t) \& \text{AT}(t, \text{John-leaves}')]]
\\b. \ Vt[Vt_1[[t < t_1 \& M(t,t_1)] \& [\text{NONPAST}(t_1) \& \text{AT}(t_1, \text{Mary-arrives}')]]] \& [\text{past}(t) \& \text{AT}(t, \text{John-leaves}')]]
\]

There are several approaches that we could take in attempting to account for the unacceptability of (125) and (126).

We might convert translations (129) and (130a,b) to contradictions by replacing '<' with '<<', where the latter is defined as follows: where \(\xi,\xi'\) denote the intervals \(i,i'\), \(\xi << \xi'\) is true iff \(i < i'\) and either (a) \([\text{past}(\xi) \& \text{past}(\xi')]\) is true, or (b) \([\text{NONPAST}(\xi) \& \text{NONPAST}(\xi')]\) is true. (Heinämäki (1974:72f) makes a suggestion something like this.) By changing (129) and (130a,b) into contradictions in this way, we could explain the anomaly of (125) and (126) as we explained that of
Promising though this approach might appear to be, I don't believe it is correct. It implies that sentence (131) should not be true in a situation in which the time predicted by Mary for John's departure is already past, and that (132) should not be true in a situation in which the predicted time hasn't yet arrived; the judgement is delicate, but I believe that this implication is false in both cases.

(131) John will leave after Mary said he would.

(132) John left before Mary said he would.

Smith (1975:72) suggests that the anomaly of sentences like (125) and (126) (and like (123) and (124)) is syntactic rather than semantic in nature. She proposes 'a principle that will predict the possible tenses of embedded time adverbials': 'an embedded time adverbial may have any tense that occurs in the main sentence.' (Here, 'tense' refers to superficial tense-marking.) This principle does rule out offensive cases like (123)-(126); unfortunately, it would also rule out perfectly acceptable cases like (131) and (133), and possibly also (132) and (134).

(133) John leaves when Mary said he would.

(134) John left when Jane says that Mary arrived.

I therefore doubt that the anomaly of (125) and (126) is purely a superficial one.

My belief is that the unacceptability of (125) and (126) is pragmatic in nature. When a speaker uses a sentence of the form $\phi$ after $\psi$, $\phi$ before $\psi$, and so on, s/he normally pragmatically presupposes the truth of $\psi$, as Heinämäki (1974:99ff) has observed;
for example, when uttering (135), a speaker presupposes the truth of (136).

(135) John will leave when Mary arrives.

(136) Vt[NONPAST(t) & AT(t, Mary-arrives')] 

This means that the use of (118) would indicate the presupposition of (137).

(137) Vt[past(t) & AT(t, Mary-arrives')] 

In the presence of this presupposition, the assertion of John will leave would suffice to establish the succession of John's departure and Mary's arrival. Thus, the information conveyed by an assertion of (125) could always be conveyed by a much simpler assertion; for this reason, (125) may be anomalous because it inherently violates a principle of conversational economy (cf. Grice (1975:67), Stalnaker (1978:325)). Analogous remarks are possible for example (126) and other, similar sentences (cf. Heinämäki 1974:50f).

Sentences like (127), whose adverbial clause has future tense-marking, are especially problematic:¹⁵ they aren't assigned contradictory interpretations, as the translation (138) of (127) shows;

(138) Vt[Vt₁[t = t₁ & Vt₂[t₂ = t₁ & [FUT(t₂) & 
AT(t₂, Mary-arrives')]][ & [FUT(t) & 
AT(t, John-leaves')]]

and they aren't pragmatically anomalous in the way (125) and (126) were shown to be. Furthermore, as Smith (1975:73) points out, sentences like (127) are considerably better when the adverbial shows verb phrase ellipsis:

(139) John will leave when Mary will.
And **before**-adverbials with future tense-marking are in general quite acceptable:

(140) *John will leave before Mary will arrive.*

(141) John will leave before Mary will.

I find these facts quite puzzling, and have no fully adequate explanation at present. Nevertheless, sentence (127) may well be unacceptable for pragmatic reasons: because of the meaning of **when**, sentence (127) is true iff (142) is true, where (142) translates as (143).

(142) John will leave when Mary arrives.

(143) \[Vt[Vt_1[t = t_1 \& [\text{NONPAST}(t_1) \& \text{AT}(t_1, \text{Mary-arrives})] \\& [\text{FUT}(t) \& \text{AT}(t, \text{John-leaves})]]]\]

Because (142) is structurally simpler than (127), perhaps it is systematically preferred.\(^{16}\) This seems like a reasonable approach to (127). Unfortunately, it can't easily be generalized to cover the anomaly of (144);

(144) *John will leave after Mary will arrive.*

the meaning of **after** makes (144) nonequivalent to (145) in the present system. I leave the problem open for the moment.

(145) John will leave after Mary leaves.

1.4.5 **Remarks on the assumed truth conditions for temporal adverbial clauses.** In this subsection, I shall briefly discuss the truthconditions which the above system assigns to sentences with temporal adverbial clauses by virtue of the translations (82a-d) of the temporal subordinators **when**, **while**, **before**, and **after**. In particular, I shall contrast these truthconditions with those proposed by Heinämäki (1974).
(82) a. before translates as \( \lambda p^t \lambda t v t_1[[t < t_1 \land m(t,t_1)] \land p^t(t_1)] \)

b. after translates as \( \lambda p^t \lambda t v t_1[[t_1 < t \land m(t,t_1)] \land p^t(t_1)] \)

c. when translates as \( \lambda p^t \lambda t v t_1[t = t_1 \land p^t(t_1)] \)

d. while translates as \( \lambda p^t \lambda t v t_1[[t \leq t_1 \land \neg \text{moment}(t_1)] \land p^t(t_1)] \)

Before I begin, let me point out two peculiarities of Heinämäki's system. First, her truth conditions don't account for the interpretations of when-, before-, and after-adverbials in which the 'extraction site' is in an embedded clause (see section 1.4.1), as Mike Geis has pointed out to me; I shall ignore this rather severe shortcoming in the ensuing discussion. Second, for reasons which are not made clear, she regards (p. 17) a sentence \( \phi \) as true at a nonminimal interval if only if \( i \) is a maximal interval of \( \phi \)'s truth—one having no proper superintervals at which \( \phi \) is true. This assumption is contrary to usual conceptions of the entailments of sentences with stative and activity predicates; furthermore, it complicates her truth conditions, and in fact makes them incorrect in certain circumstances. This will be brought out in the discussion of the different kinds of temporal adverbials.

1.4.5.1 when. According to the fragment developed here, a sentence of the form \( \phi \) when \( \psi \) is true only if there is some interval at which the tenseless forms of \( \phi \) and \( \psi \) are both true.\(^{17}\) This is intuitively correct. Heinämäki, however, has argued for somewhat more complicated truth conditions for when:

\( \lambda p^t \lambda t v t_1[[t \leq t_1 \land \neg \text{moment}(t_1)] \land p^t(t_1)] \)
(146) \( \phi \text{ when } \psi \) is true if and only if

(i) \( \phi \) is true at an interval \( i \),

(ii) \( \psi \) is true at an interval \( i' \), and

(iii) a. if \( \phi \) or \( \psi \) (or both) is durative [i.e. has a stative or activity predicate--GTS], then there is an interval \( i'' \) such that \( i'' \subseteq i \) and \( i'' \subseteq i' \). (if \( \phi \) is an accomplishment, then \( i = i'' \); if \( \psi \) is an accomplishment, then \( i' = i'' \).)

b. if neither \( \phi \) nor \( \psi \) is durative, then \( i' < i \).

(Cf. p. 27)

(iiiia) is the set of truthconditions for \( \phi \text{ when } \psi \) in those cases in which one (or both) of \( \phi \) and \( \psi \) has a stative or activity predicate. In (iiiia), the truth of \( \phi \text{ when } \psi \) is equated with the intersection (rather than the identity) of the intervals at which \( \phi \) and \( \psi \) are true. This is to account for several kinds of facts:

(a) that \( \phi \text{ when } \psi \) can be true if the intervals at which \( \phi \) and \( \psi \) are true partially overlap. This situation can arise when both \( \phi \) and \( \psi \) are 'durative', i.e. have stative or activity predicates. Thus, (147) is true if the interval at which it was raining only partially overlaps with the interval at which we were in New Orleans, as in (148).

(147) It was raining in New Orleans when we were there.
(148)

It was raining in New Orleans at $i_1$.

We were in New Orleans at $i_2$.

(Heinämäki assumes (p.17) that sentences with achievement and 'fast accomplishment' predicates can only be true at moments;¹⁸ this, plus the parenthesized restriction on accomplishments in (iiiia), guarantees that $\phi$ when $\psi$ can't be true if the intervals at which $\phi$ and $\psi$ are true only partially overlap and $\phi$ or $\psi$ has an accomplishment or achievement predicate.)

(b) that $\phi$ when $\psi$ can be true if the interval at which $\phi$ is true properly contains that at which $\psi$ is true. This situation can arise whenever $\phi$ is durative. Thus, (149) is true if the interval at which we were crossing the street properly contains that at which John noticed us, as in (150).

(149) We were crossing the street when John noticed us.

(150)

We were crossing the street at $i_1$.

John noticed us at $i_2$.

(c) that $\phi$ when $\psi$ can be true if the interval at which $\phi$ is true is properly contained by that at which $\psi$ is true. This situation can arise whenever $\psi$ is durative. Thus, (151) is true if the interval at which the balloon broke is properly contained in the interval at
which Lydia was playing with it, as in (152).

(151) The balloon broke when Lydia was playing with it.

(152)

\[ i_1 \quad i_2 \]

The balloon broke at \( i_1 \).

Lydia was playing with it at \( i_2 \).

(d) that \( \phi \) when \( \psi \) can be true if the intervals at which \( \phi \) and \( \psi \) are true are identical. This situation can arise when either \( \phi \) or \( \psi \) is durative. Thus, sentence (147) is true if the interval at which it was raining in New Orleans is identical to the interval at which we were there, as in (153).

(153)

\[ i_1 \quad i_2 \]

It was raining in New Orleans at \( i_1 \).

We were in New Orleans at \( i_2 \).

Thus, according to Heinämäki, \( \phi \) when \( \psi \) can be true no matter how the intervals at which \( \phi \) and \( \psi \) are true intersect (provided that \( \phi \) or \( \psi \) is durative).

There is, however, an important assumption behind Heinämäki's claim that when \( \phi \) or \( \psi \) is durative, \( \phi \) when \( \psi \) is true iff the intervals \( i, i' \) at which \( \phi \) and \( \psi \) are true intersect: this is the assumption (pointed out above) that \( i \) and \( i' \) must be maximal intervals of the truth of \( \phi \) and \( \psi \). This isn't a necessary assumption, however; in fact, if it is set aside, the truth conditions for \( \phi \) when \( \psi \) can be greatly simplified. Let me explain why this is so.
Recent work on the aspectual categories of English predicates (e.g. those of Taylor (1977) and Dowty (1979:163ff)) have shed much light on the entailments of sentences with stative or activity predicates. Generally, if a sentence has a stative predicate and is true at interval \( i \), then it is true at all subintervals of \( i \), including the minimal subintervals consisting of a single moment. As Dowty (1979:173ff) shows, 'interval statives' such as \( \text{stand in the corner.} \), \( \text{lie under the bed} \) probably don't give rise to an entailment quite this strong; nevertheless, if a sentence with an interval stative predicate is true at \( i \), then it is true at all nonminimal subintervals of \( i \).

The entailments to which activity predicates give rise are somewhat more complicated, because there are at least two kinds of activity predicates (cf. Taylor (1977), Dowty (1979:170ff)): homogeneous activities such as \( \text{sleep and float} \), and heterogeneous activities, like \( \text{chuckle and walk with a limp} \). If a sentence with a homogeneous activity predicate is true at interval \( i \), then it is true at all nonminimal subintervals of \( i \); but if a sentence with a heterogeneous activity predicate is true at \( i \), then the most that can be said is that it may be true at some nonminimal subintervals of \( i \)--in some cases, it won't be true at any proper subinterval of \( i \).

These entailments of stative and activity predicates have rather profound consequences regarding Heinämäki's truthconditions. For example, if \( \phi \) and \( \psi \) both have momentary stative predicates and the intervals at which they are true overlap in any way, then there will automatically be some interval at which both \( \phi \) and \( \psi \) are true. For instance, if (154) is true at \( i_1 \) in (148) and (155) is true at \( i_2 \),
then both (154) and (155) are true at \(i_3\).

(154) It is raining in New Orleans.

(155) We are in New Orleans.

Similarly, if one of the two sentences \(\phi\) and \(\psi\) has a momentary stative predicate and the interval at which it is true properly contains the interval at which the other sentence is true (no matter what sort of predicate the latter has), then, again, there will necessarily be an interval at which \(\phi\) and \(\psi\) are both true. Thus, if (156) is true at \(i_1\) in (150) and (157) is true at \(i_2\), then both (156) and (157) are true at \(i_2\):

(156) We are crossing the street.

(157) John notices us.

and if (158) and (159) are respectively true at \(i_1\) and \(i_2\) in (152), then both (158) and (159) are true at \(i_1\).

(158) The balloon breaks.

(159) Lydia is playing with it.

The implication of these facts is clear: in cases in which \(\phi\) or \(\psi\) has a momentary stative predicate but neither \(\phi\) nor \(\psi\) has an interval stative or activity predicate, my truthconditions for \(\phi\) when \(\psi\) give exactly the same results as Heinämäki's.

In cases in which \(\phi\) or \(\psi\) has an interval stative or activity predicate, my truthconditions actually yield superior results. Recall that the truth at \(i\) of a sentence \(S\) with an interval stative or activity predicate does not entail the truth of \(S\) at every moment throughout \(i\), and in fact may not entail the truth of \(S\) at any proper subinterval of \(i\) if \(S\) happens to have a heterogeneous activity
predicate. In the light of this fact, consider the following situation: John has been walking normally all evening. He is about to leave the kitchen, and is in fact standing at its threshold. He steps over the threshold into the hall with his left foot and continues walking, limping on his right foot. This situation may be represented as in (160).

(160) ![Diagram](first limp)

John was in the kitchen at $i_1$.

John walked with a limp at $i_2$.

Heinämäki's truthconditions predict that (161) should be true of this situation, because the interval at which John was in the kitchen intersects the interval at which John walked with a limp, even though John walks with a limp isn't itself true at the interval of intersection (i.e. $i_3$ in (160)). Intuitively, this is wrong.

(161) When he was in the kitchen, John walked with a limp.

(161) requires that some interval at which John walked with a limp coincide with an interval at which he was in the kitchen; this is exactly what my truthconditions predict.

Further examples could be adduced to confirm the point: in cases in which $\phi$ or $\psi$ has an interval stative or activity predicate, Heinämäki's truthconditions allow $\phi$ when $\psi$ to be true even if there is no interval at which $\phi$ and $\psi$ are both true; my truthconditions, on the other hand, do require that $\phi$ and $\psi$ be simultaneously true. In every case, the latter truthconditions make the right prediction.
Thus, when \( \phi \) or \( \psi \) has a stative or activity predicate, Heinämäki's truth conditions for \( \phi \) when \( \psi \) are either equivalent to mine or are demonstrably inferior.

Part (iii b) of the truth conditions in (146) is somewhat problematic. Heinämäki observes that when \( \phi \) and \( \psi \) both have accomplishment or achievement predicates, \( \phi \) when \( \psi \) seems to have truth conditions very different from those in (iii a). Consider sentences (162) and (163).

(162) When John wrecked the car, Bill fixed it.

(163) When John broke his leg, he made a pair of crutches.

It's clear that (162) is understood to mean that John wrecked the car before Bill fixed it, and that (163) is understood to mean that John broke his leg before he made a pair of crutches. For this reason, Heinämäki suggests that when both \( \phi \) and \( \psi \) have accomplishment or achievement predicates, \( \phi \) when \( \psi \) is true iff \( \psi \) is true at an interval which precedes the interval at which \( \phi \) is true.

There is one important problem with (iii b), namely that when \( \phi \) and \( \psi \) both have accomplishment/achievement predicates, \( \phi \) when \( \psi \) can sometimes entail the simultaneous truth of \( \phi \) and \( \psi \). Consider, for example, sentences (164) and (165).

(164) When John wrecked the car, he somehow managed to jump to safety.

(165) When John broke his leg, he also hurt his elbow.

(164) can easily be understood to mean that John jumped to safety as he wrecked the car, and (165), to mean that John hurt his elbow just as he broke his leg. My truth conditions predict this; Heinämäki's do
not. Note also that when-adverbials can be explicitly contrasted with after-adverbials, even when the subordinate and superordinate clauses both have accomplishment/achievement predicates:

(166) a. Q: Did Mary arrive when John did?  
   A: No, she arrived (just) after he did.  

b. Q: Did Mary arrive after John did?  
   A: No, she arrived (right) when he did.

This shouldn't be possible with Heinämäki's truthconditions, but it's predicted by mine.

Still, something must be said about sentences like (162) and (163). On the one hand, we might postulate a second when, with different truthconditions from the when of simultaneity; this solution would, however, be extremely ad hoc, and would have no way of accounting for why \( \psi \) and \( \psi \) must both have accomplishment/achievement predicates in a sentence of the form \( \phi \text{ when} \psi \). On the other hand, we could assume that when always entails simultaneity; under this assumption, a pragmatic account of sentences like (162) and (163) may be possible.

When stands out among the temporal subordinating conjunctions because it allows language users to pick out precisely the interval at which some event occurs. We might therefore suppose that a speaker may use a when-adverbial to pick out some interval, and rely on his/her audience to infer the connection between this interval and the interval at which the main clause is true. For example, a speaker might use the adverbial when John wrecked the car to pick out the interval \( i \) at which John wrecked the car--i.e. the (most salient) interval \( i \) satisfying (167)--and, on uttering Bill fixed it, expect his/her audience to infer
the temporal connection between \( i \) and the interval at which **Bill** fixes

\[ \text{it is true.} \]

\[(167) \lambda t V t \left[ t = t_1 \land [\text{past}(t_1) \land \text{AT}(t_1, \text{John-wrecks-the-car'})] \right] \]

This isn't a hard inference to draw, because of the way in which car repairs normally succeed car accidents. In this way, the nonsimultaneous interpretation of **when** can be regarded as parasitic on the simultaneous interpretation. (An analogous situation is found with spatial reference: **Mary sat where Bill was sitting.**) This is what I shall assume.\(^19\)

1.4.5.2 **While.** According to the system developed here, a sentence of the form \( \phi \text{ while } \psi \) is true only if there is an interval \( i \) and a nonminimal interval \( i' \) such that the tenseless form of \( \phi \) is true at \( i \), the tenseless form of \( \psi \) is true at \( i' \), and \( i \) is a subinterval of \( i' \).\(^20\)

This is intuitively accurate. The requirement that \( i' \) be nonminimal is meant to capture the fact that **while**-clauses don't have instantaneous achievement predicates:

\[(168) \star \text{Phil had an idea while he spotted the elephant (through his binoculars).} \]

Heinämäki's truth conditions are only slightly more complicated:

\[(169) \phi \text{ while } \psi \text{ is true if and only if} \]

\[(\text{i}) \phi \text{ is true at an interval } i, \]

\[(\text{ii}) \psi \text{ is true at an interval } i' \text{ which is not a moment, and} \]

\[(\text{iii}) \text{there is an interval } i'' \text{ such that } i'' \subseteq i \text{ and } i'' \subseteq i'. \text{ If } \phi \text{ is an accomplishment, } i = i''; \]
if $\phi$ is an accomplishment, $i' = i''$. (Cf. p. 35)

Here, the truth of $\phi$ while $\psi$ is equated with the intersection of the interval of $\phi$'s truth with the (non-minimal) interval of $\psi$'s truth. If $\phi$ has an accomplishment predicate, then the interval of intersection must be $i'$; so also if $\phi$ has an achievement predicate, given Heinämaa's assumption that sentences with achievement predicates are true only at moments; likewise, if $\psi$ has an accomplishment or achievement predicate, the interval of intersection must be $i'$. Thus, Heinämaa's truth conditions differ from mine only in that they don't require $i$ to be a subinterval of $i'$ in cases in which $\phi$ has a stative or activity predicate.

Recall that if a sentence with a momentary stative is true at an interval $i$, then it is true at every subinterval of $i$; this means that if $\phi$ has a momentary stative predicate and the interval $i$ at which $\phi$ is true intersects the interval $i'$ at which $\psi$ is true, then there is necessarily a subinterval $i''$ of $i$ at which $\phi$ is true and which is a subinterval of $i'$. Thus, her truth conditions are equivalent to mine as regards cases in which $\phi$ has a momentary stative.

On the other hand, her truth conditions make distinct predictions in cases in which $\phi$ has an interval stative or activity predicate. These distinct predictions are easily shown to be wrong, however. For example, according to the truth conditions in (169), (170) should be true of the situation represented by (160) in 1.4.5.1;

(170) John walked with a limp while he was in the kitchen, this is surely wrong. For (170) to be true, John must have walked
with a limp at some subinterval of an interval at which he was in the kitchen; this is just what my truthconditions predict. Thus, here too, Heinämäki's truthconditions are at best equivalent to mine, and in some instances give incorrect results.

1.4.5.3 *Before*. According to the present analysis, a sentence of the form $\phi$ *before* $\psi$ is true only if an interval at which the tenseless form of $\phi$ is true precedes an interval at which the tenseless form of $\psi$ is true.\(^{21}\) Heinämäki's truthconditions are the following:\(^{22}\)

\[(171) \quad \phi \text{ before } \psi \text{ is true if and only if}
\]

\[(i) \quad \phi \text{ is true at some interval},
\]

\[(ii) \quad \psi \text{ is true at some interval}, \text{ and}
\]

\[(iii) \quad \text{the reference point of the interval at which } \phi \text{ is true precedes the initial point of the interval at which } \psi \text{ is true.} \quad (Cf. \ p. 49)
\]

Here, Heinämäki introduces the notion of a reference point: if a sentence $S$ has an accomplishment predicate, then the reference point of the interval at which $S$ is true is its final point; if $S$ has some other sort of predicate, then the reference point of the interval at which $S$ is true is its initial point. Clearly, the truthconditions in (171) yield the same results as mine in those cases in which has an accomplishment predicate—or an achievement predicate, given Heinämäki's assumption that sentences with achievement predicates are true only at moments; furthermore, because the truth at $i$ of a sentence $S$ with a momentary stative predicate entails the truth of $S$ at all moments in $i$, the truthconditions in (171) are equivalent to mine whenever $\phi$ has a momentary stative predicate. Thus, the
truthconditions in (171) give different results from mine only when
\( \phi \) has an interval stative or activity predicate. (171) can easily
be shown to produce incorrect results in some such cases; for example,
unlike the truthconditions which I assume, those in (171) predict that
sentence (172) should be true of the situation represented in (160)
in 1.4.5.1.

(172) John walked with a limp before he left the kitchen.
This is again incorrect. (172) clearly requires that there be some
interval at which John walked with a limp and which preceded his
departure from the kitchen; this is just what my truthconditions for
\( \phi \) before \( \psi \) predict.

1.4.5.4 After. In the fragment developed here, a sentence of the
form \( \phi \) after \( \psi \) is true only if an interval at which the tenseless form
of \( \phi \) is true follows an interval at which the tenseless form of \( \psi \) is
ture.\(^{23}\) Heinämäki's truthconditions for \( \phi \) after \( \psi \) are those in (173).

(173) \( \phi \) after \( \psi \) is true if and only if
\[\begin{align*}
(i) & \quad \phi \text{ is true at some interval } i, \\
(ii) & \quad \psi \text{ is true at some interval, and} \\
(iii) & \quad \text{there is some } i' \text{ such that } i' \subseteq i \text{ and the} \\
& \quad \text{reference point of the interval at which } \psi \text{ is} \\
& \quad \text{true precedes } i'. \text{ (For some speakers, if } \phi \\
& \quad \text{has an accomplishment predicate, then } i' = i.\) \\
\end{align*}\]
(Cf. p.72)

In the parenthesized remark in (iii), Heinämäki implies that
speakers differ in their understanding of sentences like (174), in
which the main clause has an accomplishment predicate:
(174) John built the house after he got more money.

the suggestion is that for some speakers, (174) can be true in a situation in which John got more money after he had already begun to build the house, while for other speakers it cannot. My judgment follows those of the intolerant speakers. Furthermore, I suspect that the tolerant speakers can regard (174) as true in such a situation because of a certain vagueness in what it means to build a house. For example, it seems to me that erecting a structure on a foundation that has already been laid might sometimes count as 'building a house'; thus, tolerant speakers might regard (174) as true in a situation in which John had poured the foundation of the house before he got more money. On the other hand, adding walls, doors, windows, and siding to a previously built frame seems less like 'building a house'; I would accordingly expect many fewer of the tolerant speakers to regard (174) as true in a situation in which John had built the frame of the house before he got more money. My guess is that nobody would think of (174) as true in a situation in which John had done everything but shingle the roof before he got more money. Notice, too, that when the main clause of a sentence like (174) has an accomplishment predicate that isn't especially vague, the sentence probably can't have an interpretation analogous to the tolerant interpretation of (174); (175), for instance, would not be true in a situation in which Bill had already drawn part of the circle with a crayon before he found his pen.

(175) Bill drew a circle after he found his pen.

I therefore conclude that the parenthesized portion of (iii) in (173)
represents an inessential component of the truthconditions for \( \phi \ after \ \psi \).

If this is conceded, then Heinämäki's truthconditions are in many cases equivalent to mine—specifically, when neither \( \phi \) nor \( \psi \) has an interval stative or activity predicate. When \( \phi \) or \( \psi \) does have such a predicate, however, the truthconditions in (173) make distinct predictions from mine. In particular, they predict that \( \phi \ after \ \psi \) can be true even if there is no interval at which \( \psi \) is true which precedes an interval at which \( \phi \) is true. For example, they predict that (176) is true of the situation represented in (160).

(176) John was in the kitchen after he walked with a limp.

This is plainly wrong. (176) requires that an interval at which John walked with a limp precede an interval at which he was in the kitchen; this requirement is embodied in the truthconditions which I have assumed. Thus, here, as in the preceding cases, Heinämäki's truthconditions are in some cases equivalent to mine, but give incorrect results in other cases.

1.5 Sequence of tense. The rules presented in 1.3,4 account for the interpretation of a wide variety of tensed sentences. There are, however, certain interpretations which they cannot account for.

Consider the following sentences:

(52) John claimed that Mary was hitting Bill.
(34) John will claim that Mary is hitting Bill.
(44) John claimed that Mary would hit Bill.
(45) John will claim that Mary will hit Bill.

Sentence (52) is ambiguous: it can mean either (a) that John claimed
that Mary was hitting Bill sometime before his claim, or (b) that John claimed that Mary was hitting Bill at the time of his claim.

The tense rules proposed in 1.3.1 suffice to induce interpretation (a) for sentence (52), but not to induce interpretation (b). Sentence (34) is similarly ambiguous: it can mean either (a) that John will claim that Mary is hitting Bill right now, or (b) that John will claim that Mary is hitting Bill at the time of his claim. As we have already seen, the rules proposed above can induce interpretation (a); they are, however, unable to induce interpretation (b). The rules are also incapable of assigning (44) the nonmodal interpretation that John claimed that Mary would hit Bill at some time after his claim. Finally, the rules cannot assign (45) the interpretation that John will claim that Mary will hit Bill at some time after his claim. I analyze these unassigned interpretations for sentences (52), (34), (44), and (45) in the traditional fashion: the embedded clause in (52) and (34) is, on the (b) interpretation, taken to be a present tense sentence whose denotation shifts relative to the tense in whose scope it appears; and the embedded clause in (44) and (45) is, on the nonmodal interpretation, assumed to be a shifting future tense sentence.

Sentences like (52), (34), (44), and (45) are syntactically interesting, for they show a formal dependency between the tense of the higher clause and the tense-marking of the lower clause. Such a dependency would appear to call into question the cotenability of two assumptions—(i) that tense-marking applies only to bracketed main verbs, and (ii) that main verbs of subordinate clauses are
debracketed (see Chapter I, section 5); however, as I shall now show, it is possible to maintain both assumptions and yet provide an adequate account of the sequence of tense phenomenon.

Rule (177) forms the basis for this account:

\[(177) \text{S26. If } \alpha \in P_{IVS/t}, \text{ then } F_{26,n}(\alpha) \in P_{IVS}, \text{ where} \]
\[F_{26,n}(\alpha) = \text{ that}^n. \]

Example: \(F_{26,4}([\text{think}]) = [\text{think that}^4 \text{think}] \)

\[\text{T26. If } \alpha \in P_{IVS/t} \text{ and } \alpha \text{ translates as } \alpha', \text{ then} \]
\[F_{26,n}(\alpha) \text{ translates as } \alpha'(_p^n). \]

Example: \([\text{think that}^4 \text{think}] \text{ translates as } \text{think'(_p^n)} \)

S26 converts stage-level verbs taking sentential complements into stage-level intransitive verb phrases by adding the subscripted element \text{that}^n; T26 concomitantly applies the translation of the verb to a free variable \(p^n\) over propositions. By virtue of (177), tenseless sentences like (178) are derived:

\[(178) \text{(John) } [\text{claims that}^4 \text{claims}]\]

(178) is assigned the translation (179).

\[(179) Vx^S[R(x^S, \text{John}') \& \text{claim'(_p^n, p^4)}] \]

When an expression containing an instance of \text{that}^n undergoes a rule of tense, \text{that}^n will be marked with a superscript indicating whether the tense is past ('pa') or nonpast ('np'). Thus, rules S55-S57 in section 1.3.1 are to be revised as follows:

S55. [see (13)]

... where \(F_{55}(\phi)\) is \(\text{ALLSUB(that}_{pa}^n, \text{that}^n, \text{PRET}(\phi)).\)

S56. [see (14)]

... where \(F_{56}(\phi)\) is \(\text{ALLSUB(that}_{np}^n, \text{that}^n, \phi)).\)
S57. [see (15)]

... where $F_{57}(\phi)$ is $\text{ALLSUB}(\text{that}^\text{np}, \text{that}^\text{np}, \text{RB}([\text{will}], \phi))$.

As a consequence of these changes, temporal abstractions like (180)-(182) are derived:

(180) (John) [will] claim that
(181) (John) [claimed] that
(182) (John) [says] that

(180)-(182) are assigned the translations (183)-(185).

(183) $\lambda t[F\text{UT}(t) \& AT(t, Vx^S[R(x^S, \text{John}^\prime) \& \text{claim}^\prime(x^S, p_4)])]$
(184) $\lambda t[p\text{ast}(t) \& AT(t, Vx^S[R(x^S, \text{John}^\prime) \& \text{claim}^\prime(x^S, p_4)])]$
(185) $\lambda t[P\text{RES}(t) \& AT(t, Vx^S[R(x^S, \text{John}^\prime) \& \text{say}^\prime(x^S, p_4)])]$

Four rules are employed to bind superscripted instances of $\text{that}^\text{np}$ in tensed sentences; these have the character of 'embedding transformations'.

(186) S60. If $\phi \in P_t$, [-Tense] and $\psi \in P_t$, [+Tense, &Past, $\gamma$Perfect], then $F_{60,n}(\phi, \psi) \in P_t$, [+Tense, &Past, $\gamma$Perfect], where $F_{60,n}(\phi, \psi)$ is $\text{ALLSUB}(\text{that}^\text{np}, \text{that}^\text{np}, \psi)$ and $\phi^\prime$ is $\text{ALLSUB}(\text{that}^\text{np}, \text{that}^\text{np}, \text{DP}(\text{PRET}(\psi)))$.

T60. If $\phi, \psi \in P_t$ and $\phi, \psi$ translate as $\phi^\prime, \psi^\prime$, then $F_{60,n}(\phi, \psi)$ translates as $\lambda p_n[\psi^\prime]\langle \text{Vt}[\text{pres}(t) \& AT(t, \phi^\prime)] \rangle$.

(187) S61. If $\phi \in P_t$, [-Tense] and $\psi \in P_t$, [+Tense, &Past, $\gamma$Perfect], then $F_{61,n}(\phi, \psi) \in P_t$, [+Tense, &Past, $\gamma$Perfect], where $F_{61,n}(\phi, \psi)$ is
ALLSUB(\textit{that} \phi \textit{, that} \textit{NP}, \psi) and \phi' is
ALLSUB(\textit{that} \textit{NP}, \textit{that}, \textit{DP}(\phi)).

T61. If \phi, \psi \in P_t and \phi, \psi translate as \phi', \psi', then
\( F_{61,n}(\phi, \psi) \) translates as \( \lambda \textit{p}_n[\psi'](\neg \textit{vt}[\textit{pres}(t) \& \textit{AT}(t, \phi'])). \)

(188) S62. If \phi \in P_t, [-Tense] and \psi \in P_t, [+Tense, \beta \textit{Past}, \gamma \textit{Perfect}], then \( F_{62,n}(\phi, \psi) \in P_t, [+Tense, \beta \textit{Past}, \gamma \textit{Perfect}] \), where \( F_{62,n}(\phi, \psi) \) is
ALLSUB(\textit{that} \phi \textit{, that} \textit{NP}, \psi) and \phi' is
ALLSUB(\textit{that} \textit{NP}, \textit{that}, \textit{DP}(\textit{will}, \phi)).

T62. If \phi, \psi \in P_t and \phi, \psi translate as \phi', \psi', then
\( F_{62,n}(\phi, \psi) \) translates as \( \lambda \textit{p}_n[\psi'](\neg \textit{vt}[\textit{fut}(t) \& \textit{AT}(t, \phi'])). \)

(189) S63. If \phi \in P_t, [-Tense] and \psi \in P_t, [+Tense, \beta \textit{Past}, \gamma \textit{Perfect}], then \( F_{63,n}(\phi, \psi) \in P_t, [+Tense, \beta \textit{Past}, \gamma \textit{Perfect}] \), where \( F_{63,n}(\phi, \psi) \) is
ALLSUB(\textit{that} \phi \textit{, that} \textit{NP}, \psi) and \phi' is
ALLSUB(\textit{that} \textit{NP}, \textit{that}, \textit{DP}(\textit{will}, \phi)).

T63. If \phi, \psi \in P_t and \phi, \psi translate as \phi', \psi', then
\( F_{63,n}(\phi, \psi) \) translates as \( \lambda \textit{p}_n[\psi'](\neg \textit{vt}[\textit{fut}(t) \& \textit{AT}(t, \phi'])). \)

Rule (186) embeds a sentence within the scope of past tense and
converts its main verb to preterit form. Thus, sentence (52) is
assigned the analysis (190). Analyzed in this way, (52) is assigned
translation (191) by rule (186).
Because \( \text{pres}(z) \) shifts in denotation when within the scope of some other tense, (191) represents the desired interpretation for (52).

To avoid confusion, readers who are familiar with Ladusaw (1977) should note carefully that in my analysis, the 'embedding' of that-clauses after the main clause is built up produces the 'sequence of tense' reading, while the derivation in which the that-clause is directly combined with the matrix verb--before the main clause is built up--is used to produce the other reading, that in which the subordinate tense is 'semantically independent' of the main clause tense. In Ladusaw's treatment, on the other hand, this correlation between the kind of analysis and the reading produced was, in effect, reversed.

Rule (187) embeds a sentence within the scope of present or future tense and leaves its main verb in present tense form. Thus, sentence (34) receives the analysis (192) and the translation (193). Again, because the denotation of \( \text{pres}(z) \) is shifting, (193)
Rule (188) embeds a sentence within the scope of past tense and marks it with would. Sentence (44) may thus be derived as in (194) and translated as (195).

Because 'FUT(t)', unlike 'FUT(\tau)', shifts in denotation when it appears within the scope of some other tense, (195) induces the elusive
interpretation for (44).

Finally, rule (189) embeds a sentence within the scope of present or future tense and marks it with will. (189) thus allows (45) to be analyzed and translated as in (196) and (197).

(196) (John) [will] claim that Mary will hit Bill, t, 63,5
     (Mary) [hits] Bill, t, 19 (John) [will] claim that$^{np}$, t, 58
     (John) [will] claim that$^{np}$, TAB, 57
     (John) [claims] that$^{5}$, t, 19
     John, T [claim] that$^{5}$, IV$^{i}$, 20
     [claim] that$^{5}$, IV$^{s}$, 26,5
     [claim], IV$^{s}$/t

(197) Vt[FUT(t) & AT(t, Vx$^{s}$[R(x$^{s}$, John')] &
       claim'(x$^{s}$, "Vt$_{1}$[fut(t$_{1}$) & AT(t$_{1}$, Mary-hits-Bill')]])]

(197) correctly represents the interpretation of (45), in which John's claim is understood to be about an event which is in the future from his point of view as well as the speaker's.

Rules (186)-(189) are generally applicable to sentences showing sequence of tense, including more complicated examples such as (198).

(198) Jane said that John would claim that Mary was hitting Bill.

(198) has the interpretation that Jane said that John would claim that Mary was hitting Bill at the time of his claim. This interpretation is induced by the translation (200) assigned to (198) on the analysis (199).
(199)  (Jane) [said] that John would claim that Mary was hitting Bill, t, 60,2

(Mary) [is] hitting Bill, t, 19  (Jane) [said] that John would claim that, t, 62,3

(John) [claims] that, t, 19  (Jane) [said] that, t, 58

John, T [claim] that, IV, 20  (Jane) [said] that, TAB, 55

[claim] that, IV, 26,2  (Jane) [says] that, t, 19

[claim], IV, 26,3  (Jane, T [say] that, IV, 20

[say], IV, 26,3

(200) Vt[past(t) & AT(t, Vx[R(x, Jane') &

say'(x, ^Vt[fut(t) & AT(t, Vy[R(y, John') &

claim'(y, ^Vt[pres(t) & AT(t, Mary-is-hitting-

Bill'))]])]]])]

Because while-adverbials may show the sequence of tense phenomenon, as in (201), the rules joining while with a sentence (with concomitant tensing) must be restated as follows.

(201) While Jane announced that Mary would arrive, John left.

S69. [see (95)]

... where F_{69}(\alpha, \phi) is \Gamma_\alpha \phi and \phi' is

\text{ALLSUB}(\text{that}_{\phi' n}, \text{that}_{n}, \text{DP}(\text{PRET}(\phi))).

S70. [see (94)]

... where F_{70}(\alpha, \phi) is \Gamma_\alpha \phi and \phi' is

\text{ALLSUB}(\text{that}_{\phi' n}, \text{that}_{n}, \text{DP}(\phi)).

S71. [see (119)]

... where F_{71}(\alpha, \beta, \phi) is \Gamma_\alpha \phi \beta and \phi' is
175

ALLSUB(\text{that}_n^{pa}, \text{that}_n, \text{DP(PRET(\phi)))}.

S72. [see (120)]

... where \( F_{72}(a, \beta, \phi) \) is \( [\alpha \phi \beta] \) and \( \phi' \) is

\[ \text{ALLSUB}(\text{that}_{n}^{np}, \text{that}_n, \text{DP(\phi))}. \]

As a result of these changes in S69-S72, while-adverbials like (202) and (203) are generated;

(202) while Jane announced that\(^{pa}_{a} \) yesterday
(203) while Mary says that\(^{np}_{a} \)

these are assigned the translations (204) and (205).

(204) \( \lambda tVt_1 [[t \subseteq t_1 \& \text{moment}(t_1)] \& [\text{yesterday}'(t_1) \& \text{past}(t_1) \& \text{AT}(t_1, Vx^S[R(x^S, Jane') \& \text{announce'}(x^S, p_4)])]] \]

(205) \( \lambda tVt_1 [[t \subseteq t_1 \& \text{moment}(t_1)] \& [\text{NONPAST}(t_1) \& \text{AT}(t_1, Vx^S[R(x^S, Mary') \& \text{say'}(x^S, p_4)])]] \]

Rules (186)-(189) bind the superscripted elements in (202) and (203) in the manner seen above. Thus, sentence (201) may be derived as in (206), and is thereby assigned the translation (207). (207) represents the desired interpretation for (201).

As will be seen in section 4 of this chapter, the sequence of tense phenomenon has important implications for the analysis of the interaction of free adjuncts with tense.
1.6 Summary of tense and time adverb system. In this section, the syntax and semantics of five categories of expressions have been discussed. These categories are listed in Table 3 with the logical types to which they correspond.

<table>
<thead>
<tr>
<th>Category</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>t</td>
<td>t</td>
</tr>
<tr>
<td>TAB</td>
<td>&lt;i,t&gt;</td>
</tr>
<tr>
<td>TA</td>
<td>&lt;i,t&gt;</td>
</tr>
<tr>
<td>MTA</td>
<td>&lt;&lt;s,&lt;i,t&gt;&gt;,&lt;i,t&gt;&gt;</td>
</tr>
<tr>
<td>TSC</td>
<td>&lt;&lt;s,&lt;i,t&gt;&gt;,&lt;i,t&gt;&gt;</td>
</tr>
</tbody>
</table>
The syntactic composition of expressions of these categories is exemplified in the partial derivation (208); the homomorphic translation tree corresponding to (208) is (209).

(208) when John arrived, (Mary) [left], t, 58
when John arrived, (Mary) [left], TAB, 59a
when John arrived, MTA, 67 (Mary) [left], TAB, 55
when John arrived, TA, 68,4 (Mary) [leaves], t, 19
when, TSC (John) [arrived] at-that-time, t, 58

(209) \[\text{VT}[t = t_1, \text{VT}[t_2 = t_1, \text{[past}(t_2) \& \text{AT}(t_2, \text{John-arrives'})]]] \& [\text{past}(t) \& \text{AT}(t, \text{Mary-leaves'})]
\]

\[\text{vp}^t \lambda t[\text{VT}[t = t_1, \text{VT}[t_2 = t_1, \text{[past}(t_2) \& \text{AT}(t_2, \text{John-arrives'})]]] \& [\text{past}(t) \& \text{AT}(t, \text{Mary-leaves'})]
\]

With these preliminary assumptions about tense and time adverbs spelled out, we can now proceed to a consideration of the ways in which free adjuncts may interact with tense.

2. Frequency adverbs and the distinction between strong and weak adjuncts. In Chapter II, it was shown that two varieties of free adjuncts—strong and weak—can be distinguished on the basis of their entailment possibilities in modal contexts. As I shall show in this
section, strong and weak adjuncts have distinct interpretations in other sorts of contexts as well.

Consider sentences (210)-(213).

(210)  
   a. Being a sailor, John sometimes smokes a pipe.
   b. Lying on the beach, John sometimes smokes a pipe.

(211)  
   a. Weighing four tons, our truck often makes the bridge shake.
   b. Carrying a load of over 1500 lbs., our truck often makes the bridge shake.

(212)  
   a. Having only ten minutes between her morning and her afternoon classes, Anne never eats lunch.
   b. Studying for finals, Anne never eats lunch.

(213)  
   a. A major stockholder of Texas Instruments, Jane always uses a calculator.
   b. Figuring her taxes, Jane always uses a calculator.

The _b_ sentences, whose adjuncts are weak, have interpretations on which the frequency adverb in the main clause seems to quantify intervals at which the adjunct is true; the _a_ sentences, which have strong adjuncts, do not allow such an interpretation. This difference between strong and weak adjuncts is reminiscent of that observed in modal contexts in Chapter II. There, the distinct entailment possibilities of strong and weak adjuncts were shown to be the result of a difference in scope relative to an accompanying modal; weak adjuncts with narrow scope were shown to have precisely the function of _if_-clauses. Here, the observed difference between strong and weak adjuncts is evidently linked to the presence of a frequency adverb, as is the fact that in each of the _b_ sentences, the adjunct intuitively plays the role of a time adverbial. To appreciate the nature of this difference, we need
a better understanding of the interpretation of frequency adverbs; this will therefore be discussed in the following subsection.

2.1 The semantics of relative frequency adverbs. In English, there are two varieties of frequency adverbs. One variety, consisting of what I shall call fixed frequency adverbs, is exemplified in (214); the other, consisting of relative frequency adverbs, is exemplified in (215).

(214) Fixed frequency adverbs
yearly, every year, once a year, annually; monthly; weekly; daily; hourly

(215) Relative frequency adverbs
always; usually; often, frequently; sometimes, periodically; occasionally, sporadically, infrequently, every so often, now and then, now and again, once in a while, from time to time; rarely; never

When applied to a sentence S, both sorts of adverbs can be understood to specify the frequency with which S is true during a single, continuous time interval; thus, both (216) and (217) are understood to mean that John is sick was true with a certain frequency during 1980.

(216) John was sick every month in 1980.
(217) John was often sick in 1980.

Relative frequency adverbs, however, can also be understood to specify the frequency with which intervals at which S is true appear in a sequence of discontinuous intervals. For example, sentence (218) is not simply understood to mean that something which happens often is that Jane uses a calculator to figure her taxes;

(218) Jane often uses a calculator to figure her taxes.
(218) would in fact be consistent with Jane's using a calculator only very infrequently, if she happened to figure her taxes only infrequently (say, once a year). (218) is instead felt to mean that intervals at which Jane uses a calculator appear often in the sequence of intervals at which she figures her taxes.

This way of interpreting (218) brings out the essential difference between fixed and relative frequency adverbs. Fixed frequency adverbs specify frequencies whose periods are of a fixed length; for example, yearly specifies a frequency the length of whose periods is a year. Relative frequency adverbs, on the other hand, specify frequencies the average length of whose periods is proportional to the length of some other interval (e.g. the interval determined by 1980 in (217)) or to the 'length' (i.e. number of members) of some sequence of discontinuous intervals (e.g. the sequence of intervals at which Jane figures her taxes in (218)). Thus, the interpretation of a relative frequency adverb is always relative to some interval or sequence of intervals; or, since an interval can be regarded as a sequence of continuous smaller intervals, we can say that relative frequency adverbs are in fact always interpreted relative to some sequence of intervals. In sentences like (218), the relevant sequence is implicit. It can, however, be explicitly designated by a temporal adverbial; in (219), for example, the adverbial when she's figuring her taxes picks out the sequence of intervals relative to which often is interpreted.

(219) When she's figuring her taxes, Jane often uses a calculator.
It is most convenient simply to regard the temporal adverbial in a sentence like (219) as a set-level adverb (i.e., of category TA) rather than as a main tense adverb; such an adverbial will have an unordered set of intervals rather than a sequence of intervals as its denotation, but the inherent linear ordering of intervals can be used to impose the ordering necessary for the interpretation of the frequency adverb.

Adverbs like often are regarded as basic expressions of the category RFA of relative frequency adverbs:

<table>
<thead>
<tr>
<th>Category name</th>
<th>Description</th>
<th>Basic expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFA</td>
<td>the basic category of relative frequency adverbs</td>
<td>always, often, frequently, sometimes, occasionally, never</td>
</tr>
</tbody>
</table>

To formalize the relativity of these adverbs, we regard them as denoting two-place relations rather than functions; the extra argument position is to be filled by the (often contextually implicit) set of time intervals which determines the sequence of intervals relative to which they are interpreted.²⁶

On first consideration, we might suppose that a relative frequency adverb a should translate as an expression a' of type \(<i, t>, <s, t>, t>\). Then we could say that, where \(\beta'\) denotes a set of time intervals and \(\phi'\) denotes a proposition, \(a'(\beta')(\phi')\) is true iff intervals at which the proposition denoted by \(\phi'\) has truth as its extension appear with the required frequency in the sequence of intervals determined by the denotation of \(\beta'\) (and \(<\)). Under this approach to the interpretation of relative frequency adverbs, sentence (219) would, for example, translate as (220):
(220) \[ \text{\textit{often}'}(\lambda tVt_1[t = t_1 \& [\text{\textit{NONPAST}}(t_1) \& \\
AT(t_1, \text{\textit{Jane-is-figuring-her-taxes'}})])(\text{\textit{Jane-uses-a-calculator'}}) \]

(220) would be true iff intervals at which the proposition denoted by 'Jane-uses-a-calculator' has truth as its extension show up with the right frequency in the sequence of intervals determined by the denotation of (221).

(221) \[ \lambda tVt_1[t = t_1 \& [\text{\textit{NONPAST}}(t_1) \& AT(t_1, \text{\textit{Jane-is-figuring-her-taxes'}})] \]

This approach seems plausible enough until we consider nonpresent tense sentences such as (222).

(222) When she figured her taxes, Jane often used a calculator.

In the analysis of this sentence, we cannot regard tense as having narrower scope than \textit{often}; if we did, (222) would translate as (223), which plainly misrepresents the truthconditions of (222) ((223) could, for example, be true even if Jane never used a calculator when figuring her taxes).

(223) \[ \text{\textit{often}'}(\lambda tVt_1[t = t_1 \& Vt_2[t_2 = t_1 \& [\text{\textit{past}}(t_2) \& \\
AT(t_2, \text{\textit{Jane-figures-her-taxes'}})])(\text{\textit{Vt[past](t)} & \\
AT(t, \text{\textit{Jane-uses-a-calculator'}})]) \]

On the other hand, we cannot regard tense as having wider scope than \textit{often} in sentences like (222): if we did, sentence (224) would translate as (something like) (225); assuming that during the past summer translates as (226), it's clear that (225) fails to embody the truth-conditions of (224) ((225) could, for example, be true even if the
only times our roof ever leaked were two summers ago).

(224) When it rained during the past summer, our roof often leaked.

(225) \( \forall t [\text{past}(t) \land \text{AT}(t, \text{often})(\lambda t_1 \forall t_2[t_1 = t_2 \land \text{past}(t_3) \land \text{AT}(t_3, \text{it-rains}))])(\text{our-roof-leaks})] \)

(226) \( \lambda t \forall t_1[[[\text{summer}(t_1) \land t_1 < \text{now}] \land \text{AT}[[\text{summer}(t_2) \land t_2 < \text{now}] + [t_2 < t_1 \land t_2 = t_1]]] \land t \subseteq t_1] \)

These problems can be avoided under a slightly different analysis, which I shall adopt here. In this analysis, relative frequency adverbs are taken to denote binary relations between sets of time intervals (i.e., of type \( \langle \langle i, t, \rangle, \langle i, t, \rangle, t > \rangle \)). Where \( \alpha' \) is the translation of such an adverb and \( \beta', \gamma' \) denote sets of time intervals, \( \alpha'(\beta')(\gamma') \) is true iff it is true that members of the denotation of \( \gamma' \) appear with the required frequency in the sequence of intervals determined by the denotation of \( \beta' \). (The 'required frequency' associated with a given relative frequency adverb is sometimes quite straightforward. For example, \( \text{always}'(\beta')(\gamma') \) is true iff all members of the denotation of \( \beta' \) are also members of the denotation of \( \gamma' \); \( \text{never}'(\beta')(\gamma') \) is true iff none of the members of the denotation of \( \beta' \) are also members of the denotation of \( \gamma' \). More often, than not, however, the 'required frequency' associated with a given frequency adverb is vague and context-dependent; as I have shown elsewhere (Stump 1981), it's possible to formulate truthconditions for such adverbs which account for this indeterminacy. I won't propose complete truthconditions here, however; all that is necessary is that we recognize that for
any relative frequency adverb \( \alpha \), there is some range \( R \) of frequencies such that the truth of \( \alpha'(\beta')(\gamma') \) depends on the existence of a frequency \( f \) within range \( R \) with which members of the denotation of \( \gamma' \) appear in the sequence of intervals determined by the denotation of \( \beta' \).

In this analysis, relative frequency adverbs are assumed to join with temporal abstracts rather than full sentences. Thus, two rules are employed to introduce relative frequency adverbs into larger expressions: one joins a frequency adverb \( \alpha \) with a set-level adverb \( \beta \) and a temporal abstract to produce a new temporal abstract— in this case, \( \beta \) explicitly restricts the interpretation of \( \alpha \); a second rule simply joins a frequency adverb \( \alpha \) with a temporal abstract to produce a new temporal abstract— \( \alpha \) is, in this instance, only implicitly restricted. The two rules are the following.

\[(227) S64. \text{ If } \alpha \in P_{RFA}, \beta \in P_{TA}, \text{ and } \gamma \in P_{TAB}, \text{ [\$Tense, t\Past, n\Perfect], then } F_{64a}(\alpha, \beta, \gamma), F_{64b}(\alpha, \beta, \gamma) \in P_{TAB}, \text{ [\$Tense, t\Past, n\Perfect], where } F_{64a}(\alpha, \beta, \gamma) \text{ is } [\beta, \gamma'] \text{, } F_{64b}(\alpha, \beta, \gamma) \text{ is } [\gamma' \beta'], \text{ and } \gamma' \text{ is ROS}(\alpha, \gamma).\]

Example: \( F_{64a}(\text{never, after he}_0 \text{ mowed the lawn, (he}_0 \text{) [trimmed] the hedges}) = \text{after he}_0 \text{ mowed the lawn, (he}_0 \text{) never [trimmed] the hedges}\)

\[T64. \text{ If } \alpha \in P_{RFA}, \beta \in P_{TA}, \gamma \in P_{TAB}, \text{ and } \alpha, \beta, \gamma \text{ translate as } \alpha', \beta', \gamma', \text{ then } F_{64a}(\alpha, \beta, \gamma), F_{64b}(\alpha, \beta, \gamma) \text{ translate as } \lambda t[\alpha'(\beta')(\lambda t_{1}[t_{1} \subseteq t \& \gamma'(t_{1})])]].\]

Example: \( \text{after he}_0 \text{ mowed the lawn, (he}_0 \text{) never [trimmed] the hedges} \) translates as
(227) [continued]
\[
\lambda t[\text{never}'(\lambda t_1 \forall t_2[(t_2 < t_1 \& M(t_1,t_2)) \& \forall t_3(t_3 = t_2 \\
\& [\text{past}(t_3) \& \text{AT}(t_3, \text{he}_0\text{-mows-the-lawn'})])])]
\]
\[
(\lambda t_1[t_1 \leq t \& [\text{past}(t_1) \& \text{AT}(t_1, \text{he}_0\text{-trims-the-}
\text{hedges'})])])
\]

(228) S65. If \( a \in \mathcal{P}_{\text{RFA}} \) and \( b \in \mathcal{P}_{\text{TAB}} \), [\( b^\text{Tense, b^\text{Past,}
\& b^\text{Perfect} \)], then \( F_{65,n}(a,b) \in \mathcal{P}_{\text{TAB}} \), [\( b^\text{Tense, b^\text{Past,}
\& b^\text{Perfect} \)], where \( F_{65,n}(a,b) \) is \( \text{ROS}(a,b) \).

Example: \( F_{65,6}(\text{occasionally, (a sailor) [strolled] by}) = \)

\( (\text{a sailor) occasionally [strolled] by} \)

T65. If \( a \in \mathcal{P}_{\text{RFA}} \), \( b \in \mathcal{P}_{\text{TAB}} \), and \( a,b \) translate as
\( a',b' \), then \( F_{65,n}(a,b) \) translates as
\[
\lambda t[a'(I_n)(\lambda t_1[t_1 \leq t \& b'(t_1)])].
\]

Example: \( F_{65,6}(\text{occasionally, (a sailor) [strolled] by}) \) translates as
\[
\lambda t[\text{occasionally}'(I_6)(\lambda t_1[t_1 \leq t \& [\text{past}(t_1) \&
\text{AT}(t_1, \text{a-sailor-strolls-by'})]])]
\]

Under this approach, sentence (219) can be analyzed and translated
by means of rule (227) as in (229) and (230):
(229) when she is figuring her taxes, (Jane) often [uses] a calculator, \( t, 54,1 \)

Jane, \( T \) when she, is figuring her, taxes, (she,) often [uses] a calculator, \( t, 58 \)

when she, is figuring her, taxes, (she,) often [uses] a calculator, \( \text{TAB}, 64a \)

often, RFA when she, is figuring her, taxes, \( (\text{she,}) \) [uses] a calculator, \( \text{TA}, 68,0 \)

when, TSC (she,) [is] figuring her, taxes \( \text{at}-\text{that}-\text{time}, \ t, 58 \)

(at-\text{that}-\text{time}, MTA (she,) [is] figuring her, taxes, \( \text{TAB}, 56 \)

(she,) [is] figuring her, taxes, \( t, 19 \)

(230) \( \text{Vt}[\text{often'}(\lambda t_1 \text{Vt}_2[t_1 = t_2 \& \text{Vt}_3[t_3 = t_2 \& \text{PRES}(t_3) \& \text{AT}(t_3, \text{Jane-is-figuring-her-taxes'}).]))](\lambda t_1[t_1 < t \& \text{PRES}(t_1) \& \text{AT}(t_1, \text{Jane-uses-a-calculator'}).]) \)

Similarly, the past tense sentence (222) is analyzed as (231) and translates as (232).

(231) when she figured her taxes, (Jane) often [used] a calculator, \( t, 54,1 \)

Jane, \( T \) when she, figured her, taxes, (she,) often [used] a calculator, \( t, 58 \)

when she, figured her, taxes, (she,) often [used] a calculator, \( \text{TAB}, 64a \)

often, RFA when she, figured her, taxes, \( (\text{she,}) \) [used] a calculator, \( \text{TA}, 68,0 \)

when, TSC (she,) [figured] her, taxes \( \text{at}-\text{that}-\text{time}, \ t, 58 \)

(at-\text{that}-\text{time}, MTA (she,) [figured] her, taxes, \( \text{TAB}, 55 \)

(at-\text{that}-\text{time}, (she,) [figures] her, taxes, \( t, 19 \)


(232) \( Vt[\text{often} \langle \lambda_{t_{1}} Vt_{2}[t_{1} = t_{2} \& Vt_{3}[t_{3} = t_{2} \& [\text{past}(t_{3}) \& \text{AT}(t_{3}, \text{Jane-figures-her-taxes'})]] \rangle \langle \lambda_{t_{1}}[t_{1} \subseteq t \& [\text{past}(t_{1}) \& \text{AT}(t_{1}, \text{Jane-uses-a-calculator'})]\rangle] \)

(232) induces the proper interpretation for (222).

Sentence (224) is analyzed and translated as in (233) and (234).

(233) when it rained during the past summer, (our roof) often [leaked], t, 58

when it rained during the past summer, (our roof) often [leaked], TAB, 64a

often, RFA when it rained during the past summer, (our roof) [leaked], TAB, 55

past summer, TA, 68,0

when, TSC (it) [rained] at-that-time, during the past summer, (our roof) [leaks], t, 19

during the past summer, TA, 67 (it) [rained] at-that-time, MTA (it) [rained], TAB, 59b

(234) \( Vt[\text{often} \langle \lambda_{t_{1}} Vt_{2}[t_{1} = t_{2} \& Vt_{3}[d\text{uring-the-past-summer}[t_{3}] \& t_{3} = t_{2} \& [\text{past}(t_{3}) \& \text{AT}(t_{3}, \text{it-rains'})]] \rangle \langle \lambda_{t_{1}}[t_{1} \subseteq t \& [\text{past}(t_{1}) \& \text{AT}(t_{1}, \text{our-roof-leaks'})]\rangle] \)

(234) represents the desired truth conditions for (224).

Sentence (235), in which the adverb \textit{often} isn't explicitly restricted by a set-level time adverb, is derived by means of rule (228) as in (236), and is thus assigned the translation (237), in which \( I_{6} \) is a variable over sets of time intervals (whose value is inferred).

(235) Jane often uses a calculator.
(236) \((\text{Jane}) \text{ often [uses] a calculator}, t, 58\)

\((\text{Jane}) \text{ often [uses] a calculator}, \text{TAB}, 65, 6\)

\(\text{often, RFA} \quad (\text{Jane) [uses] a calculator, TAB, 56}\)

\(\text{(Jane) [uses] a calculator, t, 19}\)

(237) \(Vt[\text{often}'(I_0)(\lambda t_1[t_1 \subseteq t \& \text{PRES}(t_1) \& \text{AT}(t_1, \text{Jane-uses-a-calculator}'))]})\)

The reader may have wondered why the expressions produced by rules (227) and (228) must be temporal abstracts rather than sentences. The reason is that main tense adverbs may combine with them. Consider, for example, sentence (238).

(238) When he was in Columbus, John always went for a walk after he ate supper.

(238) can be understood to relate to a single interval at which John was in Columbus; on such an interpretation, the adverb when he was in Columbus intuitively has wider scope than the frequency adverb always. This interpretation could not be induced if (227) and (228) produced sentences rather than temporal abstracts. But according to the present analysis, (238) can be derived as in (239) and thereby assigned the translation (240), which represents the desired interpretation.

The feasibility of this analysis of relative frequency adverbs provides further justification for the category TAB of temporal abstracts; in section 3, temporal abstracts will be employed in the analysis of a certain variety of generic sentence.

The foregoing analysis of the interpretation of relative frequency adverbs affords a very clear understanding of the difference between
strong and weak adjuncts observed in sentences (210)-(213), as will
be seen in the following subsection.

(210) a. Being a sailor, John sometimes smokes a pipe.
    b. Lying on the beach, John sometimes smokes a pipe.

(211) a. Weighing four tons, our truck often makes the
    bridge shake.
    b. Carrying a load of over 1500 lbs., our truck
    often makes the bridge shake.

(212) a. Having only ten minutes between her morning and
    her afternoon classes, Anne never eats lunch.
    b. Studying for finals, Anne never eats lunch.

(213) a. A major stockholder of Texas Instruments, Jane
    always uses a calculator.
    b. Figuring her taxes, Jane always uses a calculator.
2.2 Adjuncts restricting the interpretation of relative frequency adverbs. In the preceding subsection, relative frequency adverbs were analyzed as denoting binary relations between sets of time intervals; this analysis permitted an explicit account of the way in which a time adverb—specifically, an adverb of category TA—may restrict the interpretation of a relative frequency adverb. In the light of this analysis, we now return to the problem of explaining the observed differences in sentences (210)-(213).

Consider sentence (210b). In this sentence, the free adjunct lying on the beach is felt to supply the temporal restriction on the frequency adverb sometimes—it specifies exactly which intervals are the ones at which it is sometimes true that John smokes a pipe; it thus appears to serve exactly as a time adverbial would—as the first argument of the frequency adverb. If this is so, then free adjuncts must be able to belong to the category TA of expressions denoting sets of time intervals. We might therefore postulate the following rule converting primal adjuncts to members of TA:

\[
(241) \quad S10. \text{If } a \in P_t, \text{ then } F_{10,n}(a) \in P_{TA}, [+\text{Adjunct}],
\]

where \( F_{10,n}(a) \) is \( a \).

Example: \( F_{10,0}(\text{lying on the beach}) = \text{lying on the beach} \)

As a first approximation for the corresponding translation rule, (242) might seem promising.

\[
(242) \quad T10. \text{If } a \in P_t, \text{ and } a \text{ translates as } a', \text{ then } F_{10,n}(a) \text{ translates as } \lambda t V t_1[t = t_1 \& AT(t_1, a')].
\]

According to (242), the free adjunct in (210b) designates the set of intervals at which John is lying on the beach. This seems reasonable...
for (210b), but I believe that identity may in general be too restrictive a relation between the intervals denoted by \( t \) and \( t_1 \) in (242); in (243), for example, the adjunct seems to designate some set of intervals each of which precedes an interval at which Leroy gets down from his highchair.

(243) Getting down from his highchair, Leroy sometimes walks all the way to the living room.

This suggests that the temporal relation between the intervals denoted by \( t \) and \( t_1 \) in (242) should be left indeterminate—just like the logical relation between the adjunct and the superordinate clause in a sentence like (244).

(244) Preferring to go dancing, Mary agrees to go skydiving.

For this reason, (242) is to be revised as in (245), where \( M \) is again a free variable of type \(<i,<i,t>>\).

(245) \[ \lambda t V t_1 [M_n(t,t_1) \land AT(t_1, a')] \]

Example: \( F_{10,0} \) (lying on the beach) translates as

\[ \lambda t V t_1 [M_0(t,t_1) \land AT(t_1, Vx^S[R(x^S,x^i) \land lying-on-the-beach'(x^S)])] \]

By assuming rules (241) and (245), we can derive sentence (210b) as in (246) and thus arrive at a translation which satisfactorily embodies the logical structure of (210b), namely (247).

(246) lying on the beach, (John) sometimes [smokes] a pipe,

\[ t, 58 \]

lying on the beach, (John) sometimes [smokes] a pipe, TAB,64a

sometimes,

\[ TA,10,9 \]

(John) [smokes] a pipe, TAB,56

lying on the beach, \( t' \), 1,4 (John) [smokes] a pipe, \( t \), 19
(247) \[ Vt[sometimes'((\lambda t_1 Vt_2^V t_3 M_3(t_1,t_2) \& AT(t_2, Vx^S[R(x^S,x^1)])
& \text{lying-on-the-beach'}(x^S)])])((\lambda t_1[t_1 \subseteq t \& \text{PRES}(t_1)
& AT(t_1, \text{John-smokes-a-pipe'})])]) \]

(247) captures the intuition that the role of the free adjunct in
(210b) is analogous to that of the adverbial clause in (248).

(248) While he is lying on the beach, John sometimes smokes a pipe.

Now consider sentence (210a). In this sentence, the free adjunct
is not felt to provide a temporal restriction on sometimes--(210a)
doesn't mean that it is sometimes true at intervals at which John is
a sailor that he smokes a pipe. Instead, the restriction on sometimes
is determined contextually, and the free adjunct bears some relation
to the entire sentence which follows, its intuitive function being
that of a reason adverbial. Thus, (210a) might simply translate as
(249), where \( I_3 \) is again a variable over sets of time intervals.

(249) \[ K(L_2)(^\text{being-a-sailor'}(x^0))(^\text{sometimes'}(I_3)
(\lambda t_1[t_1 \subseteq t \& \text{PRES}(t_1) \& AT(t_1, \text{John-smokes-a-pipe'})])]) \]

This translation implies a syntactic analysis like (250):^28

(250) being a sailor, (John) sometimes [smokes] a pipe, t, 36a
being a sailor, t/t, 13,2 (John) sometimes [smokes] a pipe, t, 58
being a sailor, t', 2,4 (John) sometimes [smokes] a pipe, TAB, 65,3
sometimes, RFA (John) [smokes] a pipe, TAB, 56

(John) [smokes] a pipe, t, 19

Thus, in the interpretation of (210a), the free adjunct being a
sailor has wider scope than sometimes; in (210b), on the other hand,
the adjunct lying on the beach has narrower scope than the main clause frequency adverb, since it serves to restrict its interpretation. Careful consideration reveals that the a and b sentences of (211)-(213) have completely analogous interpretations: in each case the adjunct in the a sentence has wide scope relative to the accompanying relative frequency adverb, while that in the b sentence may serve to restrict the interpretation of this adverb, and thus have narrow scope. For example, the most likely translations for (211a,b) are (251) and (252), respectively:29

\[
(251) \ K(K_2)((\text{weighing\-four\-tons}'(x^2))(\text{Vt[often]'}(I_3)
(\lambda t_1[t_1 \subseteq t \& [\text{PRES}(t_1) \& \text{AT}(t_1, \text{our-truck-makes-the-bridge-shake'})])])
\]

\[
(252) \ Vt[\text{often}'](\lambda t_1\text{Vt}_2[M_9(t_1,t_2) \& \text{AT}(t_2, \forall x^S[R(x^S,x^4) \& \text{carrying-a-load-of-over-1500-lbs.'}(x^S)])](\lambda t_1[t_1 \subseteq t 
\& [\text{PRES}(t_1) \& \text{AT}(t_1, \text{our-truck-makes-the-bridge-shake'})])])
\]

these translations imply the distinct syntactic analyses in (253) and (254).28

\[
(253) \ \text{weighing four tons, (our truck) often [makes] the bridge shake, t, 36a}
\]

\[
\text{weighing four tons, (our truck) often [makes] the bridge shake, t, 58}
\]

\[
\text{weighing four tons, (our truck) often [makes] the bridge shake, t', 2, 4}
\]

\[
\text{often, RFA [our truck] [makes] the bridge shake, TAB, 56}
\]

\[
\text{[our truck] [makes] the bridge shake, t, 19}
\]
The differences between strong and weak adjuncts in the context of a relative frequency adverb are thus analogous to the differences observed in modal contexts in Chapter II. Strong adjuncts uniformly fail to be interpretable as the first argument of a modal or relative frequency adverb. Instead, they may always be interpreted as expressions of category t/t, and thus as having wide scope with respect to an accompanying modal or frequency adverb. Weak adjuncts, on the other hand, may restrict the interpretation of both modals and relative frequency adverbs; when they do, they are expressions of categories t' and TA, respectively.

Let me emphasize that weak adjuncts don't have to be within the scope of a main clause frequency adverb if one appears.\(^{30}\) (255), for example, could conceivably be understood as a narrative sentence describing something which John often did during a single occasion of lying on the beach.

(255) Lying on the beach, John often thinks of home.

In such readings of sentences like (255), the adjunct has wide scope relative to the frequency adverb, even though it is weak. The important generalization is that a weak adjunct may restrict a main clause frequency adverb, while a strong adjunct may not.
Nonpresent tense sentences having frequency adverbs restricted by weak adjuncts are straightforward. Sentence (256), for example, is assigned the analysis in (257) and the translation (258).

(256) Carrying over 1500 lbs., our truck often made the bridge shake.

(257) carrying over 1500 lbs., (our truck) often [made] the bridge shake, t, 58

carrying over 1500 lbs., (our truck) often [made] the bridge shake,

often, carrying over 1500 lbs., (our truck) [made] the bridge shake, TAB, 55

carrying over 1500 lbs., (our truck) [makes] the bridge shake, t, 19

t', 1,4

(258) Vt[often'(λt1Vt2[M9(t1,t2) & AT(t2, vx[R(xs,x4) & carrying-over-1500-lbs.'(xs)])])](λt1[t1 ≤ t & [past(t1) & AT(t1, our-truck-makes-the-bridge-shake')]])

(258) represents the desired interpretation for (256). Similarly, the future tense sentence (259) may be derived as in (260) and translated as in (261).

(259) Hearing that song, John always will think of Mary.

(260) hearing that song, (John) always [will] think of Mary,

hearing that song, (John) always [will] think of Mary, TAB, 64a

always, hearing that song, (John) [will] think of Mary, TAB, 57

hearing that song, t', 1,4

(John) [thinks] of Mary, t, 19
In this section, we have found that the distinction between strong and weak adjuncts, motivated in two independent ways in Chapter II, is further supported by the semantics of free adjuncts in the context of adverbs of relative frequency. As we shall see in the following section, there are even further grounds for distinguishing the same two varieties of free adjuncts.

3. A generalization operator. So far, we have seen two environments which motivate a distinction between two varieties of free adjuncts: modal sentences and sentences with relative frequency adverbs. In this section, a third environment motivating a distinction between strong and weak adjuncts is discussed. Consider sentences (262)-(265).

(262) Lying on the beach, John smokes cigars.
(263) Drunk, he drives very dangerously.
(264) In first gear, the truck makes funny noises.
(265) Wearing her new outfit, Mary looks fat.

Each of these sentences can be understood as expressing a generalization about intervals at which its (weak) adjunct is true. But if strong adjuncts are substituted for the weak adjuncts in (262)-(265), this kind of interpretation is not found; none of (266)-(269) can be understood as expressing a generalization about intervals at which its adjunct is true.

(266) Being a businessman, John smokes cigars.
(267) Being a drunk, he drives very dangerously.

(268) Having a rather decrepit engine, the truck makes funny noises.

(269) Weighing over 200 lbs., Mary looks fat.

Above, it was shown that the distinction between strong and weak adjuncts in modal contexts is a function of the fact that weak adjuncts, but not strong, can serve as the first argument of a modal; similarly, we saw that weak adjuncts can function as the first argument of a relative frequency adverb, while strong adjuncts cannot. In sentences (262)-(269), however, there is no explicit element (akin to a modal or relative frequency adverb) relative to which we might explain the observed difference in interpretation between strong and weak adjuncts. In the following subsections, I shall nevertheless provide independent evidence of the existence of a phonologically null 'generalization operator'; I shall argue that weak adjuncts like those in sentences (262)-(265) can serve to restrict the interpretation of this operator, while strong adjuncts like those in (266)-(269) cannot, and thus that the weak adjuncts in sentences (262)-(265) play a role essentially analogous to those played by the adjuncts in (270) and (271).

(270) Lying on the beach, John might smoke a pipe.

(271) Lying on the beach, John sometimes smokes a pipe.

3.1 Two sorts of interpretations for temporal adverbial clauses. The distinctiveness of the class of sentences represented by (262)-(265) can be appreciated by considering two different ways in which certain temporal adverbial clauses can be interpreted. In many cases, temporal
adverbials can be understood either to pick out a single interval or time or to pick out indefinitely many distinct intervals. For example, the adverbial clause *when he was drunk* in (272) can be felt to relate to a particular past interval (perhaps the only one) at which Bill was drunk;

(272) When he was drunk, Bill drove very dangerously.

on the other hand, it can also pick out an indefinite number of such intervals---on this interpretation, (272) is roughly equivalent to (273) and (274).

(273) Whenever he was drunk, Bill drove very dangerously.
(274) When he was drunk, Bill always drove very dangerously.

This pair of interpretations is by no means restricted to *when*-clauses; a wide variety of temporal adverbial clauses show a precisely analogous pair of usages, as the ambiguity of each of (275)-(277) suggests.

(275) After he finished dinner, he smoked a cigar.
(276) He took aspirin before going to the dentist.
(277) She sat reading while she waited for her mother.

When a temporal adverbial clause is itself present in tense, the 'multiple-interval' interpretation is highly preferred; the adverbial clauses in (278)-(281), for example, do not simply pick out a single occasion of lying on the beach, being drunk, etc., unless we consider the rather unlikely narrative present interpretation of these sentences.

(278) While he's lying on the beach, John smokes cigars.
(279) When he's drunk, Bill drives very dangerously.
(280) When it is in first gear, the truck makes funny noises.
(281) When she's wearing her new outfit, Mary looks fat.

The relevant generalization about sentences like (262)-(265) is that they are understood to express a generalization about intervals at which their adjunct is true precisely when the adjunct functions as a 'multiple-interval' adverbial clause. Thus, just as (282) is ambiguous between a 'single-interval' and a 'multiple-interval' interpretation, so is (283);

(282) While he lay on the beach, John smoked cigars.

(283) Lying on the beach, John smoked cigars.

and it is just the possibility of a 'multiple-interval' interpretation that distinguishes the weak adjuncts in (262)-(265) from the strong adjuncts in (266)-(269).

How exactly are the two interpretations of temporal adverbial clauses to be accounted for? We could, of course, postulate pairs of temporal subordinating conjunctions—when₁, when₂; after₁, after₂; etc.; the members of each pair would be identical in interpretation except that one member would give rise to a 'multiple-interval' interpretation while the other would not. Such an approach could, I believe, be made to account for the facts; but it would imply—wrongly, I think—that the fact that all members of a well-defined class of adverbial clauses have both a 'multiple-interval' and a 'single-interval' interpretation is merely accidental. It would therefore be preferable to derive one interpretation from the other, or to derive both interpretations from some common element of meaning. In the following subsection, I shall develop the means for doing just this.
3.2 Generalization operators. In this subsection, I shall argue that sentences like (262)-(265) have an implicit 'adverb of generalization', and that their (weak) adjuncts restrict its interpretation in precisely the manner in which weak adjuncts may restrict the interpretation of relative frequency adverbs. A brief excursus on Carlson's operators G and G' will provide the necessary background for discussion of this covert adverb.

In his dissertation, Carlson (1977) observes a superficially unexpected asymmetry in the verb system of English: although certain predicates (alive, available, drunk) are always interpreted as stage-predicates (they uniformly induce the 'existential reading' of a bare plural) and certain others (widespread, rare, extinct) as predicates of kinds, there are seemingly no predicates applying uniquely to objects; in general, if a predicate can be used of an object, it can be used of a kind as well. Carlson presents extensive arguments that this state of affairs is a consequence of the fact that, given any predicate known to hold of some object, this predicate can be 'generalized' to apply to the corresponding kind—that given the observation that Fido has four legs, and Rover has four legs, and Spot has four legs, and Rex has four legs, we can generalize and say that dogs have four legs. Carlson represents this generalization of a predicate holding basically of objects to the generic level as a generalization operator G' taking object-level verb phrase intensions into generic verb phrase extensions. Our inductive generalization might therefore be represented as in (284):
In order for \( G'(P) \) to hold for some kind \( x^k \), it need not always be the case that all objects realizing \( x^k \) have property \( P \); Dogs have four legs, for example, is not falsified by the existence of some three-legged dog. But \( G'(P) \) cannot be true of \( x^k \) unless enough of the objects realizing \( x^k \) have \( P \). So how many are 'enough'? Carlson demonstrates at length that 'statements of frequency or of absolute number of occurrences cannot be stated generally for all generic sentences' (1979:59): while Lions are mammals applies to all lions, Lions give milk to their young applies only to mother lions; Lions attain a weight of several hundred pounds applies only to lions which reach physical maturity; Lions attack zookeepers applies only to lions in captivity; and so on. Ultimately, the question of when a property ceases to be an accidental property of certain objects and becomes an essential property of the kind they realize is epistemological in nature, and thus one which the grammar of English should not be expected to answer.

Carlson also finds that any predicate (headed by a verb) interpretable as a stage-predicate may also be interpreted as a predicate of objects and kinds. He suggests that this too is the result of generalizing the application of predicates from 'lower' to 'higher'
entities; observing several stages of Fido chasing cars, we can
generalize and say that Fido (the object) chases cars—or observing
stages of several dogs engaged in the same pursuit, we can say that
dogs (the kind) chase cars. Accordingly, a second generalization
operator \( G \) taking intensions of stage-predicates into extensions of
individual-level predicates is posited:

\[
\begin{align*}
R(s_0, \text{Fido}') & \land \text{chase-cars}'(s_0) \\
R(s_1, \text{Fido}') & \land \text{chase-cars}'(s_1) \\
R(s_2, \text{Fido}') & \land \text{chase-cars}'(s_2) \\
R(s_3, \text{Fido}') & \land \text{chase-cars}'(s_3) \\
\vdash G('\text{chase-cars}')'(\text{Fido}')
\end{align*}
\]

As Carlson points out (p. 280), 'the two \( G \) functions together in
a sense serve the inverse purpose of the realization relation...
Realization makes "available" entities of a lower level from those
of a higher level; generalization makes available predicates from
a lower level to those of a higher level.'

I wish to suggest that a generalization operator in some ways
like those posited by Carlson is responsible for the 'multiple-interval'
interpretation of the time adverbials in sentences like (275)-(281) and of the weak adjuncts in sentences like (262)-(265). First,
however, I shall briefly demonstrate why the operator in question
cannot be identified with either of those which Carlson has postulated.

Carlson discusses (pp. 418ff) a type of sentence in which a tempo-
ral adverbial clause seems to be within the scope of a generalization
operator. For instance, (286) can be understood to mean, roughly,
that any dog barks when it sees a mailman—that the kind designated by dogs has the generalized property of any object that barks when it sees a mailman, as in (287).

(286) Dogs bark when they see a mailman.

(287) G'(x^o[x^o-barks-when-x^o-sees-a-mailman']) (dogs')

Carlson doesn't address the matter, but it seems intuitively plausible to suppose that in the interpretation of 'habitual' sentences like (288), the adverbial clause is again within the scope of a generalization operator;

(288) Fido barks when he sees a mailman.

here, however, it would be the stage-to-individual level operator G, as in (289).

(289) G(x^s[x^s-barks-when-x^s-sees-a-mailman']) (Fido')

In accordance with this analysis, we could supply additional internal structure for (287):

(290) G'(x^o[G(x^s[x^s-barks-when-x^s-sees-a-mailman']) (x^o)]) (dogs')

Such an analysis would apparently afford a very nice account of the fact that temporal adverbial clauses have both 'single-interval' and 'multiple-interval' interpretations: it would allow us to say that the 'single-interval' interpretation is basic, and that the 'multiple-interval' interpretation arises when the adverbial is within the scope of the generalization operator G; that this operator, not the adverbial clause itself, is the source of the multiplicity. Thus, suppose that (291) has the internal structure (292).

(291) x^s-barks-when-x^s-sees-a-mailman'

Here, the when-clause is interpreted as picking out a single interval. But when (292) occurs within the scope of a generalization operator, as in (289) and (290), it picks out a number of distinct intervals: for any object o, the truth of (293) implies that there are a certain number of distinct stages satisfying (294);

\[(293) \forall x^S \forall t \left[ \forall t_1 \left[ t = t_1 \land \forall t_2 \left[ t_2 = t_1 \land [\text{PRES}(t_2) \land \text{AT}(t_2, \text{see-a-mailman}'(x^S))] \land [\text{PRES}(t) \land \text{AT}(t, \text{bark}'(x^S))] \right] \right] \right] \]

and given the ontological status of stages--spatiotemporal 'slices' of an individual--this implies that there are a certain number of distinct intervals satisfying (295).

\[(295) \forall x^S \left[ [\forall x^S,o] \land [\forall t_1 \left[ t = t_1 \land \forall t_2 \left[ t_2 = t_1 \land [\text{PRES}(t_2) \land \text{AT}(t_2, \text{see-a-mailman}'(x^S))] \land [\text{PRES}(t) \land \text{AT}(t, \text{bark}'(x^S))] \right] \right] \right] \]

The latter implication is the 'multiple-interval' interpretation of the adverbial clause in sentence (288). This approach is intuitively sound, and could easily be made to account for 'multiple-interval' interpretations involving other sorts of temporal adverbial clauses, and for 'single/multiple-interval' ambiguities. Thus, we might represent the 'single-interval' interpretation of (275) as in
After he finished dinner, he smoked a cigar.

the 'multiple-interval' interpretation of (275), on the other hand, might be induced by translation (297), in which the generalization operator G again appears.

Thus, the 'multiple-interval' interpretation of a temporal adverbial clause seemingly may be derived from the 'single-interval' interpretation by means of Carlson's operator G.

Despite the initial plausibility of this approach, there are certain kinds of 'multiple-interval' sentences which militate against it. This approach predicts that if a temporal adverbial clause has a 'multiple-interval' interpretation, then either its superordinate clause or the adverbial clause itself must have a generalizable stage-level predicate. Unfortunately, there are perfectly good examples of sentences whose temporal adverbial clause has a 'multiple-interval' interpretation but which lack generalizable stage-predicates. In (298), for instance, both the adverbial clause and the main clause have kind-level predicates;

When cats are widespread, dogs are rare.
there is simply no stage-level property to generalize; yet, (298) may be understood to mean 'whenever cats are widespread, dogs are rare.'

Also, Carlson shows that predicates consisting of be plus a stage-level adjective phrase (e.g. be asleep, be drunk, and be available) cannot be generalized: (299), for example, can't receive a generic interpretation, but instead induces an 'existential reading' for its bare plural subject.31

(299) Sailors were drunk.

Thus, 'multiple-interval' sentences like (300) are an additional problem for the approach outlined above:

(300) When he is drunk, John is unavailable.

in (300), neither the adverbial clause nor the main clause has a generalizable stage-level predicate.

From these facts, I conclude that Carlson's operator G is not to be employed in explicating the 'multiple-interval' interpretation of temporal adverbial clauses. The problem with Carlson's operator is not the notion of generalization per se; for all sentences involving an adverbial clause with a 'multiple-interval' interpretation imply a generalization of a certain kind, including (298) and (300). The problem with G instead appears to be in the sort of generalization it embodies: generalization from the stage level to the individual level. It is not clear that any shifting of levels is implied in 'multiple-interval' interpretations.

I shall therefore introduce a new operator G\* which doesn't shift its argument to a 'higher' level, but embodies a much simpler
kind of generalization. \( G' \) is a dyadic operator; like a relative frequency adverb, it denotes a two-place relation between sets of time intervals. Where \( \beta' \) and \( \gamma' \) are expressions of type \(<i,t>\), the truth of \( G'(\beta')(\gamma') \) implies that a certain number of time intervals in the denotation of \( \gamma' \) are in the denotation of \( \beta' \). Exactly how many intervals are enough for \( G'(\beta')(\gamma') \) to be true varies with \( \beta' \) and \( \gamma' \): for example, sentence (301) seems to imply that John needs help whenever he gives the signal, while the truth of (302) would seem to admit some instances in which John got mad without swearing.

(301) When John gives this signal, he needs help.

(302) When he gets mad, John swears.

Necessary and sufficient conditions for the truth of \( G'(\beta')(\gamma') \) are therefore not specified by the grammar.

The rule which introduces \( G' \) is parallel to the rule (227) (see section 2.1) which introduces relative frequency adverbs that are restricted by a set-level time adverb: it joins a set-level time adverb with a temporal abstract to produce a temporal abstract. The rule introducing \( G' \) is (303).

(303) S66. If \( \alpha \in PTA \) and \( \beta \in TAB, \gamma \in PTA, \delta \text{Tense, } \delta \text{Past, } \delta \text{Perfect}, \) then \( F_{66a}(\alpha,\beta), F_{66b}(\alpha,\beta) \in TAB, \gamma \text{Tense, } \delta \text{Past, } \delta \text{Perfect}, \) where \( F_{66a}(\alpha,\beta) \) is \( \Gamma \alpha, \beta \) and \( F_{66b}(\alpha,\beta) \) is \( \Gamma \beta \alpha \).

T66. If \( \alpha \in PTA, \beta \in TAB, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then \( F_{66a}(\alpha,\beta), F_{66b}(\alpha,\beta) \) translate as \( \lambda t[G'(\alpha')(\lambda t_1[t_1 \leq t \& \beta'(t_1)])] \).

According to (303), sentence (288) may be analyzed as in (304) and
translated as (305).

(304) (Fido) [barks] when he sees a mailman, t, 54,0

Fido, T (he₀) [barks] when he₀ sees a mailman, t, 58

(he₀) [barks] when he₀ sees a mailman, TAB, 66b

when he₀ sees a mailman, TA, 68,3 (he₀) [barks], TAB, 56

when, TSC (he₀) [sees] a mailman at-that-time₃, t, 58

(he₀) [sees] a mailman at-that-time₃, TAB, 59b

at-that-time₃, MTA (he₀) [sees] a mailman, TAB, 56

(he₀) [sees] a mailman, t, 19

(305) Vt[σ'(At₁Vt₆[t₁ = t₂ & Vt₃[t₃ = t₂ & [PRES(t₃) &

∧ T(t₅, he₀-sees-a-mailman')])]))(At₁[t₁ ⊆ t & [PRES(t₁)

& AT(t₁, he₀-barks')])]

Similarly, we can derive the past tense sentence (275) in two distinct ways--(306) and (307)--and thereby assign it the two distinct interpretations represented in (308).

(306) after he₀ finished dinner, (he₀) [smoked] a cigar, t, 58

after he₀ finished dinner, (he₀) [smoked] a cigar, TAB, 66a

after he₀ finished dinner, (he₀) [smoked] a cigar, TAB, 55

after, (he₀) [finished] dinner at-that-time₃, t, 58

(he₀) [finished] dinner at-that-time₃, TAB, 59b

at-that-time₃, MTA (he₀) [finished] dinner, TAB, 55

(he₀) [finishes] dinner, t, 19
(307) after he_0 finished dinner, (he_0) [smoked] a cigar, t, 58

after he_0 finished dinner, (he_0) [smoked] a cigar, TAB, 59a

after he_0 finished dinner, MTA, 67 (he_0) [smoked] a cigar, TAB, 55

after he_0 finished dinner, TA, 68,3 (he_0) [smokes] a cigar, t, 19

after, TSC (he_0) [finished] dinner at-that-time, t, 58

(he_0) [finished] dinner at-that-time, TAB, 59b

at-that-time, MTA (he_0) [finished] dinner, TAB, 55

(he_0) [finishes] dinner, t, 19

(308) a. 'Multiple-interval':

Vt[\gamma'((\lambda t_1Vt_2[[(t_2 < t_1 & M(t_1,t_2)] & Vt_3[t_3 = t_2 & [past(t_3) & AT(t_3, he_0-finishes-dinner')]])

(\lambda t_1[t_1 \subseteq t & [past(t_1) & AT(t_1, he_0-smokes-a-cigar')]])]

b. 'Single-interval':

Vt[Vt_1[[t_1 < t & M(t,t_1)] & Vt_2[t_2 = t_1 &
[past(t_2) & AT(t_2, he_0-finishes-dinner')]]) &
[past(t) & AT(t, he_0-smokes-a-cigar')]]

And we can derive the problematic sentences (298) and (300) as in (309) and (310), and thereby assign them the translations (311) and (312).
(309) when cats are widespread, (dogs) [are] rare, t, 58
when cats are widespread, (dogs) [are] rare, TAB, 66a
when cats are widespread, TA, 68,7 (dogs) [are] rare, TAB, 56
when, TSC (cats) [are] widespread (dogs) [are] rare, t, 19
at-that-time_7, t, 58
(cats) [are] widespread at-that-time_7, TAB, 59b
at-that-time_7, MTA (cats) [are] widespread, TAB, 56
(cats) [are] widespread, t, 19

(310) when he is drunk, (John) [is] unavailable, t, 54,0
John, T when he_0 is drunk, (he_0) [is] unavailable, t, 58
when he_0 is drunk, (he_0) [is] unavailable, TAB, 66a
when he_0 is drunk, TA, 68,4 (he_0) [is] unavailable, TAB, 56
when, TSC (he_0) [is] drunk (he_0) [is] unavailable, t, 19
at-that-time_4, t, 58
(h_0) [is] drunk at-that-time_4, TAB, 59b
at-that-time_4, MTA (he_0) [is] drunk, TAB, 56
(h_0) [is] drunk, t, 19

(311) \( V t[G''(\lambda t_1 \nu t_2 [t_1 = t_2 \& \nu t_3 [t_3 = t_2 \& \left[\text{PRES}(t_3) \& \text{AT}(t_3, \text{widespread'(cats'))}] \right)])(\lambda t_1 [t_1 \subseteq t \& \left[\text{PRES}(t_1) \& \text{AT}(t_1, \text{rare'(dogs'))}] \right]) \)

(312) \( V t[G''(\lambda t_1 \nu t_2 [t_1 = t_2 \& \nu t_3 [t_3 = t_2 \& \left[\text{PRES}(t_3) \& \text{AT}(t_3, x^S[R(x^S, John') \& \text{drunk'(x^S)])}] \right)])(\lambda t_1 [t_1 \subseteq t \& \left[\text{PRES}(t_1) \& \text{AT}(t_1, x^S[R(x^S, John') \& \text{unavailable'(x^S)])}] \right]) \)

3.3 Adjuncts restricting the generalization operator \( G'' \). We return now to the analysis of sentences like (262)-(265).

(262) Lying on the beach, John smokes cigars.
(263) Drunk, he drives very dangerously.

(264) In first gear, the truck makes funny noises.

(265) Wearing her new outfit, Mary looks fat.

The interpretations of (262)-(265) on which they are understood to express a generalization about intervals at which their (weak) adjunct is true are just those in which the adjunct has a 'multiple-interval' interpretation. Since we have already introduced free adjuncts into the category TA of set-level time adverbs, derivations (313)-(316) for sentences (262)-(265) are automatically produced by rule (303);

(313) lying on the beach, (John) [smokes] cigars, t, 58

lying on the beach, (John) [smokes] cigars, TAB, 66a

lying on the beach, TA, 10,9 (John) [smokes] cigars, TAB, 56

lying on the beach, t', 1,4 (John) [smokes] cigars, t, 19

(314) drunk, (he_0) [drives] very dangerously, t, 58

drunk, (he_0) [drives] very dangerously, TAB, 66a

drunk, TA, 10,9 (he_0) [drives] very dangerously, TAB, 56

drunk, t', 1,4 (he_0) [drives] very dangerously, t, 19

(315) in first gear, (the truck) [makes] funny noises, t, 58

in first gear, (the truck) [makes] funny noises, TAB, 66a

in first gear, TA, 10,9 (the truck) [makes] funny noises, TAB, 56

in first gear, t', 1,4 (the truck) [makes] funny noises, t, 19

(316) wearing her new outfit, (Mary) [looks] fat, t, 54,1

Mary, T wearing her new outfit, (she_1) [looks] fat, t, 58

wearing her new outfit, (she_1) [looks] fat, TAB, 66a

wearing her new outfit, TA, 10,9 (she_1) [looks] fat, TAB, 56

wearing her new outfit, t', 1,4 (she_1) [looks] fat, t, 19
these derivations determine (317)-(320) as translations for (262)-(265); (317)-(320) induce precisely the interpretations we would want to give to (262)-(265) in those contexts in which their adjuncts are understood to specify a set of intervals relative to which some generalization holds.

(317) \[ \forall t [G'((\lambda t_1 \forall t_2 [M_9(t_1,t_2) \& AT(t_2, Vx^S[R(x^S,x^i_4) \& lying-on-the-beach'(x^5)])((\lambda t_1[t_1 \subseteq t \& [PRES(t_1) \& AT(t_1, Vx^S[R(x^S,John') \& smoke-cigars'(x^S)])])])])

(318) \[ \forall t [G'((\lambda t_1 \forall t_2 [M_9(t_1,t_2) \& AT(t_2, Vx^S[R(x^S,x^i_4) \& drunk'(x^5)])])((\lambda t_1[t_1 \subseteq t \& [PRES(t_1) \& AT(t_1, Vx^S[R(x^S,x^0_4) \& drive-very-dangerously'(x^5)])]])]

(319) \[ \forall t [G'((\lambda t_1 \forall t_2 [M_9(t_1,t_2) \& AT(t_2, Vx^S[R(x^S,x^i_4) \& in-first-gear'(x^5)])])((\lambda t_1[t_1 \subseteq t \& [PRES(t_1) \& AT(t_1, the-truck'(x^0Vx^S[R(x^S,x^0) \& make-funny-noises'(x^5)])])]])

(320) \[ \forall t [G'((\lambda t_1 \forall t_2 [M_9(t_1,t_2) \& AT(t_2, Vx^S[R(x^S,x^i_4) \& wearing-Mary's-new-outfit'(x^5)])])((\lambda t_1[t_1 \subseteq t \& [PRES(t_1) \& AT(t_1, Vx^S[R(x^S, Mary') \& look-fat'(x^5)])]])]]

Now consider sentences (266)-(269).

(266) Being a businessman, John smokes cigars.

(267) Being a drunk, he drives very dangerously.

(268) Having a rather decrepit engine, the truck makes funny noises.

(269) Weighing over 200 lbs., Mary looks fat.
Recall that the strong adjuncts in these sentences lack the 'multiple-interval' interpretation found in (262)-(265); they cannot be understood to specify a set of intervals over which some sort of generalization is made (i.e. as the first argument of $G''$). As in modal sentences and sentences with relative frequency adverbs, they may always be understood as adsentential modifiers with wide scope. Here, the sentences which they modify may either be understood as narrative presents or, more naturally, as generic sentences; in the latter case, Carlson's $G$ operator, not the dyadic $G''$ operator introduced above, is responsible for the generalization. Thus, sentences (266) and (267) may be analyzed as in (321) and (322), and assigned the translations (323) and (324),\textsuperscript{32}

\[
(321) \text{being a businessman, (John) } [\text{smokes} \text{ cigars}, t, 58] \\
\text{being a businessman, (John) } [\text{smokes} \text{ cigars}, \text{TAB}, 56] \\
\text{being a businessman, (John) } [\text{smokes} \text{ cigars}, t, 36a] \\
\text{being a businessman, t/t, 13,6 (John) } [\text{smokes} \text{ cigars}, t, 19] \\
\text{being a businessman, t', 2,4 John, T } [\text{smoke} \text{ cigars}, \text{IV}^{i}, 21 [G] ] \\
\text{[smoke] cigars, IV}^{S}, 27
\]

\[
(322) \text{being a drunk, (he}^{0} \text{) } [\text{drives} \text{ very dangerously}, t, 58] \\
\text{being a drunk, (he}^{0} \text{) } [\text{drives} \text{ very dangerously}, \text{TAB}, 56] \\
\text{being a drunk, (he}^{0} \text{) } [\text{drives} \text{ very dangerously}, t, 36a] \\
\text{being a drunk, t/t, 13,6 (he}^{0} \text{) } [\text{drives} \text{ very dangerously}, t, 19] \\
\text{being a drunk, t', 2,4 he}^{0}, \text{T } [\text{drive} \text{ very dangerously}, \text{IV}^{i}, 21 [G] ] \\
\text{[drive] very dangerously, IV}^{S}, 27
\]

\[
(323) Vt[\text{PRES}(t) \& \text{AT}(t, K(L_{6})(\text{'being-a-businessman'}(x_{d}^{0})) ] \\
\text{('[G('smoke-cigars')(John')]'))}
\]
Thus, generalization sentences are yet another environment in which strong and weak adjuncts are interpreted in distinct ways.

Nonpresent tense sentences of the character of (262)-(265) are straightforwardly derived. Sentence (325), for example, may be analyzed as in (326) and assigned the translation (327).

(325) Lying on the beach, John smoked cigars.

(326) \text{lying on the beach}, (John) [\text{smoked}] \text{cigars}, t, 58
\text{lying on the beach}, (John) [\text{smoked}] \text{cigars}, \text{TAB}, 66a
\text{lying on the beach}, \text{TA}, 10,9 (John) [\text{smoked}] \text{cigars}, \text{TAB}, 55
\text{lying on the beach}, t', 1,4 (John) [\text{smokes}] \text{cigars}, t, 19

(327) \text{Vt}[\text{PRES}(t) \& \text{AT}(t, \text{K}_6(\text{\text{"being-a-drunk"} }(x^i_4))))
\& [\text{G}(\text{\text{"drive-very-dangerously"} }(x^0_0)))]]

In this section, we have found a third environment—generic sentences—in which strong and weak adjuncts are interpreted in distinct ways. In the following, final section of this chapter, the interaction of free adjuncts with tense in nongeneric sentences will be considered.

4. Free adjuncts as main tense adverbs. In the preceding two sections, we have seen two contexts in which free adjuncts may play a role paradigmatically reserved for set-level time adverbs. In this section, we will see that free adjuncts may also function as main tense adverbs.
4.1 The relative scope of tense and free adjuncts. Logically, free adjuncts could interact with the tense of their superordinate clause in any or all of three ways (excluding those instances in which an adjunct serves to restrict a modal, frequency adverb or generalization operator): they could, as adsentential adjuncts, have wider or narrower scope; or they could serve a main tense adverbs, joining with tense to characterize a single interval. It is also logically possible that strong and weak adjuncts do not interact with tense in the same ways. Careful consideration of the facts below leads to the conclusion that all adjuncts that do not serve to restrict the interpretation of a modal, frequency adverb, or generalization operator may be analyzed as main tense adverbs.

Consider sentences (328)-(331).

(328) Weighing over 300 lbs., Bill obviously overate when he was young.

(329) Being thirty-three years old, John will be eligible to run for president in 1984.

(330) Weighing over 300 lbs., Bill was the heaviest one in the class.

(331) Being thirty-five years old, John will be eligible to run for president in 1984.

Sentence (328) can be understood to mean that because he now weighs over 300 lbs., Bill must have overeaten when he was young; similarly, (329) can mean that because he is now thirty-three years old, John will be eligible to run for president in 1984. Sentence (330), on the other hand, is most easily understood to mean that because he weighed over 300 lbs. at the time, Bill was the heaviest one in the class; likewise, (331) can mean that because he will be thirty-five
years old at the time, John will be eligible to run for president in 1984. Thus, an adjunct may apparently relate to the speaker's interval (as in (328) and (329)) or to the time at which the tenseless form of its superordinate clause is true (as in (330) and (331)).

There are at least two ways of accounting for this fact. On the one hand, we could regard the time reference of an adjunct as a function of its scope relative to the tense of its superordinate clause: an adsentential adjunct would relate to the speaker's interval if it had wide scope relative to tense, but would share the tense of its superordinate clause if it had narrow scope. On this approach, sentence (329) would be analyzed as in (332), and would thus be assigned the translation (333).

\[
\text{(332) } \text{being 33 years old, (John) [will] be eligible to run for president in 1984, t, 36a}
\]

\[
\begin{align*}
\text{being 33 years old,} & \quad \text{(John) [will] be eligible to run for president in 1984, t, 58} \\
\text{in 1984, MTA, 67} & \quad \text{(John) [will] be eligible to run for president, t, 19} \\
\text{in 1984, TA} & \quad \text{(John) [is] eligible to run for president, t, 57} \\
\text{(333) } & \quad \text{K(L_G)('being-33-years-old'(x_G))(Vt[in-1984'(t) & [FUT(t) & AT(t, John-is-eligible-to-run-for-president'])])}
\end{align*}
\]

sentence (331), on the other hand, would be derived as in (334) and so translate as (335).
Another way of approaching the variant time reference of the adjuncts in (328)-(331) is to assume that adjuncts may not vary in their scope relative to tense, but are simply inferred to relate to some salient interval—which, in normal contexts, will be either the speaker's interval or some interval closely tied to the time to which the superordinate clause relates. Ultimately, I shall adopt this approach; as I shall show in the following subsection, it is the most economical analysis consistent with two facts about free adjuncts.

4.2 Evidence for treating free adjuncts as main tense adverbs. The 'relative scope' analysis of sentences (328)-(331) is founded on the assumption that adjuncts that do not restrict a modal, frequency adverb, or generalization operator may (as adsentential adjuncts) have either wide scope or narrow scope with respect to the tense of their superordinate clause. This assumption is not clearly correct, however. Consider sentence (336).
(336) Working at the post office, Mary decided to go back to school.

In the most natural interpretation of this sentence, the adjunct working at the post office is understood to relate, not to the speaker's interval, but to some past interval (at or during which Mary decided to go back to school); thus, according to the 'relative scope' analysis, the adjunct in (336) must have narrow scope with respect to tense, as in (337).

(337) $\forall t [\text{past}(t) \& \text{AT}(t, K(L_t))(\forall x \in S[R(x^S, x^I) \& \text{working-at-the-post-office}(x^S)])(\text{Mary-decides-to-go-back-to-school}')]$

But now consider (338), in which the free adjunct is itself modified by a main tense adverb.34

(338) Working at the post office during the past summer, Mary decided to go back to school.

Intuitively, (338) has an interpretation analogous to that of (336); yet, the adjunct in (338) cannot be taken to have narrow scope relative to the tense of its main clause, as in (339).

(339) $\forall t [\text{past}(t) \& \text{AT}(t, K(L_t))(\forall x \in S[R(x^S, x^I) \& \text{working-at-the-post-office-during-the-past-summer}(x^S)])(\text{Mary-decides-to-go-back-to-school}')]$

(339) could be true if Mary worked at the post office ten summers ago and at no time since; (338), on the other hand, entails that Mary worked at the post office during the most recent summer. Thus, because the adverb during the past summer in (338) must be interpreted relative to the present interval (cf. the translation (226) of during the past summer in section 2.1), the adjunct in (338) cannot be
analyzed as having narrow scope.

We can avoid this problem in at least two ways. First, we might assume that all adjuncts that do not restrict a modal, frequency adverb, or generalization operator are adsentential adjuncts with wide scope relative to tense. Under such an approach, the adjunct in sentences (329) and (338) would translate as in (340) and (341), where \( t \) is a free variable whose value is inferred;

\[
\begin{align*}
(340) & \lambda p[K(L_0)(^\langle AT(t, \text{being-33-years-old}'(x^p_0)) \rangle(p)] \\
(341) & \lambda p[K(L_0)(^\langle \text{during-the-past-summer}'(t) \& \text{AT}(t, Vx^S[R(x^S, x^i_1) \& \text{working-at-the-post-office}'(x^S)]) \rangle(p)]
\end{align*}
\]

by virtue of these translations, sentences (329) and (338) would themselves translate as (342) and (343).

\[
\begin{align*}
(342) & K(L_0)(^\langle AT(t, \text{being-33-years-old}'(x^p_0)) \rangle(\neg^\langle Vt_1[\text{in-1984}](t_1) \& [FUT(t_1) \& \text{AT}(t_1, \text{John-is-eligible-to-run-for-president}')])
\end{align*}
\]

\[
\begin{align*}
(343) & K(L_0)(^\langle \text{during-the-past-summer}'(t) \& \text{AT}(t, Vx^S[R(x^S, x^i_1) \& \text{working-at-the-post-office}'(x^S)]) \rangle(\neg^\langle Vt_1[\text{past}(t_1) \& \text{AT}(t_1, \text{Mary-decides-to-go-back-to-school}')]))
\end{align*}
\]

Note that according to (343), the adverb during the past summer in (338) is interpreted relative to the present interval, as desired.

Alternatively, we might assume that all adjuncts that don't restrict a dyadic operator are main tense adverbs—i.e. that they join with a temporal abstract to produce a new temporal abstract. The adjuncts in sentences (329) and (338) would thus translate as
in (344) and (345), where $M$ is a free variable of type $<i,<i,t>$ whose value is inferred.

(344) $\lambda P^t \lambda t[K(L_6)(\neg \forall t_1 [M(t,t_1) \& AT(t_1, \text{being-33-years-old}')(x^5_d)])(\neg [P^t(t)])]

(345) $\lambda P^t \lambda t[K(L_6)(\neg \forall t_1 [M(t,t_1) \& [\text{during-the-past-summer}'](t_1) \& AT(t_1, \forall x^S[R(x^S,x^i) \& \text{working-at-the-post-office}'](x^S)])](\neg [P^t(t)])]

Under this analysis, sentences (329) and (338) would themselves translate as (346) and (347).

(346) $\forall t[K(L_6)(\neg \forall t_1 [M(t,t_1) \& AT(t_1, \text{being-33-years-old}')(x^5_d)])(\neg [\text{in-1984}'](t) \& [\text{FUT}(t) \& AT(t, \text{John-is-eligible-to-run-for-president'})])]

(347) $\forall t[K(L_6)(\neg \forall t_1 [M(t,t_1) \& [\text{during-the-past-summer}'](t_1) \& AT(t_1, \forall x^S[R(x^S,x^i) \& \text{working-at-the-post-office}'](x^S)])](\neg [\text{past}(t) \& AT(t, \text{Mary-decides-to-go-back-to-school'})])

A comparison of (342), (343) and (346), (347) as translations for (329) and (338) reveals how nearly identical these two alternative analyses are; nevertheless, I believe there is a shred of indirect evidence in favor of regarding free adjuncts that don't restrict some dyadic operator as main tense adverbs rather than as adsentential modifiers with wide scope relative to tense. The critical fact for choosing between the two analyses is that free adjuncts may show the sequence of tense phenomenon:

(348) Promising that Mary would answer our questions, John left the room.
Denying that he was under 21, Bill indignantly ordered a pitcher.

Believing that he was surrounded, Fido snarled.

Certain that a search party would be dispatched, Lois built a fire.

In the analysis of sequence of tense assumed here, clauses having a shifting present or future tense interpretation are introduced into tensed sentences by rules with the general character of embedding transformations (see rules (186)-(189) in section 1.5). For this reason, adjuncts with subordinate clauses showing sequence of tense cannot be directly generated, since free adjuncts are tenseless; that is, sentence (348) must be analyzed as in (352) rather than as in (353).

(352) promising that Mary would answer our questions, (John) [left] the room

(Mary) [answers] our questions promising that, (John) [left] the room

(353) promising that Mary would answer our questions, (John) [left] the room

promising that Mary would answer (John) [left] the room our questions

So far, only rules of tense (i.e. rules (13)-(15) in section 1.3.1, rules (93) and (94) in section 1.4.2, and rules (119) and (120) in section 1.4.3) have been assumed to introduce the superscripted expressions that$^p_a$ and that$^n_p$ for which shifting present and future tense clauses are substituted in the assumed analysis of sequence of tense; for this reason, the rules presented in this chapter are, in their present form, incapable of generating expressions like (354) and (355) (whether their adjuncts are analyzed as
main tense adverbs or as adsentential modifiers with wide scope).

(354) promising that\textsuperscript{pa}, (John) [left] the room
(355) believing that\textsuperscript{pa}, (Fido) [snarled]

To generate such expressions, two different revisions are possible, depending on how we analyze their adjuncts. If we regard them as adsentential modifiers with wide scope, then all that is necessary is the following revision of the rule (see (22) in Chapter II, section 1) joining an adsentential modifier with a sentence:

(356) S36. If $\alpha \in P_{t/t}$ and $\phi \in P_t$, [+Tense, $\delta$Past, $\gamma$Perfect], then $F_{36a}(\alpha, \phi)$, $F_{36b}(\alpha, \phi)$, $F_{36c}(\alpha, \phi) \in P_t$,

$\{+$Tense, $\delta$Past, $\gamma$Perfect$\}$, where $F_{36a}(\alpha, \phi)$ is $\Gamma_{\alpha'}$, $\phi$, $F_{36b}(\alpha, \phi)$ is $\Gamma_\phi$, $\alpha'$, $F_{36c}(\alpha, \phi)$ is $\text{ROS}(\Gamma_{\alpha'}, \phi)$, $\alpha'$ is $\text{ALLSUB}(\text{that}_n, \text{that}_n, \alpha)$, and $\delta$ is 'pa' if $\phi \in [+\text{Past}]$ and 'np' if $\phi \in [-\text{Past}]$.

Example: $F_{36a}(\text{promising that}_n, \text{that}_n, (\text{John}) [left] \text{the room}) = \text{promising that}_n, (\text{John}) [left] \text{the room}\text{.}$

On the other hand, if we regard adjuncts like those in (354) and (355) as main tense adverbs, then we must instead revise the rule (see (20) in section 1.3.2) joining a main tense adverb with a temporal abstract:

(357) S59. If $\alpha \in P_{MTA}$ and $\beta \in P_{TAB}$, $\{+$Tense, $\delta$Past, $\zeta$Perfect$\}$, then $F_{59a}(\alpha, \beta)$, $F_{59b}(\alpha, \beta) \in P_{TAB}$, $\{+$Tense, $\delta$Past, $\zeta$Perfect$\}$, where $F_{59a}(\alpha, \beta)$ is $\Gamma_{\alpha'}$, $\beta$, $F_{59b}(\alpha, \beta)$ is $\Gamma_\beta$, $\alpha'$, $\delta$ is $\alpha'$ is $\text{ALLSUB}(\text{that}_n, \text{that}_n, \alpha)$, and $\eta$ is 'pa' if $\beta \in [+\text{Past}]$ and 'np' if $\beta \in [-\text{Past}]$.

Example: $F_{59a}(\text{promising that}_n, \text{that}_n, (\text{John}) [left] \text{the room}) = \text{promising that}_n, (\text{John}) [left] \text{the room}$. 
promising that, (John) [left] the room
My belief is that (357) can be independently motivated, and thus that we can account most economically for the appearance of sequence of tense in adjuncts which don't restrict dyadic operators by analyzing them as main tense adverbs.

(357) is independently motivated by the appearance of sequence of tense in augmented adjuncts like those in (358) and (359) and gerund constructions like those in (360) and (361).

(358) While explaining that he would not attend the meeting, John walked to the window.

(359) When promising that Mary would answer our questions, John stifled a laugh.

(360) After denying that he was under 21, Bill indignantly ordered a pitcher.

(361) Before noticing that John was present, Jane spoke very critically of him.

It is easily shown that the underlined expressions in (358)-(361) cannot be correctly analyzed as adsentential modifiers having wider scope than tense (cf. Dowty 1979:323f); they must be analyzed as main tense adverbs. Thus, in order to account for the appearance of sequence of tense in these expressions, revision (357) must be adopted (given, of course, the assumption of the general approach to sequence of tense presented in section 1.5). If (357) is adopted, we can automatically account for the appearance of sequence of tense in adjuncts like those in (348)-(351), provided we analyze them as main tense adverbs rather than as adsentential modifiers. (356), on the
other hand, is without clear independent motivation. I therefore choose to regard all adjuncts not serving to restrict the interpretation of a modal, frequency adverb, or generalization operator as main tense adverbs.

Let me briefly summarize what we have seen in this subsection. We cannot regard the variant time reference of the adjuncts in sentences (328)-(331) as a variance in scope relative to tense; this is inconsistent with the interpretation of adjuncts (such as that in (338)) which are themselves modified by main tense adverbs. Two alternative analyses are consistent with this interpretation: to treat adjuncts like those in (328)-(331) as wide scope adsentential modifiers whose time reference is inferred, or to treat them as main tense adverbs. The two analyses are nearly identical in their syntactic and semantic consequences; the latter, however, allows adjuncts showing sequence of tense to be analyzed entirely in terms of independently needed rules, which the former does not. In the interests of economy, the latter analysis is adopted.  

4.3 Free adjuncts of category MTA. At this stage, we reject the rule (rule (9) in Chapter II, section 1) converting primal adjuncts into adsentential modifiers, since we no longer assume the existence of adjuncts of category t/t. We replace this rule with the following rule converting adjuncts from the category TA of set-level time adverbs into that of main tense adverbs:

\[(362) \text{S13. If } \alpha \in P_{TA}, [\text{+Adjunct}], \text{ then } F_{13,n}(\alpha) \in P_{MTA},\]

where \(F_{13,n}(\alpha)\) is \(\alpha\).

Example: \(F_{13,6}(\text{walking home}) = \text{walking home}\)
(362) [continued]

T13. If $\alpha \in P_{TA}$ and $\alpha$ translates as $\alpha'$, then

$$F_{13,n}(\alpha) \text{ translates as } \lambda p^t \alpha t[K(L_n)(\alpha'[t])(\{p^t\})]$$

Example: $F_{13,6}(\text{walking home}) \text{ translates as } \lambda p^t \alpha t[K(L_6)(\forall v_1[M(t,t_1) \& AT(t_1, Vx^S[R(x^S,x^i_4) \& working-home'(x^S)])]) (\{p^t\})]$

Assuming this rule, we can analyze sentence (336) as in (363);

(336) Working at the post office, Mary decided to go back to school.

(363) working at the post office, (Mary) [decided] to go back to school, $t$, 58

before we can analyze sentences like (338), we must decide how free adjuncts come to have main tense adverbs: so far, we have only considered rules which join main tense adverbs with temporal abstractions (rule (20), section 1.3.2) or introduce main tense adverbs concomitantly with tense (rules (119) and (120), section 1.4.3); since free
adjuncts are tenseless and do not derive from temporal abstracts, special rules are clearly required to introduce main tense adverbs into free adjuncts.

Free adjuncts of all categories (t', TA, and MTA) show main tense adverbs. For example, the adjunct in (365) may restrict the modal would in the fashion of an if-clause (see Chapter II), and is thus an instance of a primal adjunct with a main tense adverb;

(365) Walking home yesterday evening, he would have seen the new billboard.

the adjunct in (366) may restrict the frequency adverb often (see section 2 of this chapter), and is thus an instance of an adjunct of category TA with a main tense adverb;

(366) Walking home last year, John often stopped to see Mary.

and the adjunct in (338) is an instance of an adjunct of category MTA that is itself modified by a main tense adverb.

(338) Working at the post office during the past summer, Mary decided to go back to school.

The most obvious approach to introducing main tense adverbs into free adjuncts is to introduce them all at the 'level' of primal adjuncts; because all adjuncts ultimately derive from primal adjuncts, this would automatically account for the existence of adjuncts with main tense adverbs in each of the categories t', TA, and MTA. Unfortunately, though this approach is syntactically feasible, it would produce the wrong results semantically, as is easily shown.

I assume that the rule for introducing main tense adverbs into primal adjuncts is (367).
(367) S3. If $\alpha \in P_{MTA}$ and $\beta \in P_{t''}$, then $F_3(\alpha, \beta) \in P_{t''}$,
where $F_3(\alpha, \beta)$ is $\alpha' \beta$.

Example: $F_3(\text{yesterday}, \text{walking home}) = \text{walking home yesterday}$

T3. If $\alpha \in P_{MTA}$, $\beta \in P_{t''}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_3(\alpha, \beta)$ translates as $Vt[\alpha'(t)[AT(t_1, \beta')])(t)]$.

Example: $\text{walking home yesterday}$ translates as $Vt[\text{yesterday}(t) \& AT(t, Vx^s[R(x^s, x^4) \& \text{walking-home}(x^s)])]$.

Primal adjuncts produced by rule (367) can be converted to adjuncts of category TA by rule (241) (discussed in section 2.2); however, they get rather undesirable translations. For example, the adjunct $\text{walking home yesterday}$, if converted to category TA by rule (241), is assigned the translation (368).

(368) $\lambda t Vt_1[M_9(t_1) \& AT(t_1, Vt_2[\text{yesterday}(t_2) \& AT(t_2, Vx^s[R(x^s, x^4) \& \text{walking-home}(x^s)])])$.]

Notice that (369) expresses an eternal proposition.

(369) $Vt_2[\text{yesterday}(t_2) \& AT(t_2, Vx^s[R(x^s, x^4) \& \text{walking-home}(x^s)])]$

For this reason, (368) has an extremely broad denotation: if $M_9$ has the identity relation as its value, (368) denotes the set of all intervals if (369) is true (otherwise the empty set); if $M_9$ has the value of '$<$', (368) denotes the set containing all intervals but the first one in history (if there is one) when (369) is true (otherwise the empty set); and so on. This is clearly not the kind of translation we want for adjuncts of category TA; such translations
would wreak havoc with the interpretation of sentences like (366).

As a member of category TA, walking home yesterday should have a translation like (370).

\[(370) \lambda tV_1[M_g(t,t_1) \& \text{[yesterday}'(t_1) \& AT(t_1, Vx^S[R(x^S,x^S_4) \& \text{walking-home}'(x^S)])]]\]

This translation cannot be obtained from the translation assigned to the primal adjunct walking home yesterday by rule (367). Instead, a separate rule is needed to produce adjuncts of category TA with main tense adverbs; thus, I assume rule (371).^38

\[(371) \text{S11. If } \alpha \in P_{MTA} \text{ and } \beta \in P_{t'}, \text{ then } F_{11,n}(\alpha,\beta) \in P_{TA}, [+\text{Adjunct}], \text{ where } F_{11,n}(\alpha,\beta) \text{ is } [\beta \alpha].\]

Example: \(F_{11,9}(\text{yesterday, walking home}) = \text{walking home yesterday}\)

\[(372) \text{T11. If } \alpha \in P_{MTA}, \beta \in P_{t'}, \text{ and } \alpha,\beta \text{ translate as } \alpha',\beta', \text{ then } F_{11,n}(\alpha,\beta) \text{ translates as } \lambda tV_1[M_g(t,t_1) \& \alpha'(t_2[AT(t_2, \beta')])(t_1)].\]

Example: \(F_{11,9}(\text{yesterday, walking home}) \text{ translates as } \lambda tV_1[M_g(t,t_1) \& \text{[yesterday}'(t_1) \& AT(t_1, Vx^S[R(x^S,x^S_4) \& \text{walking-home}'(x^S)])]].\)

Adjuncts of category MTA which are themselves modified by main tense adverbs can automatically be derived if rule (371) is assumed: rule (371) simply feeds the rule (362) converting adjuncts of category TA to main tense adverbs. Thus, sentence (338) may now be derived as in (372) and thereby assigned the translation (373). (373) induces the desired interpretation for (338), but also reflects the fact that certain aspects of the intuitive meaning of this sentence are inferences (i.e. the understood values of \(L_6, M_g, \) and \(x^S_4\)).
Adjuncts showing sequence of tense are easily derived, provided that the revised version (357) of the rule combining main tense adverbs with temporal abstractions is assumed:

(374) promising that Mary would answer our questions, (John) [left] the room, t, 62, 7
(Mary) [answers] our questions, t, 19
promising that^, (John) [left] the room, t, 19
promising that^, MTA, 13, 6 (John) [left] the room, TAB, 55
promising that^, TA, 10, 9 (John) [leaves] the room, t, 19
promising that^, t', 2, 4
promising that^, PRPL^, 46
[promise] that^, IV^, 20
[promise] that^, IV^, 26, 7
[promise], IV^/t

(373) \( Vt[K(L_{t}) \vee [M_{g}(t, t_{1}) \& \text{[during-the-past-summer]}(t_{1}) \& \text{AT}(t_{1}, Vx^{S}[R(x^{S}, x_{4}^{i}) \& \text{working-at-the-post-office}'(x^{S})))]]) (\text{[past}(t) \& \text{AT}(t, \text{Mary-decides-to-go-back-to-school}')]) \)

Adjuncts showing sequence of tense are easily derived, provided that the revised version (357) of the rule combining main tense adverbs with temporal abstractions is assumed:
Here, the rule S46 converting individual-level intransitive verb phrases to individual-level present participial phrases is tentatively assumed to have no semantic effects; in section 2.2 of Chapter IV, this will be shown not to be so.)

At this stage, we might briefly return to sentences (329) and (331).

(329) Being thirty-three years old, John will be eligible to run for president in 1984.

(331) Being thirty-five years old, John will be eligible to run for president in 1984.

Recall that the adjunct in (329) can be understood to specify John's present age, and that the adjunct in (331) can be understood to specify John's age in 1984. Under the 'relativ e scope' analysis, this variant time reference was formalized as variant scope relative to the tense of the superordinate clause. In the present analysis, on the other hand, (329) and (331) have isomorphic syntactic analyses:

(376) being 33 years old, (John) [will] be eligible to run for president in 1984, t, 58

being 33 years old, (John) [will] be eligible to run for president in 1984, TAB, 59a

being 33 years old, (John) [will] be eligible to run for president in 1984, MTA, 13, 6

being 33 years old, (John) [will] be eligible to run for president in 1984, TAB, 59b

being 33 years old, (John) [will] be eligible to run for president in 1984, MTA, 67

being 33 years old, TA, 10, 9

being 33 years old, t, 2, 4 (John) [is] eligible to run for president, t, 19
And they are assigned parallel translations:

\[(378) \, Vt[K(L_6)](\text{"}Vt_1[M_9(t,t_1) \& AT(t_1, \text{being-35-years-old}(x_4^0))\"}[\text{in-1984'}(t) \& [\text{FUT}(t) \& AT(t, John-is-eligible-to-run-for-president')]])] \]

\[(379) \, Vt[K(L_6)](\text{"}Vt_1[M_9(t,t_1) \& AT(t_1, \text{being-35-years-old}(x_4^0))\"}[\text{in-1984'}(t) \& [\text{FUT}(t) \& AT(t, John-is-eligible-to-run-for-president')]])] \]

In short, the variant time reference observed in (329) and (331) is regarded as inferred: in (378), \(M_9\) may be inferred to have a value which requires \(t_1\) to denote the present interval; in (379), \(M_9\) may be inferred to have an identity relation as its value; and so on.

The inferred time reference of adjuncts of category MTA is not wide open, however; on the contrary, it is subject to rather substantial pragmatic restrictions, as will be seen in Chapter VI.

In this chapter, we have seen a number of ways in which adjuncts behave like time adverbs: weak adjuncts were seen to function like time adverbs in restricting the interpretation of relative frequency adverbs (section 2) and the generalization operator \(G'\) proposed in section 3 for the analysis of certain kinds of generic sentences;
and it was found in section 4 that both strong and weak adjuncts can play the role of main tense adverbs, which join with tense to characterize a single interval. Also, the distinction between strong and weak adjuncts established in Chapter II has been repeatedly reinforced in this chapter.

Although we have seen that free adjuncts may show the general behavior of time adverbs, we have so far offered no explanation for the fact that a given adjunct may be felt to function as a very specific sort of time adverb. For example, the adjunct in (380) is understood roughly as a while-adverbial, while that in (381) has the approximate role of an after-adverbial.

(380) Crossing the street, he was almost hit by a car.

(381) Getting down from his highchair, he crawled into the living room.

This problem will be addressed in Chapter VI.
Footnotes—Chapter III

1 The reason for defining the past tense predicate in this way will be taken up in Chapter IV.

2 Dowty (1979:354) defines an index of possible utterance as one whose temporal coordinate consists of exactly one moment. I choose to allow the temporal coordinate of an index of possible utterance to be a longer interval of time because of such sentences as (i);

   (i) John often stops to see Mary on his way home.

in my analysis (see section 2 of this chapter), (i) entails that each of the relevant occasions of John's stopping to see Mary occurs within a single, broad interval of time which is 'conceptually present' to the speaker. Of course, the temporal coordinate of an index of possible utterance may consist of a single moment in my analysis.

3 That is, main tense adverbs are regarded as denoting functions of type $<s,<i,t>,<i,t>>$, rather than functions of type $<s,<i,t>,t>$ (as Dowty (1979:326f) has advocated). This is motivated in part by the fact that a single tensed sentence may be modified by an indefinite number of main tense adverbs (see section 1.3.2). (As Dowty has pointed out to me, the iteration of time adverbs can be accounted for under the $<s,<i,t>,t>$ analysis if it is assumed that multiple main tense adverbs form a constituent; this, however, is a questionable assumption—cf. (i)—and is in no way necessitated by the analysis adopted here.)

   (i) Yesterday John saw Mary while he was walking home.

4 S67 applies only to members of TA that aren't free adjuncts; see section 4.3 for discussion of the rule converting adjuncts of category TA to category MTA. The latter rule is necessary because adjuncts of category MTA may bear more than just a temporal relation to their superordinate clause; thus, this rule introduces 'K(L)' into the translation of an adjunct of category MTA.

5 Rules S55-S57 will all be slightly revised in section 1.5 of this chapter; rule S59 will be revised in section 4.

6 Dowty (1979:325) suggests that a sentence like John will leave today conventionally implicates (rather than entails) that $i$ is in the future, where $i$ is the interval of John's alleged departure. Under this approach, a sentence like John will leave yesterday is not contradictory, nor is a sentence like John will not leave yesterday tautologous; but they are both inappropriate, because their entailments conflict with their conventional implicatures. This approach is founded on the assumption that an unasserted (or unassertable) aspect of the meaning of a sentence does not contribute to its truthconditions.
As this is not an uncontroversial assumption (it would, for example, force us to regard John left on Thursday and John will leave on Thursday as truthconditionally equivalent), I prefer to assume that John will leave yesterday is a contradiction, and John will not leave yesterday a tautology, and that their pragmatic peculiarity is simply a consequence of these facts; nothing in my analysis depends on this assumption, however.

7Dowty (to appear) does give a treatment of sentences like (41) that assigns the shifting interpretation, but his overall analysis is incompatible with other facts about the interpretation of embedded tensed sentences as I understand these facts to be.

8Note that without such a context variable, after Mary sang would just denote the whole set of intervals following the first one at which Mary sang; similarly, before Mary sang would denote the whole set of intervals preceding the last interval at which Mary sang.

9I am of course ignoring certain other interpretations of (59): the interpretation in which the subordinate clause Mary was leaving functions as a 'shifted present', and the two interpretations (parallel to those represented by (61) and (62)) in which Mary was leaving serves as a 'shifted futurate progressive' (cf. Dowty 1979:154ff). The fragment developed here is capable of producing the first of these three additional interpretations. See section 1.5.

10(72) isn't acceptable unless it is construed as a narrative present; however, as Heinämäki (1974:34) points out, present tense sentences with while-adverbials are sometimes acceptable with a nonnarrative interpretation—cf. her example (i).

(i) I am reading "Elephants can remember" while Alyne is watching "Maude" on the TV.

It appears that this type of sentence is acceptable when the simultaneous events/states of affairs to which it relates are understood to have been planned (or at least expected) to coincide.

11Rules S69 and S70 are revised in section 1.5.

12Rules S71 and S72 are revised in section 1.5.

13Sentences like these are sometimes acceptable when a 'cyclic' concept of time is assumed. For example, in a context in which Mary arrived at 2:00 p.m. yesterday, (123) can be acceptably used to assert that John will leave at 2:00 p.m. sometime in the future. Cyclic interpretations like this appear to be possible for when-, before-, and after-adverbials; interestingly, while-adverbials appear not to have such an interpretation. Interpretations of this sort are not induced by the fragment developed here; they would appear to require a model structure incorporating a cyclic (rather than linear) ordering
of time intervals.

According to Stalnaker (1978:321), 'the presuppositions of a speaker are the propositions whose truth he takes for granted as part of the background of the conversation. A proposition is presupposed if the speaker is disposed to act as if he assumes or believes that the proposition is true, and as if he assumes or believes that his audience assumes or believes that it is true as well.'

Instances of temporal adverbial clauses with marked future tense do show up in archaic forms of English:

(i) Immediately after they shall be assembled in consequence of the first election, they shall be divided as equally as may be into three classes.
(U. S. Constitution I.3.2)

Nevertheless, in modern-day standard English, this is not done; (i) would be 'Immediately after they are assembled...'

Cf. McCawley (1978), where it is argued that given two equivalent expressions, the use of the more complex one implicates that the less complex one is somehow inappropriate in the circumstances at hand. It is hard to imagine what sort of circumstances would make (142) but not (127) inappropriate.

Actually, this isn't quite accurate, because the 'extraction site' in $ may be in an embedded clause. For simplicity's sake, I will ignore when-adverbials of this sort in this section; their truthconditions will, in any event, be analogous to those for the simpler sort of when-adverbial in which the 'extraction site' is in the highest clause.

Dowty (1979:88ff) assumes that sentences with achievement predicates are true at nonminimal intervals, because they may occur in the progressive. Nevertheless, I believe that sentences with 'instantaneous achievement predicates' such as spot (as in He spotted an elephant through his binoculars) may only be true at a moment; note the oddness of ??He was spotting an elephant.

Another possible analysis of when is to assume that $ when $ is true iff the interval at which $ is true is identical with or closely precedes that at which $ is true (where 'close precedence' varies contextually). Under such an analysis, the intuitive truth-conditions for sentences like (162) and (163) could be accounted for semantically, without recourse to pragmatic considerations. On the other hand, unlike the approach I have assumed, such an analysis would have to resort to pragmatics to explain the acceptability of the contrasts exemplified in (166).
20 These are essentially the truthconditions implied by Bennett and Partee (1972:31).

21 Here again I am ignoring the possibility that the 'extraction site' in $\psi$ may be in an embedded clause; I am also ignoring the contribution made by the context variable $M$ to the semantics of before-adverbials in my analysis. The truthconditions which I assume are essentially those of Bennett and Partee (1972:32).

22 Heinämäki also discusses the truthconditions for sentences in which before functions as a kind of modal connective. Such sentences will be ignored here.

23 Once again I neglect cases in which the 'extraction site' in $\psi$ is embedded. The truthconditions assumed here are basically those of Bennett and Partee (1972:32).

24 The superscripts introduced by the revised versions of S55-S57 are in violating of Partee's (1979) 'well-formedness constraint' (WFC). I believe that they can be eliminated by the introduction of a different sort of formalism—labelled bracketing—which doesn't violate the WFC; however, I choose to tolerate the ill-formedness of expressions like (John) [said] that$^{2a}$ for reasons of expository simplicity, and because the account of sequence of tense is not central to my analysis of free adjuncts and absolutes.

25 See Stump (1981) for a discussion of these two sorts of adverbs.

26 The motive for interpreting relative frequency adverbs as two-place relations rather than as functions is thus very much like the reason for interpreting modals relationally—to 'factor out' a recurrent context dependency. Cf. Chapter II, section 3.

27 As we have seen, relative frequency adverbs specify frequencies the average length of whose periods is proportional to the length of some other interval. They are, however, usually vague with respect to the proportion which they determine in a given context: for example, even if we know the length of the commercial in question, sentence (i) is vague regarding the number of times the fly landed on my foot.

(i) During the commercial, the fly often landed on my foot.

Also, the individual periods into which a relative frequency adverb divides a given interval (or sequence of intervals) may vary in length; for example, if different sailors have strolled by at 1:07, 1:20, 1:29, and 1:51, we can truthfully say Occasionally a sailor has strolled by at 2:00, even though there is no fixed frequency with which sailors have gone by.

28 In section 4, I will argue that what I have been regarding as adsentential adjuncts may always be analyzed as main tense adverbs;
I will therefore suggest that the category 𝑡/𝑡 of ad sentential modifiers does not have adjuncts among its members. Accordingly, the rule S13 converting primal adjuncts to ad sentential modifiers (discussed as (9) in Chapter II, section 1) will be dispensed with. New analyses for sentences (210a) and (211a) will be provided.

29. The value inferred for 𝑀₂ in (252) will, of course, specify the appropriate relation between the intervals denoted by 𝑡₁ and 𝑡₂; notice, however, that it may additionally specify that these intervals satisfy some tense predicate, e.g., 'PRES(𝑡)'. If this were not the case, (252) might not induce the right interpretation for (211b).

30. An analogous point has already been made with respect to modals—see the discussion accompanying example (66) in Chapter II.

31. This is an additional reason for supposing that the be in be asleep translates as \( \lambda P^S x^1 \lambda x^2 [R(x^2,x^1) \land P^S(x^1)] \) (as in (111) in Chapter II): this translation guarantees that be asleep (translation: \( \lambda x^1 \lambda x^2 [R(x^2,x^1) \land asleep'(x^2)] \)) will not be a possible candidate for generalization.

32. As was noted in footnote 28, ad sentential adjuncts will be reanalyzed as main tense adverbs in section 4; sentences (266) and (267) will be assigned new analyses.

33. As will be seen in Chapter VI, strong adjuncts can freely relate to either of these intervals; weak adjuncts, however, are normally inferred to relate to the same time as their superordinate clause.

34. Williams (1975:267) asserts that free adjuncts ('adverbial participles') cannot have sentence adverbs, citing the 'strangeness' of (i) as evidence.

(i) ?Sam, predictably seeking Mary's favor, is a fool.

I have found no such restriction on the natural occurrences of free adjuncts which I have collected:

(ii) As the mare labored up the ravine, he dismounted and walked beside her, occasionally stroking her muzzle. (OSI, 326)

(iii) Predictably defensive, evangelical politicians charge that such criticisms are themselves political sour grapes from liberal opponents. (Newsweek 9/15/80, 31)

35. Recall from section 1.2 of Chapter I that an augmented adjunct is an adverbial construction consisting of a subordinating conjunction plus a predicative phrase. In the fragment developed here, the following rule introduces augmented adjuncts into the category $T_A$ of
set-level time adverbs:

S12. If $\alpha$ is when or while and $\beta \in P_{t'}$, then $F_{12}(\alpha, \beta) \in P_{TA}$,

[-Adjunct], where $F_{12}(\alpha, \beta)$ is $\alpha \beta^T$.

Example: $F_{12}(\text{when, walking home}) = \text{when walking home}$

T12. If $\alpha \in P_{TSC}$, $\beta \in P_{t'}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{12}(\alpha, \beta)$ translates as $\alpha'(\text{AT}(t', \beta'))$.

Example: when walking home translates as

$$\lambda t Vt_1[t = t_1 \& \text{AT}(t_1, Vx^S[R(x^S, x^S)]) \&$$

$$\text{walking-home'}(x^S)]$$

Since the expressions produced by S12 are in the subcategory [-Adjunct], they may be converted to main tense adverbs by rule S67 ((9) above).

As a consequence of adopting this analysis, we must assign new derivations to sentences containing what were previously analyzed as adsentential adjuncts with wide scope.

For example, sentences (210a) and (211a), in which a strong adjunct has wide scope relative to a relative frequency adverb, are to be reanalyzed as in (i) and (ii) (cf. (250), (253)):

(i) being a sailor, (John) sometimes [smokes] a pipe, $t$, 58

being a sailor, (John) sometimes [smokes] a pipe, TAB, 59a

being a sailor, MTA, 13,6 (John) sometimes [smokes] a pipe, TAB, 65,3

being a sailor, TA, 10,9 sometimes, (John) [smokes] a pipe, TAB, 56

being a sailor, $t'$, 2,4 (John) [smokes] a pipe, $t$, 19

$Vt[K(L_6)(\text{\textit{Vt}_1[M_{t_1}(t, t_1) \& \text{AT}(t_1, \text{being-a-sailor'}(x_2))]})$

($\text{\textit{sometimes'}}(I_3)(\text{\textit{at}}[t_1 = t \& [\text{PRES}(t_1) \&$

$\text{AT}(t_1, \text{John-smokes-a-pipe'})]])])$
(ii) weighing four tons, (our truck) often [makes] the bridge shake, t, 58

weighing four tons, (our truck) often [makes] the bridge shake, TAB, 59a

weighing four tons, (our truck) often [makes] the bridge shake,

TA, 10,9 RFA

weighing four tons, often, (our truck) [makes] the bridge shake,

TA, 10,9 RFA

weighing four tons, t', 2,4 (our truck) [makes] the bridge shake,

t, 19

Vt[\(L_6^{(*)}\)]\(Vt_1[M_9(t, t_1) \& AT(t_1, \text{weighing-four-tons'}(x_2^0))]\)

\(\langle\text{often'}(I_3)\rangle\langle t_1 \subseteq t \& [PRES(t_1) \& AT(t_1, \text{our-truck-makes-the-bridge-shake'})]\rangle\)]

Similarly, sentences (266) and (267), in which a strong adjunct has wide scope in a generic sentence, must be reanalyzed as in (iii) and (iv) (cf. (321) and (322)):

(iii) being a businessman, (John) [smokes] cigars, t, 58

being a businessman, (John) [smokes] cigars, TAB, 59a

being a businessman, MTA, 13,6 (John) [smokes] cigars, TAB, 56

being a businessman, TA, 10,9 (John) [smokes] cigars, t, 19

being a businessman, t', 2,4 John, T [smoke] cigars, IVi, 21

[smoke] cigars, IVs, 27

Vt[K(L_6^{(*)})]Vt_1[M_9(t, t_1) \& AT(t_1, \text{being-a-businessman'}(x_2^0))] \n
\(\langle[PRES(t) \& AT(t, G(\text{smoke-cigars'})(\text{John}'))]\rangle\)]

(iv) being a drunk, (he_0) [drives] very dangerously, t, 58

being a drunk, (he_0) [drives] very dangerously, TAB, 59a

being a drunk, MTA, 13,6 (he_0) [drives] very dangerously, TAB, 56

being a drunk, TA, 10,9 (he_0) [drives] very dangerously, t, 19

being a drunk, t', 2,4 he_0, T [drive] very dangerously, IVi, 21

[drive] very dangerously, IVs, 27
Finally, sentences in which an adjunct has wide scope in a modal context must be reanalyzed. Thus, sentence (v) is analyzed as in (vi) (cf. (69) in Chapter II, section 3.2):

(v) Having unusually long arms, John can touch the ceiling.

(vi) having unusually long arms, (John) [can] touch the ceiling, t, 58

having unusually long arms, (John) [can] touch the ceiling, TAB, 59a

having unusually long arms, MTA, 13,6

having unusually long arms, TA, 10,9

having unusually long arms, t', 2,4

\[\text{Vt}[\mathcal{K}(L_6)(^*\text{Vt}_1[\mathcal{M}_9(t,t_1) & \text{AT}(t_1, \text{being-a-drunk}')(x_9)])]

\[\text{PRES}(t) & \text{AT}(t, G(\text{drive-very-dangerously}')(x_9)))]\]

\[\text{Vt}[\mathcal{K}(L_6)(^*\text{Vt}_1[\mathcal{M}_9(t,t_1) & \text{AT}(t_1, \text{having-unusually-long-arms}')(x_9)])](\text{PRES}(t) & \text{AT}(t, \text{can}')(C(cb)(\text{John-touches-the-ceiling}')))\]

\(^{37}\)Recall that rule S67 converts nonadjuncts of category TA to the category MTA of main tense adverbs; see (9) in section 1.2 and footnote 4.

\(^{38}\)Note that this analysis depends on the existence of strong adjuncts of category TA (since there are strong adjuncts of category MTA which derive from them) even though strong adjuncts never show up as the first argument of a relative frequency adverb or generalization operator. My belief is that such uses of strong adjuncts are not to be ruled out syntactically (e.g. by removing all strong adjuncts from the category TA), but are instead to be regarded as pragmatically anomalous. See Chapter VI.

\(^{38}\)We must somehow rule out those adjuncts resulting from the application of rules (241) and (371) to primal adjuncts produced by (367). Perhaps we should simply say that such adjuncts are pragmatically anomalous because they are essentially devoid of informational content.
CHAPTER IV
ASPECT AND THE INTERPRETATION OF FREE ADJUNCTS

In this chapter, new analyses are presented for the perfect and the progressive in English. In section 1, it is shown that the so-called 'extended now' theory of the perfect, distinguished by McCoard (1978) as the most satisfactory of four alternatives, is inadequate to account for the use of the perfect in free adjuncts (and other constructions); an alternative to this theory is proposed. In section 2, a semantics for present participial phrases is developed; it is demonstrated that the semantic peculiarities of present participial adjuncts follow from this analysis, which additionally allows the progressive to be reduced to a predicative participle construction. The rules presented here appear in the formal fragment presented in the Appendix.

1. The perfect tense and the interpretation of free adjuncts. As we saw in Chapter III, one of the most salient features of any relation holding between the propositions expressed by a free adjunct and its superordinate clause is its temporal dimension. The two propositions may be felt to stand in any of a range of different temporal relations --precedence, simultaneity, subsequence, and so on. The precise nature of the relation is normally inferred by language users;\(^1\) see
Chapter VI for a discussion of inferred temporal relations.

One special way of explicitly indicating a relation of temporal succession in free adjunct sentences is to employ the perfect in the adjunct:

(1) Having been on the train, John knows exactly why it derailed.

The propositions expressed by the free adjunct and its superordinate clause are felt to be simultaneously true in such sentences; (1) is understood to mean that (2) and (3) are simultaneously true.

(2) John has been on the train.

(3) John knows exactly why it derailed.

But the perfect establishes a relation of succession between the proposition on which it operates and the proposition expressed by the main clause; thus, if (2) and (3) are both true at some interval $i$, then by virtue of the meaning of the perfect, sentence (4) will normally be true at some interval preceding or ending with $i$.

(4) John is on the train.

A peculiarity of perfect adjuncts is the fact that they occur with a broader range of time adverbs than do finite clauses in the present perfect. For example, although both (5a,b) are acceptable, only (6a) is possible for most speakers.

(5) a. Having been on the train since noon, John knows exactly why it derailed.

   b. Having been on the train yesterday, John knows exactly why it derailed.

(6) a. John has been on the train since noon.

   b. *John has been on the train yesterday.
Superficially, this has the appearance of a completely idiosyncratic fact. Yet, as I shall now argue, it has profound implications for the analysis of the English perfect. In particular, I shall show that the 'extended now' theory of the perfect, distinguished by McCoard (1978) as the most adequate of several alternatives, is insufficient to predict the difference in acceptability between (5b) and (6b); I shall present a revision of this theory which embodies certain generalizations overlooked by McCoard, and from which the difference between (5b) and (6b) follows automatically.

1.1 The semantic unspecificity of the perfect. In his recent monograph on the semantics of the English perfect, Robert McCoard (1978) discusses four major analyses of the perfect which appear recurrently--though in a variety of guises--throughout the rather prodigious literature on this subject. After reviewing a considerable body of evidence, McCoard concludes that three of these are inadequate, either because they mistakenly equate the meaning of the perfect with some pragmatic implication associated with the perfect in certain contexts, or because they depend on an erroneous identification of the perfect with a complex configuration of simple tenses. The only defensible analysis, he argues, is what he calls the 'extended now' theory.

This theory is based on a distinction between two sorts of time intervals. At a given interval i, those intervals which precede i and are separated from i are termed past intervals, as in (7). Those intervals which end with i, on the other hand, are called extended nows, as in (3).
(7) $i'$ is a past interval relative to $i$.

(8) $i'$ is an extended now relative to $i$.

The extended now theory holds that the function of the perfect is to locate an event within an extended now, while the function of the preterit is to locate an event at some past interval. According to this analysis, sentence (9) is true at interval $i$ iff sentence (10) is true sometime during an extended now relative to $i$, as in (11).

(9) John has seen Mary.

(10) John sees Mary.

(11) (9) is true at $i$ iff (10) is true at $i'$.

The preterit sentence (12), on the other hand, is true at interval $i$ iff sentence (10) is true at some past interval relative to $i$, as in (13).

(12) John saw Mary.

(13) (12) is true at $i$ iff (10) is true at $i'$.

[i' is a past interval relative to $i$.]
We can formally represent these distinct truthconditions by introducing an intensional logic predication \( \text{xn}(\xi) \) such that, where \( \xi \) denotes interval \( i \)', \( \text{xn}(\xi) \) is true at index \( <w,i> \) iff \( i \) is a final subinterval for \( i \}'. Given this addition, translations (14) and (15) embody the truthconditions for (9) and (12) prescribed by the extended now theory.²

\[
\text{(14)} \quad \forall t[\text{xn}(t) \land \forall t_1(t_1 \subseteq t \land \text{AT}(t_1, John-sees-Mary')])
\]

\[
\text{(15)} \quad \forall t[\text{past}(t) \land \text{AT}(t, John-sees-Mary')]
\]

In this theory, the perfect is rightly regarded, not as an aspect, in the strict sense, but as a tense. (See McCoard (1978: Chapter 1) for arguments to this effect.)

The special merit of the extended now theory is that it affords a semantic account of which sorts of time adverbs may occur with the present perfect and which may not. While some time adverbs, such as those in (16), may occur with either the present perfect or the preterit, others, such as those listed in (17), occur only with the preterit, and still others, like those listed in (18), only with the present perfect. (Cf. McCoard 1978:135.)

\[
\begin{align*}
\text{(16)} & \quad \text{today} & \text{(17)} & \quad \text{long ago} & \text{(18)} & \quad \text{at present} \\
\text{in the past} & \quad \text{five years ago} & \text{up till now} \\
\text{in my life} & \quad \text{once [= formerly]} & \text{so far} \\
\text{for three hours} & \quad \text{yesterday} & \text{as yet} \\
\text{recently} & \quad \text{the other day} & \text{not yet} \\
\text{just now} & \quad \text{last night} & \text{during these} \\
\text{this week} & \quad \text{in 1900} & \text{five years} \\
\text{already} & \quad \text{at 3:00} & \text{past} \\
& \quad \text{after the war} & \text{lately} \\
& \quad \text{no longer} & \text{before now} \\
& \quad & \text{since noon}
\end{align*}
\]

This difference is illustrated in examples (19)-(21).

\[
\text{(19)} \quad \text{John (has been) on the train today.}
\]
To see how the extended now theory accounts for these facts, we must consider the semantic distinction between the three sorts of adverbs listed in (16)-(18), and the way in which adverbs enter into the interpretation of perfect sentences.

The adverbs in (16)-(18) are regarded as expressions of the category $MTA$ of main tense adverbs, and thus as denoting functions from properties of time intervals to sets of time intervals. They do, however, have three distinct sorts of denotations. At a given index $<w,i>$, the adverbs in (16) in general denote functions from properties to sets containing both past intervals and extended nows relative to $i$; for example, the denotation of $\text{today}$ is that of (22), as we have already seen (see (7a) in Chapter III, section 1.2).

$$\lambda t\lambda x[\{\text{day}'(t_1) \& \text{NOW} \subseteq t_1 \& t \subseteq t_1\}] \& p^t(t)$$

The adverbs in (17), on the other hand, denote functions from properties to sets of past intervals; $\text{yesterday}$, for instance, has the denotation of (23) (see (7b) in Chapter III, section 1.2), where $\text{today}'$ is (24).

$$\lambda t\lambda x[\{\text{day}'(t_1) \& \text{At}_1[\text{today}'(t_2) \rightleftharpoons t_1 < t_2 \& \text{At}_2[[t_1 < t_2 \& t_3 < t_2] \rightarrow \text{today}'(t_3)]] \& t \subseteq t_1\}] \& p^t(t)$$

Finally, the adverbs in (18) all denote functions from properties to sets of extended nows; $\text{since noon}$, for instance, translates as (25).
(25) \[ \lambda P^t \lambda t[[x^n(t) \& Vt_1[[noon')(t_1) \& Vt_2[xay')(t_2) \&
[t_1 \leq t_2 \& now \leq t_2]]] \& t_1 < t]] \& P^t(t) \]

Now, recall from Chapter III that main tense adverbs join with
tense to characterize a single interval. Thus, the preterit sentence
(26) is true at interval i iff there is some past interval relative to
i at which (4) is true and which is in the denotation of (27) at i.

(26) John was on the train yesterday.

(4) John is on the train.

(27) \[ \lambda t Vt_1[[day')(t_1) \& At_2[[today')(t_2) \rightarrow [t_1 < t_2 \&
At_3[[t_1 < t_3 \& t_3 < t_2] \rightarrow today')(t_3)]]] \& t \leq t_1 \]

These truth conditions are captured by the translation (28) for (26)
(where yesterday" is (23)):

(28) \[ Vt[yesterday')(t_1[[past(t_1) \& AT(t_1, John-is-on-the-
train')]](t)] \]

The case of the perfect is analogous under the extended now theory:
main tense adverbs join with the present perfect tense to characterize
a single interval. Thus, the present perfect sentence (6a) is true
at interval i iff there is an extended now relative to i which is in
the denotation of (29) at i and during which (4) is true. (NB: It
is the extended now, and not its subinterval, which must be in the
denotation of the main tense adverb.)

(6a) John has been on the train since noon.

(29) \[ \lambda t[x^n(t) \& Vt_1[[noon')(t_1) \& Vt_2[xay')(t_2) \& [t_1 \leq t_2 \&
now \leq t_2]]] \& t_1 < t]] \]

These truth conditions are embodied in the translation (30) for (6a)
(where since-noon" is (25)).
If perfects and preterits are interpreted in this way, then the unacceptable sentences (31) and (32) turn out to be contradictions—in both sentences, the tense and the time adverb give rise to conflicting entailments.

(31) *John was on the train since noon.

(32) *John has been on the train yesterday.

For (31) to be true at interval i, there would have to be some past interval relative to i that is in the denotation of (29) at i; but there can be no such interval, since every member of this set is an extended now relative to i. Likewise, if (32) were true at interval i, then there would have to be some extended now relative to i that is a member of the set denoted by (27) at i; but this is impossible, since members of the latter set will always be separated from i. Note that sentences (33) and (34) are, on the other hand, both acceptable, because the denotation of (24) at interval i contains both past intervals and extended nows relative to i.

(33) John has been on the train today.

(34) John was on the train today.

As these few examples suggest, the extended now theory of the perfect affords a subtle and intuitive account of how time adverbs join with tenses in English. (For a much more detailed account along these lines, see Dowty (1979:339ff).)

In this section, I shall argue that the central claim of the extended now theory—that the function of the perfect is to locate
an event within an extended now—is wrong; an alternative conception of the perfect will be proposed. The latter can be most easily grasped if a new piece of terminology is introduced: any interval which begins earlier than some interval $i$ and lasts no later than $i$ is to be a perfect interval relative to $i$, as in (36).

$$(36) \ i_1, i_2, i_3 \text{ are perfect intervals relative to } i.$$ 

My claim is that the real function of the perfect is to locate an event within a perfect interval; that is, I shall argue that the semantics of the perfect is such that (9) is true at interval $i$ iff (10) is true sometime during a perfect interval relative to $i$, as in any of the situations represented in (37). (This analysis predicts exactly the same truth conditions as the extended now analysis for perfect sentences without main tense adverbs; when such adverbs are present, however, they make crucially distinct predictions, as I shall show immediately below.)

(9) John has seen Mary.

(10) John sees Mary.

This claim—that the function of the perfect is to locate an event within a perfect interval—would appear to be immediately contradicted by the anomaly of (32); but I shall argue that this is a pragmatic anomaly, not a semantic one, as the extended now theory implies.
(37) (9) is true at i iff (10) is true at a subinterval of i'.

\[ \begin{array}{c}
\text{i} \\
\text{i'} \\
\text{i} \\
\text{i'} \\
[\text{i'} \text{ is a perfect interval relative to } \text{i}.]
\end{array} \]

Consider sentence (1) again.

(1) Having been on the train, John knows exactly why it derailed.

The free adjunct in this sentence is headed by the have of the perfect. The extended now theory predicts that adjuncts of this sort will contain time adverbs like since noon, but not those like yesterday, which, it is argued, are semantically incompatible with the perfect. Yet, as we observed above, perfect adjuncts may contain adverbs of either sort:

(5) a. Having been on the train since noon, John knows exactly why it derailed.

b. Having been on the train yesterday, John knows exactly why it derailed.

There is, however, an intuitive difference between (5a) and (5b): if we paraphrase these with sentences (38) and (39), which have full adverbial clauses instead of free adjuncts, we find that while the perfect construction in sentence (5a) functions essentially like a present perfect, that in (5b) has the function of a preterit.
(38) Because he \( \text{has been} \) on the train since noon, John knows exactly why it derailed.

(39) Because he \( \text{has been} \) on the train since noon, John knows exactly why it derailed.

The use of the perfect construction in a preterit role is in fact very widespread. It shows up in every nonfinite structure that admits the perfect; in the structures in (40), for example, the underlined phrases can function as present perfects or as preterits, depending on the accompanying adverb.

(40) Marked infinitive complements:

Bill seems \text{to have slept} \( \text{since noon, yesterday} \).

Unmarked infinitive complements:

Mary may \text{have played the piano} \( \text{since noon, yesterday} \).

Adverbial infinitives:

To have done the entire job \( \text{since noon, yesterday} \), John must have had help.

Gerunds:

In spite of \text{having studied} \( \text{since noon, yesterday} \), John isn't confident of passing.

His \text{having been in New York} \( \text{since noon, yesterday} \) is hard to explain.

Participial absolutes:

His father \text{having driven} \( \text{since noon, yesterday} \), John wants to take the wheel.

'Reduced relative clauses':

Anyone \text{having spoken with Anne} \( \text{since noon, yesterday} \) should contact the police.

Furthermore, the perfect construction may serve as a preterit in the
past and future perfects. These compound tenses are normally analyzed as the preterit or future of a present perfect; and this analysis would appear to be correct in the case of sentences like (41) and (42).

(41) John had worked on the problem since noon.
(42) John will have worked on the problem since noon.

But the acceptability of sentences like (43) and (44) compels us to admit that the past and future perfect constructions may express the preterit or future of a preterit; otherwise, sentences (43) and (44) would be fully as anomalous as (45).

(43) John had worked on the problem the day before.
(44) John will have worked on the problem the day before.
(45) *John has worked on the problem yesterday.

It appears, then, that the perfect construction can assume a preterit function in any nonfinite structure in which it may appear, as well as in the preterit and future tenses—in other words, everywhere but in the present tense (when there is no modal present). But it is just the present perfect that is actually in competition with the preterit—there is nothing comparable to the preterit with which the perfect may contrast in nonfinite constructions or in the preterit or future tenses. This is a critical fact in the analysis which I now propose for the perfect.

In my analysis, the preterit tense is assumed to locate an event at some past interval—exactly as in the extended now theory. The perfect, however, receives a much broader interpretation: a perfect sentence ϕ without a time adverb is true at interval i iff the
tenseless form ψ of φ is true sometime during a perfect interval relative to i; a perfect sentence ϕ with a time adverb α is true at i iff there is some perfect interval which is in the set of intervals determined by α and during which ψ is at some time true. Thus, sentence (9) is true at i iff (10) is true sometime during a perfect interval relative to i;

(9) John has seen Mary.
(10) John sees Mary.

and sentence (6a) is true at i iff there is some perfect interval relative to i which is a member of the denotation of (29) at i and during which (4) is at some time true.

(6a) John has been on the train since noon.

We can elucidate this proposal formally by introducing a new intensional logic predicate 'perf(ζ)': where ζ denotes a time interval i', let perf(ζ) be true at index <w,i> iff i' begins before i and lasts no later than i—that is, let perf(t) have the denotation of (47).

(47) \[ V_{t_1}[t_1 \subseteq t & t_1 < \text{now}] & \neg V_{t_1}[t_1 \subseteq t & \text{now} < t_1] \]

The proposed interpretation for (9) and (6a) can now be induced by the respective translations (48) and (49).

(48) \[ V_t[\text{perf}(t) & V_{t_1}[t_1 \subseteq t & \text{AT}(t_1, \text{John-sees-Mary'})]] \]
(49) \[ V_t[\text{since-noon"(t_1[\text{perf}(t_1) & V_{t_2}[t_2 \subseteq t_1 & \text{AT}(t_2, \text{John-is-on-the-train'})]][t])] \]

Because a perfect interval may be either a past interval or an extended now, my analysis predicts that percepts will occur acceptably both with adverbs like since noon and with those like yesterday; this prediction is borne out in the vast majority of cases, as we have
seen--everywhere but in the present tense. The present perfect is distinguished because it directly competes with the preterit; this, I claim, is the source of the unacceptability of sentences like (32).

(32) *John has been on the train yesterday.

In his article 'Conversational Implicature and the Lexicon', McCawley (1978) argues that 'what is conversationally implicated by an utterance depends not only on the utterance but on what other utterances the speaker could have produced but did not' (p.245); he discusses several cases 'in which an utterance conversationally implicates something by virtue of its "taking more effort" or "taking the speaker further out of his way" than some alternative utterance.' For example, he points out that though we can say something is pale green, pale blue, or pale yellow, it's odd to say that something is pale red, owing to the availability of the adjective pink; consequently when we do say that something is pale red, we conversationally implicate that pink for some reason does not apply--that we're talking about some color intermediate between red and pink, even though this may be much less pale than colors like pale green or pale blue. The case of the present perfect is analogous to this and other examples discussed by McCawley.

When we use a present perfect sentence like (9), we conversationally implicate that we have a reason for not using the corresponding preterit (12), namely that John's seeing Mary happened during some extended now which we find especially salient.

(9) John has seen Mary.

(12) John saw Mary.
This implicature in effect eliminates the overlap between the truth-
conditions of the perfect and those of the preterit, so that, for
pragmatic reasons, the present perfect seems to have essentially
the truth conditions ascribed to it by the extended now theory. Thus,
sentence (50) is, in my analysis, pragmatically rather than seman-
tically anomalous (note that translation (51) is not contradictory):
the adverb *yesterday* unequivocally locates the event of John's seeing
Mary at a past interval, so that there would normally be no motive
for choosing the perfect over the preterit in this sentence (but see
below).

(50) *John has seen Mary yesterday.*

(51) \( \text{vt}^{[\text{yesterday}']} ([t_1 [\text{perf}(t_1) \& \text{vt}_2 (t_2 \subseteq t_1 \&
\text{AT}(t_2, \text{John-sees-Mary}')] ) ] ) (t) \)

This analysis implies that the perfect is somehow more 'marked' or
'takes the speaker further out of his way' than the preterit. This
seems to be true, whether one considers the matter from a syntactic
or a semantic point of view. The perfect, a periphrastic rather than
merely inflectional tense, is structurally more complex than the
preterit. And semantically, the job of the perfect is to locate an
event somewhere within a given interval, while the preterit always
simply locates an event at some interval. The perfect is clearly the
'marked case' in both respects.

It might be objected that the unacceptability of (50) is simply
too blatant to be pragmatic. But as little as we know about pragmat-
ics, it would be foolish to prejudice our research with the assump-
tion that pragmatic anomalies are inherently hazy. Furthermore,
sentence (50) is actually acceptable in some contexts, as, for example, in (52):

(52) So far, John has seen Mary yesterday, Bill has seen her this morning, ...

Here, the perfect is accompanied by two adverbs--yesterday and so far. So far, like since noon, determines a set of extended nows; for this reason, it licenses the appearance of the perfect in this sentence. (Note that sentences like (52) are explicit contradictions in the extended now theory.)

Nevertheless, I concede that the distinction between finite Present perfects and all other kinds of perfects may have become 'grammaticized'--that is, may no longer be merely pragmatic in status. If so, then the problem posed by the perfect for stricter versions of the compositionality thesis is very real: the perfect will have both an 'extended now' interpretation and an interpretation of the sort I have advocated, the former in present perfects, the latter elsewhere. There are ways of softening the metatheoretical blow delivered by this prospect; none of them are very elegant, though. Here, I shall leave the question of grammaticization open; this is a matter independent of the point which I hope to have established, namely that the distinction between the present perfect and other perfects is pragmatic in origin."

In the extended now theory, the perfect is simply equated with the present perfect; yet, as we have seen, it is precisely the present perfect that, for pragmatic reasons, provides the least insight into the true nature of the perfect. As a consequence, the extended
now theory provides no account whatsoever of the use of the perfect in a preterit role in nonpresent tense constructions. (Under the extended now theory, the perfect would apparently have to have two distinct sets of truthconditions, one for present perfects, the other for other sorts of perfects, as in the 'grammaticized' version of the theory advocated here.) My analysis, on the other hand, allows all perfects to be uniformly interpreted, whether they are present, past, future, or nonfinite; furthermore, it recognizes the pragmatically exceptional nature of the present perfect. These are its principal advantages.

In the following subsection, a formal semantics for the perfect based on the theory advocated here will be incorporated into the developing fragment for free adjuncts and absolutes.

1.2 The formal semantics of the perfect in free adjuncts. In the formal fragment for the semantics of free adjuncts and absolutes, perfect have is regarded as the unique expression of the category TAB//TAB of perfect auxiliaries. Its translation is (53), where the interpretation of 'perf(t)' is as in (47) above.

\[(53) \lambda t.\lambda t'[perf(t) \& \forall t_1[t_1 \subseteq t \& PTAB(t_1)]]\]

The rule for deriving perfect temporal abstracts is (54).

\[(54) S73. \text{ If } \alpha \in P_{TAB//TAB} \text{ and } \phi \in P_t, [-\text{Tense}, -\text{Perfect}], \text{ then } F_{73}(\alpha, \phi) \in P_{TAB}, [-\text{Tense}, +\text{Perfect}], \text{ where } F_{73}(\alpha, \phi) \text{ is PRB}(\alpha, \phi).\]

Example: \(F_{73}([\text{have}], (\text{John}) [\text{is}] \text{ awake}) = (\text{John}) [\text{has}] \text{ been awake}\)

\[T73. \text{ If } \alpha \in P_{TAB//TAB}, \phi \in P_t, \text{ and } \alpha, \phi \text{ translate as } \alpha', \phi', \text{ then } F_{73}(\alpha, \phi) \text{ translates as } \alpha'(\hat{t}[\text{AT}(t, \phi')]).\]
Example: $F_{73}(\text{have}, (\text{John}) \ [is] \text{ awake})$ translates as

$$\lambda t[\text{perf}(t) \ & \ Vt_1[t_1 \leq t \ & \ AT(t_1, Vx^S[R(x^S, \text{John'}) \ & \ \text{awake}(x^S)])]$$

Thus, the analysis and translation of sentence (2) is as in (55) and (56).

(55) (John) [has] been on the train, t, 58

(John) [has] been on the train, TAB, 56

(John) [has] been on the train, t, 58

(John) [has] been on the train, TAB, 73

[have], TAB/TAB (John) [is] on the train, t, 19

(56) $Vt[\text{PRES}(t) \ & \ AT(t, Vt_1[\text{perf}(t_1) \ & \ Vt_2[t_2 \leq t_1 \ & \ AT(t_2, Vx^S[R(x^S, \text{John'}) \ & \ \text{on-the-train'}(x^S)])])]$}

Main tense adverbs may combine with the temporal abstracts produced by (54) in accordance with rule (17) in section 1.3.2 of Chapter III. Thus, sentences (6a) and (6b) may be analyzed as in (57) and (58) and translated as in (59) and (60).

(6) a. John has been on the train since noon.

b. *John has been on the train yesterday.

(57) (John) [has] been on the train since noon, t, 58

(John) [has] been on the train since noon, TAB, 56

(John) [has] been on the train since noon, t, 58

(John) [has] been on the train since noon, TAB, 59

since noon, MTA (John) [has] been on the train, TAB, 73

[have], TAB/TAB (John) [is] on the train, t, 19
Note that translation (60) doesn't induce a contradictory interpretation for (6b), because the set of perfect intervals and the denotation of the set-level adverb yesterday will always intersect (at an index of possible utterance); this is consistent with the claim that the anomaly of (6b) is pragmatic rather than semantic in nature.

Observe, however, that sentence (31), analyzed as in (62), is assigned a contradictory interpretation by translation (63):

(31) *John was on the train since noon.

(62) (John) [was] on the train since noon, t, 58
     (John) [was] on the train since noon, TAB, 59b
     since noon, MTA (John) [was] on the train, TAB, 55
     (John) [is] on the train, t, 19

(63) Vt[since-noon"(t_1[past(t_1)] & AT(t_1, Vx^S[R(x^S, John')] &
on-the-train'(x^S)])](t)
Past perfect and future perfect sentences are easily derived in this framework. For example, sentences (64) and (65) may be derived and translated as in (66)-(69).

(64) John had been on the train since noon.

(65) John will have been on the train today.

(66) (John) [had] been on the train since noon, t, 58

(John) [had] been on the train since noon, TAB, 59b

since noon, MTA (John) [had] been on the train, TAB, 55

(John) [had] been on the train, t, 58

(John) [has] been on the train, TAB, 73

[have], TAB//TAB (John) [is] on the train, t, 19

(67) (John) [will] have been on the train today, t, 58

(John) [will] have been on the train today, TAB, 59b

today, MTA, 67 (John) [will] have been on the train, TAB, 57

today, TA (John) [has] been on the train, t, 58

(John) [has] been on the train, TAB, 73

[have], TAB//TAB (John) [is] on the train, t, 19

(68) Vt[past(t) & AT(t, Vt₁[since-noon"(t₂[perf(t₂) & Vt₃[t₃ ≤ t₂ & AT(t₃, Vxₛ[R(xₛ, John') & on-the-train'(xₛ)])]])(t₁)])]

(69) Vt[FUT(t) & AT(t, Vt₁[today"(t₂[perf(t₂) & Vt₃[t₃ ≤ t₂

& AT(t₃, Vxₛ[R(xₛ, John') & on-the-train'(xₛ)])]])

(t₁)])]

In accordance with this analysis, the sentences (70) and (71) are assigned noncontradictory interpretations, namely those induced by (72) and (73) (where the-day-before" is (74), in which t₄ is an
inferentially evaluated free variable, whose most probable value in
(72) and (73) is that of \( t \).

(70) John had been on the train the day before.
(71) John will have been on the train the day before.
(72) \( \nu t[\text{past}(t) \& \theta(t), \nu t_1[\text{the-day-before}](t_2[\text{perf}(t_2) \& \nu t_3[t_3 \subseteq t_2 \& \theta(t_3), \nu x^s[R(x^s, \text{John}) \& \text{on-the-train'}(x^s)])])](t_1)]] \\
(73) \nu t[\text{FUT}(t) \& \theta(t), \nu t_1[\text{the-day-before}](t_2[\text{perf}(t_2) \& \nu t_3[t_3 \subseteq t_2 \& \theta(t_3), \nu x^s[R(x^s, \text{John}) \& \text{on-the-train'}(x^s)])])](t_1)]] \\
(74) \lambda \phi \lambda t_1[\nu t_2[\text{day'}(t_2) \& \nu t_3[\text{day'}(t_3) \& t_4 \subseteq t_3] \& \theta(t_5[t_5 \subseteq t_3 + [t_2 < t_5 \& \theta(t_6[[t_2 < t_6 \& t_6 < t_5] + t_6 \subseteq t_3])]]) \& t_1 \subseteq t_2] \& \phi(t_1)]

The derivation of perfect adjuncts involves rule (54), but also
involves two other rules: the derived verb phrase rule (cf. Partee
1976) and the rule creating present participial phrases from intrans-
sitive verb phrases. The derived individual-level intransitive verb
phrase rule is (75):

(75) S47. If \( \phi \in \Pi_t, [-\theta, \text{aPerfect}] \) and is of the
form \( \Gamma(\text{he}_n) \beta, \Gamma(\text{she}_n) \beta, \Gamma(\text{it}_n) \beta, \text{or } \Gamma(\text{they}_n) \beta, \)
then \( \Phi_{47_n}(\phi) \in \Pi_{IV}, [\text{aPerfect}], \) where \( \Phi_{47_n}(\phi) \) is
\( \text{SSDEL}_{n}(\text{NONF}(\beta)). \)

Example: \( \Phi_{47_0}((\text{he}_0)[\text{has} \text{seen h}_0 \text{neighbor}) = \)
[have] seen his neighbor

T47. If \( \phi \in \Pi_t \) and \( \phi \) translates as \( \phi' \), then \( \Phi_{47_n}(\phi) \)
translates as \( \lambda x_\beta^n[\phi'] \) if for some nonnegative integer
(75) [continued]

\[ m, n = 4m+3; \text{ otherwise, as } \lambda x^O_n[\phi'] \].

Example: \( F_{47,0}(\text{he has seen his neighbor}) \) translates as
\[ \lambda x^O_0[\text{perf}(t) \& \text{AT}(t, Vx^S[R(x^S, x^O) \& \text{see-his\_neighbor'}(x^S)])] \]

Derived verb phrases, like other individual-level intransitive verb phrases, undergo the rule (76) creating individual-level present participial phrases:

(76) S46. If \( a \in P_{TV} \), then \( F_{46}(a) \in P_{PRP} \), where \( F_{46}(a) \) is \( DB(\text{ING}(a)) \).

Example: \( F_{46}(\text{have seen his neighbor}) = \text{having seen his neighbor} \)

The nature of the translation rule for (76) will be at issue in section 2 of this chapter; for the moment, however, we can just assume that (76) has no semantic effect.

(77) T46. If \( a \in P_{TV} \) and \( a \) translates as \( a' \), then \( F_{46}(a) \) translates as \( a' \).

Rule (76), of course, creates expressions from which primal adjuncts can be derived, by rule (147) in Chapter II, section 4.3.

Thus, the free adjunct sentences (1), (5a), and (5b) are analyzed as in (78)-(80), and are translated as in (81)-(83):

(1) Having been on the train, John knows exactly why it derailed.

(5) a. Having been on the train since noon, John knows exactly why it derailed.

b. Having been on the train yesterday, John knows exactly why it derailed.
(78) having been on the train, (John) [knows] exactly why it derailed, t, 54,2

the train, having been on it₂, (John) [knows] exactly why it₂ derailed, t, 58

having been on it₂, (John) [knows] exactly why it₂ derailed, TAB, 59a

having been on it₂, MTA, 13,6 (John) [knows] exactly why it₂ derailed, TAB, 56

having been on it₂, TA, 10,9 (John) [knows] exactly why it₂ derailed, t, 19

having been on it₂, PRPL ¹, 46

[have] been on it₂, IV ¹, 47,0

(he₀) [has] been on it₂, t, 58

(he₀) [has] been on it₂, TAB, 73

[have], TAB/TAB (he₀) [is] on it₂, t, 19

(79) having been on the train since noon, (John) [knows] exactly why it derailed, t, 54,2

the train, having been on it₂ since noon, (John) [knows] exactly why it₂ derailed, t, 58

having been on it₂ since noon, (John) [knows] exactly why it₂ derailed, TAB, 59a

having been on it₂ since noon, MTA, 13,6 (John) [knows] exactly why it₂ derailed, TAB, 56

having been on it₂ since noon, TA, 10,9 (John) [knows] exactly why it₂ derailed, t, 19

having been on it₂ since noon, PRPL ¹, 46

[have] been on it₂ since noon, IV ¹, 47,0

(he₀) [has] been on it₂ since noon, t, 58

(he₀) [has] been on it₂ since noon, TAB, 59b

since noon, MTA (he₀) [has] been on it₂, TAB, 73

[have], TAB/TAB (he₀) [is] on it₂, t, 19
(80) having been on the train yesterday, (John) [knows] exactly why it derailed, TAB, 54a

(81) the train, having been on it₂ yesterday, (John) [knows] exactly why it derailed, TAB, 58

(82) having been on it₂ yesterday, MTA, 15,6 (John) [knows] exactly why it derailed, TAB, 56

(83) having been on it₂ yesterday, TA, 10,9 (John) [knows] exactly why it derailed, TAB, 59

(84) having been on it₂ yesterday, t', 2,4 (John) [knows] exactly why it derailed, TAB, 19

[have] been on it₂ yesterday, PRPI, 46

(he₀) [has] been on it₂ yesterday, IV₁, 47,0

(he₀) [has] been on it₂ yesterday, TA, 58

yesterday, MTA, 67 (he₀) [has] been on it₂, TAB, 73

yesterday, MTA, 67 (he₀) [has] been on it₂, TAB, 73

yesterday, TA [have], TAB//TAB (he₀) [is] on it₂, t, 19

(81) the train'(x²)₀[Vt[K(L6)]("Vt₁[M₉(t,t₁) &

AT(t₁, Vt₂[perf(t₂) & Vt₃[t₃ ≤ t₂ & AT(t₃, Vxₜ[R(xₜ,x₄)] & on-it₂'("x₄"))])])]["[PRES(t) & AT(t, John-knows-exactly-why-it₂-derailed')]])]

(82) the-train'(x²)₀[Vt[K(L6)]("Vt₁[M₉(t,t₁) &

AT(t₁, Vt₂[since-noon"("t₃[perf(t₃) & Vt₄[t₄ ≤ t₃ &

AT(t₄, Vxₜ[R(x₂,x₄) & on-it₂'("x₄"))])](t₂))]])

("[PRES(t) & AT(t, John-knows-exactly-why-it₂-derailed')]])]

(83) the-train'(x²)₀[Vt[K(L6)]("Vt₁[M₉(t,t₁) &

AT(t₁, Vt₂[yesterday'("t₃[perf(t₃) & Vt₄[t₄ ≤ t₃ &

AT(t₄, Vxₜ[R(x₂,x₄) & on-it₂'("x₄"))])](t₂))]})
As is desired, none of these translations induces a contradictory interpretation: the interpretation of '\text{perf}(\tau)' allows interpretations for perfect adjuncts which are like those of a (pragmatically acceptable) present perfect, as in (5a), or like those of preterits, as in (5b); the accompanying adverb is, in both cases, the determining factor.

\subsection{Adjuncts of category MTA and perfect tense}

In the preceding two subsections, we have been concerned with developing a semantics for the perfect consistent with its employment in free adjuncts. In this subsection, we turn to a slightly different concern—the role of adjuncts of category MTA in sentences whose main clause shows perfect tense.

In Chapter III, we saw that main tense adverbs may join with the past, present, and future tenses to characterize a single interval; since free adjuncts can join with the simple tenses in this way, we postulated the existence of adjuncts of category MTA. In the preceding subsections of this chapter, we have seen that main tense adverbs may also join with the perfect to specify some interval (in particular, a perfect interval); we would accordingly predict the occurrence of adjuncts with the function of such adverbs. In fact, it is easy to show that there are adjuncts with this sort of function.

Consider sentence (84). This sentence is at least two ways ambiguous: on the one hand, (84) can be understood to entail that Mary
(84) Working at the post office during the past summer,
Mary had decided to go back to school.

worked at the post office during the most recent summer relative to
the speaker's interval; on the other hand, it can be felt to entail
that she worked at the post office during the most recent summer
relative to some past interval. Under the former interpretation, (84)
would not be falsified if Mary had made her decision before she ever
worked at the post office--this interpretation can be singled out by
inserting already after had in (84); under the latter of the two inter-
pretations, Mary must have made her decision while employed at the
post office. This is clearly an ambiguity in the role of the adjunct
in (84). On the former interpretation, the adjunct is understood to
join with past tense to characterize a single past interval; in this
case, (84) is to be analyzed and translated as in (85) and (86).

(85) working at the post office during the past summer,
(Mary) [had] decided to go back to school,

(86) Vt[K(L6)](\neg Vt[M_9(t,t_t)] & [during-the-past-summer' (t_1)
& AT(t_1, Vx^S[R(x^S,x^S_i) & working-at-the-post-
office'(x^S)])]) (\neg [past(t)] & AT(t, Vt_1[\text{perf}(t_1) &
On the latter interpretation, however, the adjunct is understood to join with the perfect to characterize a single perfect interval; in this instance, (84) is derived as in (87), and thus receives the translation (88).

(87) working at the post office during the past summer, (Mary) [had] decided to go back to school, t, 58

(88) $\text{Vt}_2[t_2 \subseteq t_1 \& \text{AT}(t_2, \text{Mary-decides-to-go-back-to-school'})]$

According to this analysis, sentence (84) should cease to be ambiguous in the way described if it is converted to a simple past tense.
sentence--

(89) Working at the post office during the past summer, Mary decided to go back to school.

This is exactly right: the adverb during the past summer in (89) must be interpreted relative to the speaker's interval, as we saw in section 4.2 of Chapter III.

Other examples could be adduced in support of this analysis, although I won't elaborate here. I therefore conclude that adjuncts of category MTA may join either with a tensed temporal abstract or with a tenseless, perfect temporal abstract to characterize a single interval.

In this section, we have examined a theory of the semantics of the English perfect and have concluded that it is inadequate to account for the use of the perfect in free adjuncts; an alternative theory has therefore been put forward. It has also been shown that adjuncts of category MTA, like other expressions of this category, may join either with a simple tense or with the perfect to characterize some single interval of time.

2. The progressive aspect and the interpretation of free adjuncts.

In this section, the relevance of the progressive aspect to the semantics of free adjuncts will be considered.

English speakers presented with present participial adjuncts like that in (90) often assume that they are progressive in aspect;

(90) Crossing the street, John was hit by a car.

compare Kruisinga's (1932:276) observation that 'the most frequent of the verbal forms in this function [of free adjunct--G. T. S.] is the
ing; this is natural, for the ing expresses the durative aspect, and this is often what is required when attendant circumstances are referred to.'

A modern syntactician would no doubt regard this identification of present participial adjuncts with progressive forms as naive. S/he would point out (i) that although momentary predicates may occur as present participial adjuncts, as in (91a)-(93a), the same predicates do not occur as progressives, as the unacceptability of (91b)-(93b) shows;

(i)

(91) a. Being a sailor, John smokes a pipe.
    b. *John is being a sailor.

(92) a. Having barely enough money for bus fare, Mary decided to skip lunch.
    b. *Mary was having barely enough money for bus fare.

(93) a. Weighing five tons, our truck made the bridge shake.
    b. *Our truck was weighing five tons.

(ii) that verb phrases in the perfect may occur as present participial adjuncts, as in (94), even though the progressive may never govern such verb phrases in finite declarative sentences, as the unacceptability of (95) shows;

(ii)

(94) Having finished his work, John went to bed.
(95) *John is having finished his work.

and (iii) that present participial adjuncts deriving from verb phrases in the perfect may themselves contain progressives, as in (96).

(iii)

(96) Having been reading the book, John knew all the answers.
Resorting to semantic considerations, s/he might also point out that (iv) some present participial adjuncts do not obviously have a progressive meaning, such as that in (97).

(97) John drove from Cleveland to Cincinnati, stopping for a break in Columbus.

On the basis of this evidence, s/he would conclude that present participial adjuncts have no more than a superficial similarity to progressive forms.

Nevertheless, the naive intuition that present participial adjuncts have something in common with progressives has more merit than is immediately evident; in fact, a close semantic comparison of present participial adjuncts and progressives leads to some rather startling conclusions, as I shall now show.

2.1 The semantics of present participial phrases. It has recently been argued that an adequate truthconditional account of the progressive must incorporate both temporal and modal conditions.

The temporal dimension of the truthconditions has been assumed for several years now. In unpublished work dating from 1972, Michael Bennett and Barbara Partee argued that a progressive sentence is true at interval $i^5$ iff the corresponding nonprogressive sentence is true at some interval of time properly containing $i$ (but not ending with $i$); according to their truthconditions, sentence (98) is true at some interval iff sentence (99) is true at some more encompassing interval, as in (100).

(98) John is pushing a cart.

(99) John pushes a cart.
Dowty (1979: Ch. 2) has recently argued that this temporal condition is by itself inadequate, owing to what he calls the 'imperfective paradox'. The paradox consists in the fact that progressives with accomplishment or achievement predicates do not entail the corresponding nonprogressive sentences (even though the truthconditions of progressive verb phrases must apparently be stated in terms of their constituent nonprogressive verb phrases); for example, the truth of sentence (101) would not allow one to infer the truth of (102) -- (101) could well be true even if someone caught the glass in midair.

(101) The glass was falling to the floor.

(102) The glass fell to the floor.

The consequence of this paradox is that we cannot regard the progressive simply as a temporal operator, according to which the actual truth of a progressive sentence at some interval depends upon the actual truth of the corresponding nonprogressive sentence at some surrounding time interval. Instead, we must acknowledge a modal dimension in the truthconditions for the progressive. Consider sentence (103).

(103) The glass is falling to the floor.

(104) The glass falls to the floor.

Intuitively, the truth of this sentence at some interval \( i \) implies that sentence (104) would be true at some interval properly containing...
i if nothing unanticipated were to impede the glass' fall subsequently to i—that is, if the 'natural course of events' were somehow allowed to flow inertly starting at i.

Dowty (1979:145-150) proposes truthconditions for the progressive which embody this intuition model-theoretically. Crucial to these truthconditions is a category of possible worlds which he calls inertia worlds. Given any index \(<w,i>\), a set of inertia worlds is assigned to \(<w,i>\); this set is to be thought of as containing exactly those worlds that are like \(w\) up to and including \(i\), and 'in which the future course of events after this time develops in ways most compatible with the past course of events' (1979:148). Employing this novel addition to model structure, Dowty proposes an intensional logic progressive operator \(\text{PROG}\) with the following truthconditions (where \(\text{Inr}\) is the function assigning a set of inertia worlds to each index):

\[
\text{(105)} \quad [\text{PROG} \phi] \text{ is true at index } <w,i> \text{ iff for some interval } i' \text{ such that } i \subseteq i' \text{ and } i \text{ is not a final subinterval for } i', \text{ and for all } w' \in \text{Inr}(<w,i>), \\
\phi \text{ is true at } <w',i'>. \quad (\text{Cf. Dowty 1979:149})
\]

According to (105), sentence (103) is true at index \(<w,i>\) iff (104) is true at some interval which properly contains (but doesn't end with) \(i\) in every inertia world assigned to \(<w,i>\), as in (106). As the reader can appreciate, this account of the progressive captures both its temporal and modal dimensions.

In this subsection, I shall argue that the progressive aspect in fact has no independent semantic status in English—that its
(106) (103) is true at \(<w,i>\) iff (104) is true at each of \(<w_0,i'>, \ldots, <w_n,i'>\).

truth conditions are entirely determined by general semantic properties of present participles.

A good construction to examine in order to find out about the semantics of present participles is the free adjunct construction: not only can the full range of present participial phrases occur as free adjuncts, but other sorts of predicative phrases can as well; this allows us to determine exactly which parts of the meaning of a present participial adjunct derive from the participial phrase itself, and which are part of the constructional meaning of free adjuncts generally.

One conclusion which can be drawn on the evidence of free adjuncts is that the lack of an entailment of perfectiveness is not a property peculiar to the progressive. It doesn't necessarily follow from sentence (107) that John actually crossed the street, any more than it follows from sentence (108); (107), like (108), may be felt to imply only that John would have crossed the street if nothing unanticipated had happened.
(107) Crossing the street, John was hit by a car.

(108) John was crossing the street.

It's important to recognize that the fact that the adjunct in (107) lacks an entailment of perfectiveness is a consequence of the fact that the adjunct consists of a present participial phrase. Free adjuncts of other kinds—those consisting of past participial phrases, adjective phrases, prepositional phrases, or predicative noun phrases—are never imperfective in this way. Consider, for example, sentences (109) and (110).

(109) Losing, the Phillies left the field.

(110) Beaten, the Phillies left the field.

These sentences differ in meaning only because the adjunct in (109) needn't be understood as perfective, while that in (110) must be. This shows that the imperfectiveness of a present participial adjunct is not simply inferred; if language users' inferences were responsible for the possibility of understanding the adjunct in sentence (109) imperfectively, they would, in the same way, admit a similar interpretation for the adjunct in (110). Furthermore, present participial phrases in other sorts of constructions may be understood imperfectively; in each of the examples in (111), the underlined participial phrase may have such an interpretation.

(111) Adnominal participles:

Mary found the dying man.
[doesn't entail that he died]

The man crossing the street was hit by a car.
[doesn't entail that he crossed the street]
(111) [continued]

Temporally restrictive adjectives (Dowty 1973):

John sat reciting the Iliad.
[doesn't entail that he recited the Iliad]

Jane found Rover running across a field.
[doesn't entail that he ran across the field]

Augmented adjuncts:

While copying the sentence into his notebook, he ran out of ink.
[doesn't entail that he copied the sentence into his notebook]

Although neither progressive sentences with accomplishment or achievement predicates nor present participial adjuncts with such predicates have an entailment of perfectiveness, it is, in many contexts, nevertheless possible to draw an inference of perfectiveness. For example, we might well infer the simple preterit sentence (112) from the past progressive (113); similarly, we might infer (112) from the free adjunct sentence (114).

(112) John crossed the street.

(113) Before entering the building opposite his office, John was crossing the street.

(114) Crossing the street, John entered the building opposite his office.

Present participles in other constructions also seem to admit an inference of perfectiveness: sentence (115), for instance, can be taken as either (116) or (117), and sentence (118), as either (119) or (120); ⁹

(115) In the fourth inning, John bet on the winning team.

(116) In the fourth inning, John bet on the team that was winning.
(117) In the fourth inning, John bet on the team that won.
(118) Everyone climbing the mountain received a prize.
(119) Everyone who was climbing the mountain received a prize.
(120) Everyone who climbed the mountain received a prize.

Similarly, sentence (121) can be understood as (122), while (123) can be interpreted as (124).

(121) When playing the march, the ensemble rose.
(122) When they were playing the march, the ensemble rose.
(123) When playing the march, the ensemble was standing.
(124) When they played the march, the ensemble was standing.

I shall now propose a semantics for present participial phrases which accounts for these important similarities between progressives and other sorts of present participial constructions. To make my proposal explicit, I introduce an intensional logic expression $\text{Ing}$ of type $\langle s, t \rangle$ with the following interpretation:

\begin{equation}
\text{(125)} \quad \text{Where } \phi \text{ denotes a proposition } p, \text{ Ing}(\phi) \text{ is true at index } <w,i> \text{ iff for some interval } i' \text{ such that } i \subseteq i' \text{ and } i \text{ is not a final subinterval for } i', \text{ and for all } w' \in \text{Int}(<w,i>), p(<w',i'>) = 1.
\end{equation}

Given an intransitive verb phrase with translation $\alpha'$, my proposal is to interpret the corresponding present participial phrase as $\lambda x[\text{Ing}(\alpha'(x))]$.

To appreciate the content of this proposal, consider the present participial phrase crossing the street, which receives the translation (126). According to (125), John has a stage in the denotation of (126)
at index \( <w, i> \) iff there is some interval \( i' \) such that \( i \) is a proper subinterval of \( i' \), \( i \) is not a final subinterval for \( i' \), and for each inertia world \( w' \) assigned to index \( <w, i> \), John has a stage in the denotation of cross-the-street' (i.e. John crossed the street) at \( <w', i'> \).

Under this analysis of the semantics of present participial phrases, sentence (127) translates as (128).

\[
(127) \text{Crossing the street, John ran into Mary.}
\]

\[
(128) \text{\( \forall t \left[ K(L_0) \left( \neg \forall t_1 \left[ M_g(t, t_1) \land AT(t_1, x^5) \right] \land AT(t, John-runs-into-Mary') \right. \right] \left( \neg \text{past}(t) \lor \text{AT}(t, John-runs-into-Mary') \right) \right] \]
\]

According to the interpretation induced by (128), (127) doesn't necessarily entail that John crossed the street (even assuming that \( x^1_4 \) has John as its value). On the other hand, (128) reflects the possibility of inferring that the adjunct in (127) is perfective: the value inferred for \( M_g \) may require that the intervals denoted by \( t \) and \( t_1 \) be separated by some interval during which John could have finished crossing the street.

If present participial phrases are interpreted in the manner just described, the progressive may simply be regarded as a predicative construction, consisting of a copula and a present participial phrase.\(^{10}\)

2.2 The formal semantics of present participial adjuncts. In this subsection, rules embodying the generalizations of the preceding subsection are proposed for the derivation and interpretation of present participial adjuncts.
Present participial phrases are generated in two categories: PRPLS and PRPLi (see Chapter II, section 4.1 for arguments motivating this category distinction). Expressions of these two categories derive from verb phrases of category IVS and IVi, respectively. The rules accomplishing these transfers are (129) and (130):\(^1\)

(129) S46. If \(a \in P_{IVi}\), then \(F_{46}(a) \in P_{PRPLi}\), where \(F_{46}(a)\) is \(DB(ING(a))\).

Example: \(F_{46}([\text{be}] \text{ a sailor}) = \text{being a sailor}\)

T46. If \(a \in P_{IVi}\) and \(a\) translates as \(a'\), then \(F_{46}(a)\) translates as \(\lambda x^{0}[\text{Ing}([\text{sailor}'(x^{0})])]\), \(\lambda x^{k}[\text{Ing}([\text{a}'(x^{k})])]\), or \(\lambda x^{1}[\text{Ing}([\text{a}'(x^{1})])]\), according as \(a'\) is of sorted type \(<o,t'>\), \(<k,t'>\), or \(<[o,k],t'>\), respectively.

Example: \(F_{46}([\text{be}] \text{ a sailor})\) translates as \(\lambda x^{0}[\text{Ing}([\text{sailor}'(x^{0})])]\).

(130) S45. If \(a \in P_{IVS}\), then \(F_{45}(a) \in P_{PRPLS}\), where \(F_{45}(a)\) is \(DB(ING(a))\).

Example: \(F_{45}([\text{walk}] \text{ home}) = \text{walking home}\)

T45. If \(a \in P_{IVS}\) and \(a\) translates as \(a'\), then \(F_{45}(a)\) translates as \(\lambda x^{5}[\text{Ing}([\text{[walk-home]'(x^{5})}])]\).

Example: \(F_{45}([\text{walk}] \text{ home})\) translates as \(\lambda x^{5}[\text{Ing}([\text{[walk-home]'(x^{5})}])]\)

Given these rules, we can analyze sentence (107) as in (131).
(131) crossing the street, (John) [was] hit by a car, t, 58
    crossing the street, (John) [was] hit by a car, TAB, 59a
    crossing the street, MTA, 13,6  (John) [was] hit by a car, TAB, 55
    crossing the street, TA, 10,9  (John) [is] hit by a car, t, 19
    crossing the street, t', 1,4
    crossing the street, PRPL1, 45
    [cross] the street, IV1, 27

On this analysis, (107) is assigned the translation (132).

(132) Vt[K(L6)(^Vt1[Mg(t,t1) & AT(t1, VxS[R(xS,x4) &

    Ing('^[cross-the-street'(xS)])])[^past(t) &

    AT(t, John-is-hit-by-a-car')])]

According to the interpretation induced by (132), the adjunct in (107)
need not be understood as perfective; but certain possible values for
Mg would permit an inference of perfectiveness.

Sentence (133) may be derived as in (134) and assigned the
translation (135).

(133) Being asleep, John was unaware of Mary.

(134) being asleep, (John) [was] unaware of Mary, t, 58

    being asleep, (John) [was] unaware of Mary, TAB, 59a
    being asleep, MTA, 13,6  (John) [was] unaware of Mary, TAB, 55
    being asleep, TA, 10,9  (John) [is] unaware of Mary, t, 19
    being asleep, t', 2,4
    being asleep, PRPL1, 46
    [be] asleep, IV1, 23

(135) Vt[K(L6)(^Vt1[Mg(t,t1) & AT(t1, Ing('^VxS[R(xS,x4) &

    asleep'(xS)])])[^past(t) &
Here there is no question of perfectiveness: owing to the semantic properties of stative predicates, (136) is valid.

\[
(136) \lambda x^i \Box [\text{ing}(\forall x^s[ R(x^s,x^i) \& \text{asleep}'(x^s)]) \rightarrow \\
\forall x^s[ R(x^s,x^i) \& \text{asleep}'(x^s)]]
\]

The validity of (136) may be one reason for the unacceptability of be asleep in the progressive construction:

(137) *John is being asleep.

The use of (137) would implicate that the simple present John is asleep for some reason doesn't hold, in accordance with the principle of conversational economy discussed by McCawley (cf. also Dowty (1979: 180)); yet, (137) entails that John is asleep. Thus, (137) may perhaps be regarded as conversationally anomalous in roughly the same way as (6b).

(6b) *John has been on the train yesterday.

Note, however, that because there is nothing comparable to the simple tenses with which present participial phrases compete in free adjuncts, the use of present participial statives like that in (133) poses no conversational problems.\(^{12}\)

The progressive is, again, regarded simply as a predicative construction. Thus, sentence (108) is analyzed as in (138). (138) produces (139) as a translation for (108).
In this chapter, we have found that free adjuncts provide valuable data for the analysis of the perfect and the progressive. In section 1, it was shown that the use of the perfect in free adjuncts cannot be accounted for by the extended now theory of the perfect; an alternative theory was therefore proposed. In addition, it was shown that free adjuncts of category MTA may join with the perfect as well as with the simple tenses to characterize a particular interval. In section 2, I have argued for a unitary semantic analysis for present participial phrases; the semantic peculiarities of present participial adjuncts follow from this analysis, which additionally allows us to regard the progressive as nothing other than a predicative participial construction.
Footnotes--Chapter IV

1 But in some cases, e.g. sentence (i), a precise temporal relation between the adjunct and its superordinate clause is in fact entailed, due to the presence of time adverbials in both clauses that specify particular times.

(i) Setting sail for the island in the fall of 1740, he reached his destination in the spring of 1741.

2 Recall in particular the truthconditions for 'past(ζ)' given in section 1.1 of Chapter II: where ζ denotes interval i', past(ζ) is true at index <w,i> iff there is some nonempty interval i'' such that i' < i'' < i.

3 McCawley (1971) has pointed this out. McCoard (1978:152) acknowledges that 'the opposition [of the perfect] with the preterit exists only in tensed forms' and seems (p.179) to accept the notion that 'some embedded nontensed perfects are actually derived from preterits'. He appears not to have noticed that the perfect can serve as a preterit in the past and future perfect constructions, though he cites (p.184) one of McCawley's examples which shows this.

4 It has been suggested that my analysis of the perfect is methodologically unprecedented, in that it appeals to principles of conversational economy to explain the anomaly of certain sorts of sentences; in each of the cases discussed by McCawley, in contrast, conversational principles are invoked merely to account for the observed range of interpretations for sentences that are fully acceptable. Nevertheless, there do appear to be a few precedents for the use of conversational principles to explain the unacceptability of some class of sentences, as David Dowty has pointed out to me. First, Dowty (1979:180) suggests that the unacceptability of a momentary predicate in the progressive may just be conversational in nature; I shall develop this idea below. Second, a pragmatic explanation of the unacceptability of sentences like *I saw me (vs. I saw myself) may be desirable: for one thing, it's not clear that there is any plausible syntactic explanation for such sentences; and whatever pragmatic principle blocks the coreference of he and him in the syntactically acceptable sentence He saw him (cf. He saw himself) would certainly also rule out *I saw me. (See Dowty (1980) for further elaboration on this subject.)

On the other hand, it should be acknowledged that in the cases discussed by McCawley and in the case of the progressive statives, the competing sentences always have logically distinct interpretations.
But in my analysis, John left yesterday and John has left yesterday have logically equivalent interpretations, owing to the semantic contribution of the adverb yesterday. It is therefore only by reference to the meanings of the subparts of these sentences that McCawley's principle of economy can be invoked to rule out *John has left yesterday. Though I merely note these problems here, I believe that their methodological implications should not be underestimated, and deserve much further research.

5Actually, they relativize the interpretation of progressive sentences to moments rather than intervals. See Dowty (1979:188) for an argument that progressives should be interpreted relative to intervals whose length is possibly greater than a moment.

6Progressive sentences with activity predicates (walk, sing, listen for something) pragmatically entail the corresponding simple present tense sentence. See Dowty (1979:Ch.3).

7One might object to Dowty's analysis on the grounds that in some (maybe even most) situations it is very hard to decide what the natural course of events would be. But Dowty himself remarks (1979:149) that "while there are severely subjective differences among individuals' beliefs as to how the world would "turn out" if left uninterfered with, agreement on the truth of progressive sentences, to the extent that such agreement obtains at all, presupposes that such beliefs are held in common." 'Natural course of events' may be a somewhat nebulous notion, but the role it plays in the interpretation of imperfective progressives is quite clear.

Note that Dowty relativizes the interpretation of progressives to sets of inertia worlds. This is meant to capture the intuition that there may be several mutually exclusive natural courses of events—for example, at least two natural courses of events may ensue when a coin is flipped. Notice, however, that his truthconditions require that the simple present tense sentence corresponding to a progressive be true in every member of the relevant set of inertia worlds; see Dowty (1979:147f) for justification.

Dowty has recently pointed out to me that his characterization of inertia worlds as identical to the actual world up to a certain time is inadequate—that it predicts that John was crossing the street when the truck hit him cannot be true, since all the relevant inertia worlds would be ones in which the truck was coming down the street towards John (and thus hit him). Dowty himself has suggested a possible alternative characterization of inertia worlds as those that are 'locally similar' to the real world up to the relevant time—that is, those that are similar in the immediate vicinity of, e.g., John. This alternative may, however, run into problems with sentences like He was copying the sentence into his notebook when he ran out of ink or Inflation is destroying the economy.
A broader range of present participial phrases may appear as free adjuncts than may appear as 'reduced relative clauses' or temporally restrictive adjectives:

Being an experienced cook, John knows all about wine.
*Anyone being an experienced cook should know all about wine.
*I saw him being an experienced cook.

I do not wish to suggest that (116), (117), (119), and (120) represent the only possible readings for (115) and (118); other interpretations are clearly possible.

In particular, the progressive consists of the be_{1} of category IV^{1}/PRED^{5} (see Chapter II, section 4.2.1) in combination with a stage-level present participial phrase.

In Chapter III, section 4.3, and section 1.2 of this chapter, (129) was assumed to have no semantic effects; this tentative assumption is rejected here.

Note that my analysis of present participial adjuncts affords an explanation of the anomaly of adjuncts like that in (i).

(i) *Being carrying a suitcase, John entered the room.

Under the assumption that time is dense, the primal adjuncts carrying a suitcase and being carrying a suitcase have equivalent translations in my analysis:

(ii) Vx^{S}[R(x^{S},x^{i}) \& \text{Ing}(\text{\textquotesingle carry-a-suitcase\textquotesc single}}'(x^{S}))]

(iii) \text{Ing}(\text{\textquotesingle Vx^{S}[R(x^{S},x^{i}) \& \text{Ing}(\text{\textquotesingle carry-a-suitcase\textquotesc single}}'(x^{S}))])

For this reason, we may suppose that the structurally and conceptually simpler adjunct in (iv) is systematically preferred to that in (i), in accordance with the principle of conversational economy discussed by McCawley (1978).

(iv) Carrying a suitcase, John entered the room.

We therefore needn't assume that the Doubling Constraint (see Chapter I, section 1.1) is solely responsible for the anomaly of (i).
CHAPTER V

THE FORMAL SEMANTICS OF ABSOLUTES

In this chapter, the formal semantics of absolutes is discussed. In section 1, some preliminary rules for the formation of absolutes are presented. In section 2, it is shown that there are two varieties of absolutes: those that can serve as the first argument of a modal, and those that cannot; this distinction is shown to parallel the difference between weak and strong adjuncts. In section 3, it is shown that absolutes can function both as set-level time adverbs and as main tense adverbs: in particular, that weak absolutes may, like weak adjuncts, specify the temporal restriction on a frequency adverb or generalization operator, and that both weak and strong absolutes may join with a simple tense or with the perfect to pick out some interval. In section 4, the analyses of the perfect and the progressive presented in Chapter IV are shown to receive further support from the semantics of absolutes. The rules presented in this chapter appear in the formal fragment presented in the Appendix.

1. **Basic rules of syntax and interpretation for absolutes.** In this chapter, I shall argue that absolutes, like free adjuncts, are of three different categories; in particular, I shall argue that absolutes appear in exactly the same three categories as free adjuncts—t', TA, and MTA.
Recall that the intuition behind $t'$ as a category of free adjuncts is that free adjuncts, like full sentences, can be true or false; thus, the primal adjunct lying on the beach translates as (1), which denotes a truth value.

(1) $\forall x^S[R(x^S,x^i)& \text{Ing}([\text{lie-on-the-beach}')(x^S)])$

Similarly, absolutes may intuitively be true or false; for example, the absolute in sentence (2) is true iff John's brother is a farmer.

(2) His brother being a farmer, John knows all about tractors.

For this reason, we may suppose that the category $t'$ contains primal absolutes in addition to primal adjuncts, and that absolutes of all other categories derive from primal absolutes. The rules for creating primal absolutes are (3) and (4):

(3) $S_4$. If $a \in P_T$ and $b \in P_{\text{PRED}^s}$, then $F_4(a,b) \in P_{t'}$, where $F_4(a,b) = \alpha \beta'$. 

Example: $F_4(\text{the truck}, \text{in first gear}) = \text{the truck in first gear}$

(4) $S_5$. If $a \in P_T$ and $b \in P_{\text{PRED}^i}$, $\notin P_{\text{ADJ}^i}$, then $F_5(a,b) \in P_{t'}$, where $F_5(a,b) = \alpha \beta'$. 

Example: $F_5(\text{Jane}, \text{being a doctor}) = \text{Jane being a doctor}$
By assuming the existence of absolutes of category $t'$, we automatically predict the existence of absolutes of categories $T_A$ and $NT_A$; the rules converting primal adjuncts to adjuncts of the latter two categories should effect analogous conversions with primal absolutes. In the following three sections, I shall argue that this is a desirable result—that absolutes, like free adjuncts, may function as both set-level time adverbs and main tense adverbs. Further, I shall show that absolutes participate in a distinction parallel to that holding between strong and weak adjuncts.

To appreciate this distinction, we must consider not only absolutes proper, but augmented absolutes as well (see Chapter I, section 1.2). The rules for producing augmented absolutes of category $t'$ are (5)-(8).

(5) $S_6$. If $a \in P_T$, [+Object], and $\beta \in P_{\text{PRED}^s}$, then $F_6(a, \beta) \in P_{t'}$, where $F_6(a, \beta)$ is \underline{with $a$ $\beta$}.

Example: $F_6(\text{the truck, in first gear}) = \text{with the truck in first gear}$

$T_6$. If $a \in P_T$, $\beta \in P_{\text{PRED}^s}$, and $a, \beta$ translate as $a', \beta'$, then $F_6(a, \beta)$ translates as $a'(x^i \forall x^s [R(x^s, x^i) \& \beta'(x^s)])$.

Example: $\text{with the truck in first gear}$ translates as $\text{the-truck'}(x^i \forall x^s [R(x^s, x^i) \& \text{in-first-gear'}(x^s)])$

(6) $S_7$. If $a \in P_T$, [+Object], and $\beta \in P_{\text{PRED}^i}, \notin P_{\text{ADJ}^i}$, then $F_7(a, \beta) \in P_{t'}$, where $F_7(a, \beta)$ is \underline{with $a$ $\beta$}.

Example: $F_7(\text{him}_0, \text{being a doctor}) = \text{with him}_0 \text{being a doctor}$

$T_7$. If $a \in P_T$, $\beta \in P_{\text{PRED}^i}$, and $a, \beta$ translate as $a', \beta'$,
(6) [continued]
then \( F_7(\alpha, \beta) \) translates as \( \alpha'(\beta') \).

Example: with \( \text{him}_0 \) being a doctor translates as \( \operatorname{Ing}(\neg[\text{doctor}'(x^0)]) \)

(7) S8. If \( \alpha \in P_T, \) [Object], and \( \beta \in P_{\text{PRED}^s} \), then
\( F_8(\alpha, \beta) \in P_{t^t} \), where \( F_8(\alpha, \beta) \) is \( \neg \text{without } \alpha \beta \).

Example: \( F_8(\text{her}_1, \text{hair, braided}) = \text{without her}_1 \text{hair braided} \)

T9. If \( \alpha \in P_T, \beta \in P_{\text{PRED}^s}, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \),
then \( F_9(\alpha, \beta) \) translates as \( \alpha'(\neg^{\text{Vx}^s[R(x^s,x^i)]} \& \neg^{\beta'}(x^s)) \).

Example: without her\(_1\) hair braided translates as
\( \text{her}_1\text{hair}'(\neg^{\text{Vx}^s[R(x^s,x^i)]} \& \neg^{\text{braided}}(x^s)) \)

(8) S9. If \( \alpha \in P_T, \) [Object], and \( \beta \in P_{\text{PRED}^i}, \beta \notin P_{\text{ADJ}}, \) then
\( F_9(\alpha, \beta) \in P_{t^1}, \) where \( F_9(\alpha, \beta) \) is \( \neg \text{without } \alpha \beta \).

Example: \( F_9(\text{him}_0, \text{being a doctor}) = \text{without him}_0 \text{being a doctor} \)

T9. If \( \alpha \in P_T, \beta \in P_{\text{PRED}^i}, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \),
then \( F_9(\alpha, \beta) \) translates as \( \alpha'(\neg^{\text{x}^s[\neg^{\beta'}(x^s)]}), \)
\( \alpha'(x^k[\neg^{\beta'}(x^k)]), \) or \( \alpha'(x^i[\neg^{\beta'}(x^i)]), \) according as \( \beta' \) is
of sorted type \( <o,t'>, <k,t'>, \) or \( <[o,k],t'>. \)

Example: without him\(_0\) being a doctor translates as
\( \neg\operatorname{Ing}(\neg[\text{doctor}'(x^0)]) \).

With is assumed to make no semantic contribution to an augmented absolute; without is regarded merely as introducing an element of negation into the meaning of an augmented absolute.

With these preliminaries in mind, we now turn to the semantics of absolutes in modal, temporal, and aspectual contexts.

2. Modality and the interpretation of absolutes. In Chapter II, we saw that the class of free adjuncts is bifurcated in modal contexts:
weak adjuncts can be interpreted as if-clauses (more exactly, they can serve as the first argument of an accompanying modal) while strong adjuncts cannot. Careful consideration reveals that the class of absolutes shows a similar bifurcation, although it is complicated in certain respects.

Consider sentences (9)-(11).

(9) His mother being a doctor, John would know the way to the Med Center.

(10) The water being a little cold, the children must stay on the beach.

(11) His arm being broken, Bill might not be asked to participate.

In none of these sentences can the absolute be understood as an if-clause; for example, (9) is not felt to mean 'If his mother were a doctor, John would know the way to the Med Center'. Instead, (9)-(11) uniformly entail the truth of their absolutes. This is exactly what we would predict, since each of these absolutes has an individual-level predicative phrase; thus, the absolutes in (9)-(11) might be regarded as strong absolutes analogous to the strong adjuncts discussed in Chapters II-IV. As such, they may be categorized as main tense adverbs; that is, sentences (9) and (10) may be analyzed and translated as in (12)-(15) (see page 290).

The analogy of the absolutes in (9)-(11) to strong adjuncts should lead us to expect that absolutes with stage-level predicates will show the behavior of weak adjuncts—that they will, for example, play the role of an if-clause in modal contexts. This expectation is, at first glance, disappointed. Consider sentences (16)-(18), in
(12) his mother being a doctor, (John) [would] know the way to the Med Center, t, 54,0

his mother being a doctor, (he0) [would] know the way to the Med Center, TAB, 59a

(13) Vt[\langle K(L_6) \rangle (\langle Vt_1 [M_9(t,t_1) \rangle &
\langle AT(t_1, John's-mother') (\langle x^0 [\langle Ing(\langle [doctor'(x^0)]))) \rangle) \rangle\rangle]

(14) the water being a little cold, (the children) [must] stay on the beach, t, 58

the water being a little cold, MTA, 13,6 (the children) [must] stay on the beach, TAB, 59a

the water being a little cold, TA, 10,9 (the children) [must] stay on the beach, TAB, 56

(15) Vt[\langle K(L_6) \rangle (\langle Vt_1 [M_9(t,t_1) \rangle &
\langle AT(t_1, the-water') (\langle x^0 [\langle Ing(\langle [a-little-cold'(x^0)]))) \rangle) \rangle\rangle]

(\langle [PRES(t) & AT(t, must) (C(cb)) (\langle [the-children-stay-on-the-beach']))) \rangle)\rangle]
(16) The truck in first gear, we would coast gently downhill.

(17) Her hair braided, Jane must resemble Mary.

(18) The children asleep, Mary might watch TV.

which the absolutes have stage-level predicates. These sentences are of marginal acceptability, and are accordingly rather difficult to judge. Nevertheless, I sense that, to the extent that any kind of interpretation can be ascribed to (16)-(18), they lack an interpretation wherein the absolute functions as an if-clause; for me, cannot mean 'if the truck were in first gear, we would coast gently downhill'. Nevertheless, it would be wrong to conclude from this fact that the distinction between strong and weak adjuncts is not reflected among absolutes: sentences (16)-(18) can be rather remarkably transformed if the absolutes are replaced with augmented absolutes, as in (19)-(21).

(19) With the truck in first gear, we would coast gently downhill.

(20) With her hair braided, Jane must resemble Mary.

(21) With the children asleep, Mary might watch TV.

In each of (19)-(21), the augmented absolute can easily be understood as the first argument of the accompanying modal; for example, (19) is easily interpreted as 'if the truck were in first gear, we would coast gently downhill'. Sentences (19) and (20) can thus be analyzed as in (22) and (24), and assigned the translations (23) and (25). Clearly, (augmented) absolutes are yet another sort of expression which may have the function of a conditional clause (even though they are not explicitly marked by if); thus, we may consider the absolutes
(22) with the truck in first gear, (we) [would] coast gently downhill, t, 58

(23) Vt[PRES(t) & AT(t, would'(D(cb)('the-truck' (\(X^V X^S[R(x^S,x^i) & in-first-gear'(x^S)])))(we-coast-gently-downhill')))]

(24) with her hair braided, (Jane) [must] resemble Mary, t, 54, 1

(25) Vt[PRES(t) & AT(t, must'(D(cb)('Jane's-hair' (\(X^V X^S[R(x^S,x^i) & braided'(x^S)])))(Jane-resembles-Mary')))]

in (19)-(21) as weak absolutes analogous to the weak adjuncts discussed in Chapters II-IV.

A question for which I have no completely satisfactory answer is the question of why augmented absolutes should be so much better than absolutes proper as arguments of modals. (As David Dowty has pointed out to me, this state of affairs is just the opposite of what we would expect, given McCawley's principle of conversational economy--
structurally, augmented absolutes are more complex than absolutes proper.) Berent (1975) addresses this very question, and makes a good case for the conclusion that 'the less clearly marked the subordinate status of [an] absolute ..., the less acceptable [the] absolute sentence will be' (p.20); he argues that with, like a subordinating conjunction, makes the subordinate status of an absolute more explicit, and thus easier to process. This is quite plausible in the case of weak absolutes; but, as Dowty has pointed out, strong augmented absolutes are stylistically different from weak ones (note the relatively colloquial flavor of the examples in footnote 2). I leave this rather perplexing puzzle unresolved.

In this section, we have seen that in modal contexts, there is a distinction between two varieties of absolutes that is roughly analogous to the difference between strong and weak adjuncts: absolutes with individual-level predicates in general may not serve to restrict the interpretation of a modal, while augmented absolutes with stage-level predicates may. In sections 3 and 4 of this chapter, further evidence motivating a distinction between these two sorts of absolutes will be discussed.

3. Tense and the interpretation of absolutes. In this section, it will be seen that absolutes can function both as set-level time adverbs and as main tense adverbs; the distinction between strong and weak absolutes will, in addition, receive further motivation.

3.1 Absolutes and relative frequency adverbs. Recall that in section 2 of Chapter III, it was shown that weak adjuncts can restrict the interpretation of a relative frequency adverb, as in (26);
(26) Walking home, John often stops to see Mary.

strong adjuncts were seen not to function in this way. Careful
consideration reveals that there is a similar difference among
absolutes.

Consider sentences (27)-(29), which have strong absolutes.

(27) His wife being a doctor, John sometimes stops by
the Med Center.

(28) Her arm being broken, Mary never played volleyball
last summer.

(29) Their truck weighing seven tons, they are occasionally
denied access to smaller bridges.

In none of these sentences can the absolute be understood as supplying
a temporal restriction on the accompanying relative frequency adverb;
for example, sentence (29) cannot be interpreted as 'when their truck
weighs seven tons, they are occasionally denied access to smaller
bridges'. Thus, the absolutes in sentences (27)-(29) are not to be
analyzed as set-level time adverbs, but rather as main tense adverbs
—sentence (27), for instance, is to be derived and translated as
follows.

(30) his wife being a doctor, (John) sometimes [stops] by
the Med Center, t, 54,0

John, his wife being a doctor, (he0) sometimes [stops] by the Med
Center, t, 58

his wife being a doctor, (he0) sometimes [stops] by the Med Center,
TAB, 59a

his wife being a doctor, MTA, 13,6

his wife being a doctor, TA, 10,9

his wife being a doctor, t', 5

his wife, T being a doctor, PRPLi, 46

he0 [stops] by the Med Center, t, 19
I feel that it is barely possible to interpret the absolutes in these sentences as supplying the temporal restriction on the accompanying frequency adverbs; they do, however, sound far from natural. On the other hand, the corresponding augmented absolutes can be interpreted perfectly naturally as the first argument of the cooccurring frequency adverb:

(35) With her hair braided, Jane sometimes reminds me of Mary.

(36) With her children asleep, Mary often watches TV.

(37) With his work done, John never goes straight to bed.

Sentence (36), for example, can be interpreted as 'when her children are asleep, Mary often watches TV'. Thus, these augmented absolutes --and, marginally, the absolutes in (32)-(34)-- can be analyzed as set-level time adverbs, as in the analysis (38) for sentence (36).

Thus, in the environment of a relative frequency adverb, absolutes are again seen to participate in a distinction parallel to the distinction between strong and weak adjuncts: absolutes with individual-level predicates (including augmented absolutes with individual
Mary, With her children asleep, (she,) often 
(watches) TV, t, 54,1

Mary, With her children asleep, (she,) often 
(watches) TV, TAB, 64a

often, With her children asleep, TA, 10,9

she, [watches] TV, TAB, 64a

her, children, T asleep, ADJ^s

(39) Vt[often'((\lambda t_1 Vt_2[M_9(t_1,t_2) \&
AT(t_2, Mary's-children'(\exists i Vx^S[R(x^S,x^i) \&
asleep'(x^S)])))\&(\lambda t_1 [t_1 \subseteq t \& [PRES(t_1) \&
AT(t_1, Mary-watches-TV')]]))]

level predicates) may not provide the temporal restriction on a
relative frequency adverb, while absolutes with stage-level predic-
cates--especially augmented absolutes of this sort--may do so. In
the following subsection, we will see yet another environment in which
these two sorts of absolutes are distinct in their semantic behavior.

3.2 Absolutes and the generalization operator G''. In Chapter III,
section 3, a generalization operator G'' was postulated to account for
the generic nature of sentences like (40).

(40) Lying on the beach, John smokes cigars.

We found that weak adjuncts can restrict the interpretation of G'' by
specifying the set of intervals over which generalization takes place,
but that strong adjuncts cannot function in this way. Here, it is
shown that weak absolutes, like weak adjuncts, may specify the set of
intervals for which some generalization holds, while strong absolutes,
like strong adjuncts, cannot.
Consider sentences (41)-(43).

(41) His left arm being in a cast, John doesn't like to play volleyball.

(42) His father having been a wheat farmer, John works at the Board of Trade.

(43) The water being a little cold, Bill stays on the beach.

In none of these sentences can the absolute be interpreted as specifying a set of intervals over which the main clause generalizes; (41), for instance, cannot mean 'when his left arm is in a cast, John doesn't like to play volleyball'. Instead, the strong absolutes in (41)-(43) are interpreted as expressions of category MTA; thus, sentence (42) is to be analyzed and translated as in (44) and (45).

(44) his father having been a wheat farmer, (John) [works] at the Board of Trade, t, 54,0

John, his father having been a wheat farmer, (he0) [works] at the Board of Trade, t, 58

his0 father having been a wheat farmer, (he0) [works] at the Board of Trade, TAB, 59a

his0 father having been a wheat farmer, MTA, 13,6

his0 father having been a wheat farmer, TA, 10,9

his0 father having been a wheat farmer, t', 5

his0 father, T having been a wheat farmer, PRPL1, 46

(45) Vt[K(L6)('Vt1[M9(t,t1) &
AT(t1, John's-father')(*0[Ing('Vt2[perf(t2) &
Vt3[t3 ∈ t2 & AT(t3, wheat-farmer'(x0))])])])]
('[PRES(t) & AT(t, G('work-at-the-Board-of-Trade'))
(John')))]

(John')]]
Now consider sentences (46)-(48), which have weak absolutes.

(46) Her hair braided, Jane reminds us of Mary.

(47) Her children asleep, Mary watches TV.

(48) His work done, John goes straight to bed.

These absolutes are (very) marginally interpretable as specifying a set of intervals over which the main clause generalizes. The corresponding augmented absolutes are perfectly fine in this function:

(49) With her hair braided, Jane reminds us of Mary.

(50) With her children asleep, Mary watches TV.

(51) With his work done, John goes straight to bed.

For example, (49) is to be analyzed and translated as in (52) and (53).

(52) with her hair braided, (Jane) [reminds] us of Mary,

(53) Vt[G"(λt₁ Vt₂[M₉(t₁,t₂) &

AT(t₂, Jane's-hair'(x²Vx₃[R(x₃,x₁) & braided'(x₃)])]

(λt₁[t₁ ⊆ t & [PRES(t₁) & AT(t₁, Jane-reminds-us-of-Mary')])])]]

Just as weak adjuncts were seen in Chapter III, section 3 to be able to restrict the interpretation of the generalization operator G", we have seen here that weak absolutes can as well--particularly weak augmented absolutes. Strong absolutes, including strong augmented
absolutes, cannot function as the first argument of $G'$. Thus, there
are at least three environments motivating a distinction between
absolutes (including augmented absolutes) with individual-level predi-
cates from those with stage-level predicates.

3.3 Absolutes as main tense adverbs. In section 4 of Chapter III,
it was argued that the most economical approach to free adjuncts
not serving as the first argument of a modal, frequency adverb, or
generalization operator is to regard them as main tense adverbs
(rather than as adsentential modifiers). An analogous argument is
possible for absolutes, as I shall now show.

Recall that in sentences like (60), the adjunct cannot be
regarded as an adsentential modifier within the scope of tense
because the main tense adverb by which it is itself modified is
interpreted relative to the present interval, not relative to
some past interval.

(60) Working at the post office during the past summer,
Mary decided to go back to school.

Similarly, we cannot regard the absolutes in sentences like (61)
and (62) as adsentential modifiers with narrow scope, because their
own main tense adverbs are interpreted relative to the present
interval;

(61) With John leading the project during the past summer,
we made a lot of progress.

(62) Her arm being in a cast during the past summer, Mary
decided not to join the volleyball team.

this is fairly sure evidence that absolutes in general do not
function as adsentential modifiers with narrow scope with respect to
As in the case of free adjuncts, it is fairly difficult to choose between analyzing absolutes like those in (61) and (62) as adsentential modifiers with wide scope and analyzing them as main tense adverbs. Nevertheless, by analyzing absolutes that don't restrict the interpretation of a dyadic operator as main tense adverbs, we can use independently motivated rules to account for the appearance of sequence of tense in absolutes like that in (63);

(63) With Mary promising that she would answer our questions, she and John walked out the door.

the argument to this effect is just like the argument (Chapter IV, section 4.2) for treating free adjuncts as main tense adverbs, and, for this reason, will not be repeated here.

If absolutes which don't restrict dyadic operators are treated as main tense adverbs, then the range of interpretations which they show in perfect sentences is correctly predicted. Consider, for example, the past perfect sentence (64).

(64) With John leading the project during the past summer, we had made a lot of progress.

On one interpretation, (64) entails that John led the project during the most recent summer relative to some past interval (rather than to the present interval); in the present analysis, this is because of the possibility of analyzing (64) as in (65), which produces the translation (66). Under the interpretation induced by (66), the absolute joins with the perfect rather than with the past tense to characterize a single interval. Note that the simple past tense sentence (61) corresponding to (64) does not have an interpretation
with John leading the project during the past summer, (we) [had] made a lot of progress, t, 58

(65) with John leading the project during the past summer, (we) [had] made a lot of progress, TAB, 55

with John leading the project during the past summer, (we) [have] made a lot of progress, t, 58

(66) [have], TAB/ TAB (we) [make] a lot of progress, t, 19

during the past summer, MTA, 67 with John leading the project, t', 6

during the past summer, TA John, T leading-the-project, PRPLS, 45

(66) Vt[past(t) & AT(t, Vt1[K(L6)](\^Vt2[M9(t1,t2) &
    [during-the-past-summer'(t2) & AT(t2, Vx5[R(x5,John')
    & Ing("[lead-the-project'(x5)]))])(^perf(t1) &
    Vt2[t2 \subseteq t1 & AT(t2, we-make-a-lot-of-progress')])))]

in which the adverb during the past summer is interpreted relative to a past interval, as we have already seen; this is predicted if the absolute in (61) is treated as a main tense adverb, for if it is, (61) may only be analyzed as in (67). Here, during the past summer is necessarily interpreted relative to the present interval, as the translation (68) induced for (61) by (67) shows.

Thus, there is good reason to suppose that absolutes (whether weak or strong) which don't serve as the first argument of a modal, frequency adverb, or generalization operator are main tense adverbs, and that as such, absolutes of this sort may combine with a simple
(67)  with John leading the project during the past summer, (we) [made] a lot of progress, t, 58

with John leading the project during the past summer, (we) [made] a lot of progress, TAB, 59a

with John leading the project during the past summer, MTA, 13, 6 (we) [make] a lot of progress, t, 19

during the past summer, TA, 11, 9

during the past summer, MTA, 67 with John leading the project, t', 6

during the past summer, TA John, T leading the project, PRPLS, 45

(68)  \( \forall t [K(L_6)(\forall t [M_9(t, t_1) & [\text{during-the-past-summer'}(t_1) & AT(t, \forall x^{S}[R(x^{S}, \text{John') & Ing('[lead-the-project'}'(x^{S}))])})(^{'\text{past}(t) & AT(t, \text{we-make-a-lot-of-progress'})})] \]

tense (i.e. with a tensed temporal abstract) or with the perfect (i.e. with a tenseless, perfect temporal abstract) to characterize a single interval. Note that weak absolutes serving as main tense adverbs need not be augmented:

(69)  His dog at his side, he rushed to the scene of the crime.

(70)  Her hair braided, Mary began to put on makeup.

(71)  The children asleep, Bill watched TV.

They do, however, sound more formal or literary than weak augmented absolutes.

In this section, we have found a number of semantic parallels between free adjuncts and absolutes. Just as weak adjuncts may serve as the first argument of a relative frequency adverb or generalization operator, so may weak absolutes; strong absolutes, like strong
adjuncts, may not. Absolutes not restricting the interpretation of a dyadic operator, like free adjuncts of this sort, are most economically analyzed as main tense adverbs. Thus, just as we postulated three categories of free adjuncts in Chapters II-IV (namely $t'$, TA, and †TA), we conclude that absolutes appear in exactly the same three categories.

4. Aspect and the interpretation of absolutes. In Chapter IV, it was argued that free adjuncts provide important evidence for novel approaches to the semantics of the perfect tense and the progressive aspect in English. Here, it is shown that absolutes can also be used to motivate these approaches.

4.1 The perfect tense and the interpretation of absolutes. In section 1 of Chapter IV, the acceptability of adjuncts like that in (72) was shown to be inconsistent with the extended now theory of the English perfect.

(72) Having been on the train yesterday, John knows exactly why it derailed.

It was argued that the acceptability of (72) can be accounted for if the function of the perfect is taken to be to locate an event/state of affairs within a perfect interval (i.e. an interval beginning before and lasting no later than the present interval); under this analysis, the anomaly of present perfect sentences like (73) is taken to be pragmatic rather than semantic in nature.

(73) *John has been on the train yesterday.

Absolutes can be used to motivate this analysis of the perfect. Consider, for example, sentence (74).
(74) His family having lived in Paris in 1940, John sometimes has nightmares about the war.

Under the extended now theory of the perfect, the absolute in (74) should be as anomalous as the present perfect sentence (75);

(75) *His family has lived in Paris in 1940.

yet, (74) is fully acceptable. This difference in acceptability can be accounted for if the extended now theory is rejected and the analysis proposed in Chapter IV is adopted. According to the latter analysis, (74) may be derived as in (76) and thus assigned the translation (77).

(76) his family having lived in Paris in 1940, (John) sometimes [has] nightmares about the war, t, 54,0

 John, his family having lived in Paris in 1940, (he) sometimes [has] nightmares about the war, t, 58

his family having lived in Paris in 1940, (he) sometimes [has] nightmares about the war, TAB, 59a

his family having lived in Paris in 1940, (he) sometimes [has] nightmares about the war, MTA, 13,6

his family having lived in Paris in 1940, (he) sometimes [has] nightmares about the war, TA, 10,9

his family, having lived in Paris in 1940, PRPL, 46

[have] lived in Paris in 1940, IV, 47,4

(he) [has] lived in Paris in 1940, t, 58

(he) [has] lived in Paris in 1940, TAB, 59b

in 1940, MTA, 67 (he) [has] lived in Paris, TAB, 73

in 1940, TA [have], TAB/TAB (he) [lives] in Paris, t, 19
The interpretation induced by (77) is noncontradictory, as desired. (The unacceptability of sentence (75) can, on this analysis, be regarded as pragmatic in nature: the use of the perfect in (75) conversationally implicates that the (structurally and conceptually simpler) preterit sentence (78) is somehow inappropriate;)

(78) His family lived in Paris in 1940.

yet, (75) entails (78).

As this example shows, the proposed analysis of the perfect is superior to the extended now theory in the predictions it makes about perfect absolutes (as well as about the constructions discussed in Chapter IV, section 1).

4.2 The progressive aspect and the interpretation of absolutes. In Chapter IV, section 2, a semantics for present participial phrases was proposed which accounts for the semantic peculiarities of present participial adjuncts and which allows the progressive to be treated simply as a predicative participial construction. The applicability of this semantics to present participial absolutes is briefly demonstrated here.

The critical claim embodied in my analysis of present participial phrases is that they are unspecific as to their perfectiveness (when
they derive from accomplishment or achievement predicates). Thus, the adjunct in sentence (79) can be inferred either to be perfective or imperfective.

(79) Crossing the street, John ran into Mary.

Present participial absolutes with accomplishment/achievement predicates are, like the adjunct in (79), unspecific as to perfectiveness; for any given absolute, a perfective interpretation may be more or less likely, depending on the context in which it occurs. Consider, for example, the absolutes in (80) and (81).

(80) With the children setting up the tents, Jane and Bill went to look for firewood.

(81) John's horse crossed the finish line first, with Bill's horse crossing it shortly after.

Intuitively, these absolutes might contrast in perfectiveness: (80) could seemingly be true even if the children didn't actually succeed in getting the tents set up while (81) appears to require that Bill's horse crossed the finish line. In my analysis, this difference between the absolutes is pragmatic rather than semantic in nature: our knowledge of how families behave on camping trips makes an inference of imperfectiveness possible for (80), while our knowledge of what kind of thing normally happens in a horse race makes an inference of perfectiveness most likely for (81). Thus, the absolutes in (80) and (81) are assigned similar analyses and translations:3
(82) with the children setting up the tents, MTA, 13,6
     with the children setting up the tents, TA, 10,9
     with the children setting up the tents, t', 6
     the children, T setting up the tents, PRPLS, 45
     [set] up the tents, IVS

(83) with Bill's horse crossing it, shortly after, MTA, 13,6
     with Bill's horse crossing it, shortly after, TA, 11,9
     shortly after, MTA, 67 with Bill's horse crossing it, t', 6
     shortly after, TA Bill's horse, T crossing it, PRPLS, 45
     [cross] it, IVS

(84) \[\lambda \ell \lambda t[K(K_6)(\ell Vt_1[M_S(t,t_1)]) \&
     AT(t_1, the-children')(\ell Vx^S[R(x^S,x')]) \&
     Ing(\ell [set-up-the-tents'(x^S)])])](\ell [P^t(t)])
(85) \[\lambda \ell \lambda t[K(K_6)(\ell Vt_1[M_S(t,t_1)]) \& [shortly-after'(t_1)] \&
     AT(t_1, Bill's-horse')(\ell Vx^S[R(x^S,x')]) \&
     Ing(\ell [cross-it_2'(x^S)])])](\ell [P^t(t)])

In this section, we have seen that the semantics of absolutes provides additional support for the analyses of the perfect and the progressive presented in Chapter IV.

This chapter has been devoted to demonstrating that the generalizations about free adjuncts uncovered in Chapters II-IV can be extended to cover absolutes as well. Parallel to the distinction between strong and weak adjuncts is a distinction between strong and weak absolutes: weak absolutes and adjuncts may serve as the first argument of a modal, frequency adverb, or generalization operator, while strong absolutes and adjuncts may not. (When restricting a dyadic operator,
weak absolutes must be augmented, for reasons which remain unclear.)
Furthermore, as main tense adverbs, absolutes may, like free adjuncts, join either with a simple tense or with the perfect to characterize some interval. Finally, absolutes provide further motivation for the analyses of the perfect and the progressive developed in Chapter IV on the basis of the semantics of perfect and present participial adjuncts. To capture this intimate connection between free adjuncts and absolutes, we have assigned them to precisely the same categories --t', TA, and MTA.
Footnotes--Chapter V

1 There is one construction which may express a condition and which, from a historical perspective, is an absolute; this is the
provided that S construction:

(i) Provided that all is safe, you may go.
   (Visser 1972:1295)

Synchronically, provided (that) is probably best analyzed as a kind of subordinating conjunction—cf. Visser's discussion.

2 There are, of course, strong augmented absolutes:

(i) With his mother being a doctor, John would know the way to the Med Center.
(ii) With the water being a little cold, the children must stay on the beach.
(iii) With his arm being broken, Bill might not be asked to participate.

These have the same properties as strong absolutes proper—none of the augmented absolutes in (i)-(iii) can be interpreted as expressing a condition on the accompanying modal.

3 Here, I assume that the main tense adverb shortly after translates as

\[ \lambda^t \alpha [\text{shortly-after}'(t) \& \text{P}(t)] \],

where shortly-after' is deictic, denoting the set of intervals closely following some contextually specified interval.
1. Introduction. In this chapter, we return to the issue (raised in Chapter I) of the semantic versatility of free adjuncts and absolutes—i.e., the question of why these constructions, though not marked with semantically explicit subordinating conjunctions, can nevertheless play a wide variety of logical roles.

As was shown in Chapter I, this versatility of adjuncts and absolutes has attracted the attention of various traditional grammarians, who have developed inventories of the logical roles which adjuncts and absolutes may intuitively play and have, more tentatively, attempted to explain why a given adjunct or absolute is felt to play a particular sort of role. We saw two sorts of approaches to this versatility: on the one hand, Jespersen (1940) and Curme (1951) attempted to link the specific logical role of a given absolute to some feature of its internal or external syntax; on the other hand, Quirk, et al. (1972) and Kruisinga (1932) argued that the particular logical relation which a given adjunct or absolute is felt to bear to its superordinate clause is simply inferred from context. My thesis here is that the factors which determine the specific logical role of an adjunct or absolute are of more than one kind—that the nature of the intuitive relation between a free
adjunct or absolute and its superordinate clause is jointly determined by the meaning of the sentence and the inferences of language users.

In Chapters II-V, a model-theoretic semantics was developed in an attempt to elucidate some of the ways in which the logical role of a given adjunct or absolute may be determined semantically, independently of the inferences of language users. It was shown that certain sorts of expressions—modals, relative frequency adverbs, and the invisible generalization operator $G^M$—may take (weak) adjuncts and absolutes as arguments, and that when they do, they wholly or partially determine their role in the sentence. Consider, for example, sentence (1).

(1) With her hair braided, Mary would resemble Jane. On the most likely interpretation of this sentence, the absolute serves as the first argument of the modal would (i.e. supplies the condition relative to which the modal is interpreted—see Chapter II); for this reason, the conditional nature of this absolute is entirely determined by the semantics of the sentence itself. Similarly, the adjuncts in sentences (2) and (3) can be interpreted as the first argument of the accompanying relative frequency adverb or generalization operator:

(2) Driving home, John always listens to the radio.

(3) Driving home, John listens to the radio. because frequency adverbs and the operator $G^M$ are interpreted relative to sets of time intervals, the semantics of sentences (2) and (3) determines the logical role of their adjuncts insofar as it requires that they denote sets of time intervals.
Nevertheless, it was found in Chapters II-V that the logical relation between an adjunct or absolute and its main clause is often determined inferentially. For example, even though the semantics of sentence (2) requires that its adjunct denote a set of time intervals (on the most likely interpretation), it does not specify which set of intervals; the adjunct in (2) can be inferred to have the denotation of either of the set-level adverbs in (4) and (5) (among other possible denotations).

(4) Upon driving home, John always listens to the radio.

(5) While driving home, John always listens to the radio.

(This indeterminacy in the meaning of an adjunct of category TA is represented as a free variable M over two-place relations between time intervals in the translation assigned to the adjunct in (2) by the fragment developed in Chapters II-V:

\[
\lambda tVt_1[M(t, t_1) \& AT(t_1, \forall x_5[R(x_5, x_1) \& \text{driving-home}(x_5)])].
\]

More generally, any adjunct or absolute not serving as the argument of a modal, frequency adverb, or generalization operator (i.e. any adjunct or absolute, weak or strong, serving as a main tense adverb) is semantically indeterminate as to its logical role. Consider, for example, sentence (7).

(7) Being thirty-five years old, John will be eligible to run for president in 1984.

The relation between the strong adjunct and the main clause of this sentence is semantically indeterminate in at least two ways. First, the temporal relation between the adjunct and the main clause is
open: (7) can be inferred to mean either that John is thirty-five now, or that he will be thirty-five in 1984. Temporal considerations aside, the relevance of the adjunct to the main clause in (7) is not strictly specified by the semantics of English. We would almost surely infer that the adjunct in (7) provides the reason for the truth of the main clause; note, however, that in sentence (8), the very same adjunct would most likely be inferred to bear an adversative relation to the main clause.

(8) Being thirty-five years old, John will nevertheless be ineligible to run for president in 1984.

(These two sorts of indeterminacy are represented by the free variables L and M in the translation assigned to (7):

(9) Vt[K(L)("Vt[N(t,t1) & AT(t1, being-thirty-five-years-old'(x0))]("[in-1984'(t) & [FUT(t) & AT(t, John-is-eligible-to-run-for-president')]])].)

What I would like to consider in this chapter are the inferential strategies employed by language users in resolving the semantic indeterminacy of free adjuncts and absolutes; that is, I wish to explore the means by which language users arrive at satisfactory values for the variables L and M in translations like (6) and (9). Before I approach this topic, however, I wish to draw a fine distinction between two sorts of inferences involved in language comprehension.

2. Two kinds of inferences. In this section I shall draw an important distinction between two kinds of inferences in language comprehension. By an 'inference' I mean anything which is not part of the literal meaning of some sentence but which language users judge to
be part of the intended meaning of that sentence.² (Here 'meaning' is meant to cover nontruthconditional as well as truthconditional meaning.)

When a sentence \( \phi \) is asserted, an inference drawn from \( \phi \) may or may not be understood as part of what is asserted. That is, it may be that \( \phi \) does not literally express all of what it is used to assert; in this case, an inference must be drawn if \( \phi \) is to be understood at all. On the other hand, the literal meaning of \( \phi \) may constitute what is asserted; in this case, any inferences drawn from \( \phi \) are inessential for understanding what \( \phi \) is used to assert.

An example will help bring out this difference. Consider sentence (10).

(10) I saw a Picasso today.

The noun phrase \textit{a Picasso} in this sentence is an example of what Clark (1978:313ff) calls 'shorthand expressions'. A shorthand expression \( \xi \) picks out a coherent class of referents bearing some salient relation to the explicit content of \( \xi \); the expression \textit{a Picasso}, for instance, can denote (the property set of) some member of any of the classes listed in (11) (among others).

(11) \textit{Picassos:}

\begin{itemize}
  \item works of art by Picasso
  \item portraits of Picasso
  \item people named Picasso
  \item people bearing a strong physical resemblance to Picasso
  \item people with a level of artistic aptitude comparable to Picasso's
  \item autographs by Picasso
  \item forgeries intended to pass as works of art by Picasso
  \item postage stamps bearing the likeness of a work of art by Picasso
\end{itemize}
To understand a sentence containing a shorthand expression, language users must infer which class of referents the shorthand is intended to pick out. For example, to understand an assertion of (10), we must infer what sort of Picasso the speaker has in mind, for this is part of what is asserted; (10) can't simply be understood as 'I saw something in some way connected with Picasso today'.

The situation with sentence (12) is different.

(12) I saw a painting today.

Given the appropriate circumstances, we might infer that the speaker of (12) has a specific sort of painting in mind—a forgery (e.g. if the speaker is a forgery expert), a portrait of Lincoln (if s/he is a Lincoln biographer), a painting by Vermeer, etc. This inference would not, however, count as part of what (12) is used to assert; (12) can be understood without drawing any inference at all about the sort of painting the speaker saw.

In what follows, we will say that a sentence which doesn't literally express what it is used to assert is indeterminate with respect to the range of meanings which it may be used to assert; when a sentence is indeterminate in this way, we must infer what it is intended to assert if we are to understand it at all. Thus, sentence (12) is indeterminate with respect to a range of possible meanings corresponding to the range of meanings which can be inferred for the shorthand expression a Picasso. On the other hand, a sentence which literally expresses what it is used to assert may be unspecific with respect to some range of meanings; a sentence which is unspecific with respect to some range of meanings may have one of these as its
intended meaning, but what it asserts is comprehensible whether or not this is the case. Thus, sentence (12) is unspecific with respect to a range of meanings corresponding to the range of meanings which can be inferred for the noun phrase a painting.

The difference between inferences which resolve indeterminacies and those which resolve unspecificities is of great importance for understanding the nature of free adjuncts. Recall from Chapter I the claim of Quirk et al. (1972) that a logical role is inferred for a free adjunct in essentially the same way as for a nonrestrictive relative clause or coordinate clause—that the possibility of inferring a causal connection in (13) is paralleled in (14) and (15).

(13) John, being an Englishman, is brave.
(14) John, who is an Englishman, is brave.
(15) John is an Englishman, and he is brave.

Careful consideration of these sentences reveals that while (14) and (15) are merely unspecific with respect to the logical connection between John's nationality and his courage, (13) is in fact indeterminate with respect to this connection—to comprehend an assertion of (13), we must infer some sort of logical connection. This, I claim, is a general fact about sentences with free adjuncts and absolutes: when the logical role of the adjunct/absolute is not entirely determined by the semantics of English (i.e. when the adjunct/absolute isn't the first argument of a modal), such sentences are indeterminate, not merely unspecific, with respect to the logical relation holding between their adjunct/absolute and its superordinate clause. Thus, what I have represented with the free variables L and M in the
translations produced by the fragment developed in Chapters II-V are indeterminate rather than unspecific aspects of a sentence's meaning.

What I shall examine in the following section are the means by which language users resolve the indeterminacy of sentences with free adjuncts and absolutes--by which they, as it were, determine admissible values for the variables L and M.

3. Inferences, adjuncts, and absolutes. In this section we will discuss the means by which language users resolve the indeterminacy of sentences with free adjuncts and absolutes. Their inferences appear to be motivated by a variety of considerations. First, whether an adjunct or absolute has a stage-level or an individual-level predicate bears importantly on the logical role it is inferred to have. Second, the relative duration of the events or states of affairs to which an adjunct or absolute and its main clause relate places certain limitations on the temporal relation inferred to hold between the adjunct/absolute and the main clause (whether or not the principal function of the adjunct/absolute is that of a time adverb). Third, the superficial order of an adjunct or absolute and its main clause can be understood as iconic. Fourth, language users' general knowledge of the world powerfully constrains the range of logical roles that can be inferred for an adjunct or absolute. Finally, certain sorts of 'connective adverbs' can be understood as explicitly indicating the relation holding between an adjunct or absolute and its superordinate clause. Each of these considerations will be examined in turn in the following five subsections.
3.1 Carlson’s ontology. In Chapters II-V of this dissertation, the distinction between strong and weak adjuncts/absolutes was seen to have pervasive motivation: weak adjuncts and absolutes—those with stage-level predicates—were seen to be exactly those which, like conditional clauses, may serve as the first argument of a modal, and which, like explicitly temporal adverbial clauses, may serve as the first argument of a frequency adverb or generalization operator; strong adjuncts and absolutes—those with individual-level predicates—were seen not to serve in these ways. Furthermore, when serving as main tense adverbs, weak adjuncts and absolutes intuitively have a temporal role; strong adjuncts, on the other hand, are typically felt to express reasons. These facts strongly suggest that there is something about stage-level predications which makes them inherently more suitable than individual-level predications for the expression of temporal or conditional relations, and that there is something about individual-level predications which makes them naturally more suitable for expressing reasons.

On first consideration, this hypothesis appears to be falsified: it is, after all, perfectly possible to have an explicit because-clause with a stage-level predicate;

(16) Because John heard Mary, we'll have to scrap the plan.

similarly, explicitly temporal or conditional adverbial clauses sound fine with individual-level predicates.

(17) When John was a sailor, he traveled all over the world.

(18) If Bill were intelligent, he'd be able to figure this out.
Nevertheless, careful consideration reveals that there is good semantic motivation for the correlation between strong adjuncts/absolutes and the expression of reasons and for the correlation between weak adjuncts/absolutes and the expression of temporal relations (although the correlation between weak adjuncts/absolutes and the expression of conditionality remains mysterious to me).

Recall the nature of stage-level properties—"accidental" properties exhibited by the space-time slices of an individual: the interval at which a stage has a given stage-level property is characteristically comparatively short and discrete; those intervals at which stages of some individual have a given stage-level property are often discontinuous. Stage-properties contrast in these respects with basically individual-level properties ('essential' properties): the interval at (every moment of) which an individual possesses such a property is normally comparatively long and lacks definite boundaries; an individual-level property most often applies to a particular individual (at every moment) throughout a single, continuous interval (as Dowty (1979:179) observes, individual-level predicates express the dispositions or potentialities of an individual). These differences between the properties of stages and individuals make the former much more suitable for locating relatively short and discrete intervals in time. We may locate a given interval quite precisely in time by relating it to the interval at which the stage of some individual has some (stage-level) property or other; for example, in (19), the interval at which John fell down the stairs is located fairly exactly by being related to that at which some stage of John was drunk.
When John was drunk, he fell down the stairs.

If we locate an interval by relating it to the interval at which some individual has a certain (basically) individual-level property, we achieve much less precision:

When John was a drunk, he fell down the stairs.

Thus, reference to the properties of some individual's stages is important for establishing relatively precise temporal relations with adverbial subordinate clauses, free adjuncts, or absolutes.

We can see this especially clearly in the case of adverbial clauses, adjuncts, or absolutes serving to restrict a relative frequency adverb or generalization operator. The first argument of a relative frequency adverb specifies the normally discontinuous set of time-intervals over which the adverb quantifies. To the extent that the membership of this set is ill-defined or its members vague, the resulting quantification lacks informativeness; likewise this is so if this set consists of only a single, continuous interval. Accordingly, adverbial clauses, free adjuncts, and absolutes with individual-level predicates (like when John is a drunk, being a drunk, and (with) John being a drunk) aren't useful as arguments of relative frequency adverbs. (Note the oddity of When he is a drunk/Being a drunk, he often falls down the stairs if the adverbial expressions are construed as restricting the interpretation of often.) Similarly, adverbial clauses, adjuncts, and absolutes restricting the operator $G'$ specify the normally discontinuous set of intervals over which some generalization holds; to the extent that they are vague in the set of intervals they characterize, the resulting generalization is
uninformative; this is likewise the case if they characterize a single, continuous interval. For this reason, adverbial clauses, free adjuncts, and absolutes with individual-level predicates aren't very useful as arguments of $G^\prime$. (Note the oddity of *When he is a drunk/Being a drunk, he falls down the stairs* if the adverbial expressions are construed as restricting $G^\prime$.) Clearly, there is a correlation between stage-level properties and the expression of temporal relations in those instances in which an adverbial clause, free adjunct, or absolute restricts a frequency adverb or generalization operator: in these instances, only those adverbial expressions with stage-predicates are uniformly good for picking out the desired sort of set of intervals.

An additional piece of evidence suggesting that stage-level predications are better suited than individual-level predications for the expression of temporal relations is the fact that augmented adjuncts with temporal subordinators often sound quite odd with individual-level predicates; that is, though one can say *when he was a sailor*, it sounds strange to say *when (being) a sailor*.

In general, then, stage-level predications tend to be better suited than individual-level predications for expressing temporal relations. This tendency is apparently one reason for the fact that language users routinely infer that the logical role of a weak adjunct /absolute of category MTA is temporal in nature, and for the fact that weak adjuncts and absolutes, but not strong ones, may (as members of category TA) restrict the interpretation of a relative frequency adverb or generalization operator.
It can also be appreciated why adjuncts and absolutes with individual-level predicates are well-suited to the expression of reasons. As was pointed out above, individual-level predicates express an individual's 'essential' properties—its dispositions or potentialities; for this reason, individual-level predications have a law-like character which makes them highly useful for predicting future events or states of affairs as well as accounting for past ones (consider, for example, what can be confidently inferred about John's past and future behavior from the present truth of John smokes, John loves Mary, etc.). It is this salient predictiveness which makes individual-level predications good for providing explanations; it is, therefore, not surprising that language users tend to infer an explanatory role for strong adjuncts and absolutes.

Thus, the correlation between stage-predicates and the expression of temporal relations and that between individual-level predicates and the expression of reasons are not especially difficult to account for, if one keeps in mind the fundamental distinction between stage-properties and properties of individuals; this fact would appear to justify the decision (see Chapter II, section 4.3) to regard the distinction between strong and weak adjuncts/absolutes as pragmatic rather than categorial in nature. There are, however, two things which continue to puzzle me about the behavior of strong vs. weak adjuncts/absolutes—things which, to an extent, mitigate the plausibility of assuming a pragmatic rather than categorial distinction between strong and weak adjuncts/absolutes.
First, it is not clear why weak adjuncts and absolutes should be so much better than strong ones as arguments of modals. There are, admittedly, certain parallels between temporal adverbial clauses and conditional clauses—cf. the idioms if and when, unless and until, and the fact (noted by Lewis (1975)) that if-clauses can sometimes restrict the interpretation of a relative frequency adverb ('adverb of quantification'). But I can think of nothing about stage-level predications in particular which makes them better for expressing conditions than individual-level predications.

The second problem concerns the problematic class of individual-level predicates consisting of be\textsubscript{1} (see Chapter II, section 4.2.1) plus some stage-level predicative phrase: be asleep, be in the barrel, be ready to leave, etc. Recall that a number of diagnostics (ability to occur in the progressive, ability to occur postnominally in existential there sentences, ability to occur in the see them drunk construction, generalizability) all suggest that such expressions are individual-level predicates, as does the fact that they give rise to strong rather than weak adjuncts and absolutes. The problem is that such expressions do not express essential properties or dispositions; on the contrary, the properties they express are no less accidental nor less temporally bound than those expressed by the stage-level predicative phrases from which they derive (compare, for example, the denotations of asleep and be asleep: asleep', \(\lambda x^t \square x^s [R(x^s, x^t) \& asleep'(x^s)]\)). Why, then, are they so naturally inferred to express reasons when they appear in free adjuncts and absolutes?
I admit I have no completely satisfactory answer to this problem. It may be that some special property of the verb be (above and beyond that of 'shifting' a stage-predicate to the individual level) is responsible for this peculiarity of predicates like be asleep, but I haven't been able to find convincing evidence of any such property; in fact, it appears that in earlier English, adjuncts consisting of being plus an adjective could be inferred to have a temporal role—

(21) ... being young, he was a pensioner in the house of this Ammonius.
[= Modern English 'when he was young ...']
(Dryden, Life of Plutarch, 1683, cited by Visser (1972:1136))

(This is still possible with étant-adjuncts in Modern French.) Another possibility is that the logical role of an adjunct or absolute with being isn't inferred at all in Modern English--that such constructions are an idiom with the approximate meaning of a because-adverbial. A tantalizing piece of evidence in favor of this point of view are the being as (how) and being (that) constructions present in earlier English and in some contemporary American dialects (mine included):

(22) You loyter heere too long, being you are to take soulldiers up.
(Shakespeare, Henry IV, Pt.2, 1597, cited by Visser (1972:1218))

(23) Being as you are a giant, you move naturally in seven league boots.
(Visser 1972:1218)

These are unquestionably idiomatic constructions used exclusively to express reasons; perhaps adjuncts and absolutes with being are analogous. This possibility is consistent with the strong tendency of free adjunct and absolute constructions to develop historically into
prepositional and adverbial clause constructions (see Visser (1972: 1217ff; 1292ff) for discussion and examples).

Before proceeding to a discussion of how language users determine the nature of the temporal relation holding between an adjunct or absolute and its superordinate clause, I wish to point out a relevant difference between strong and weak adjuncts/absolutes. Recall that in section 1.4.4 of Chapter III, we saw that, for semantic reasons, when-clauses and while-clauses must agree in tense with their superordinate clause; furthermore, we saw that sentences like (24) and (25), though noncontradictory, are pragmatically anomalous.

(24) *John will leave after Mary arrived.
(25) *John left before Mary arrives.

The upshot of these facts is that temporal adverbial clauses must in general relate to an interval satisfying the same tense predicate ('past(t)', 'PRES(t)', or 'FUT(t)') as the interval to which their superordinate clause relates, if they are to be semantically and pragmatically acceptable. Now, because weak adjuncts and absolutes are characteristically inferred to have the function of temporal adverbials, it is not surprising that they are normally inferred to relate to an interval of the same 'tense' as the interval to which their superordinate clause relates. Consider, for example, sentences (26) and (27).

(26) Working at the post office during the past summer, Mary decided to go back to school.
(27) *Working at the post office during the past summer, Mary will go back to school this spring.

In both (26) and (27), the adjunct relates to a past interval,
because of the adverb during the past summer which modifies it. For this reason, sentence (27), in which the superordinate clause is future in tense, sounds quite bad. ((27) can, of course, be repaired by converting its adjunct to perfect form:

(28) Having worked at the post office during the past summer, Mary will go back to school this spring.

In this sentence, the adjunct itself need not relate to a past interval—rather, it need only relate to some interval at which it it true that Mary worked at the post office during the preceding summer. This can be a future interval, so (28) is fine.)

Strong adjuncts and absolutes present a different situation.

Reason-adverbials, unlike temporal adverbials, are temporally independent of their superordinate clause; this is, of course, because the truth of a proposition p at index i may qualify as a reason for the truth of some other proposition q at index j even if i and j satisfy different tense predicates. For example, (29) is perfectly acceptable:

(29) Because she is thirty-five years old, Mary will be eligible to run for president in 1984.

Because strong adjuncts and absolutes are so well suited for expressing reasons, it should not be any surprise that, unlike weak adjuncts and absolutes, they can be inferred to relate to some interval distinct in 'tense' from the interval to which their superordinate clause relates. Thus, the adjunct in (30) can be understood to relate to the speaker's interval as well as to 1984.

(30) Being thirty-five years old, Mary will be eligible to run for president in 1984.

Thus, the difference between strong and weak adjuncts/absolutes has consequences for the inferred time reference of such expressions.
In the following subsection, we will see another sort of consideration entering into the inference of a temporal connection between a free adjunct or absolute and its superordinate clause.

3.2 Instantaneousness. Free adjuncts and absolutes of category MTA are always felt to bear some sort of temporal relation to their main clause, whether or not their principal function is felt to be that of a temporal adverbial. As we have seen, strong adjuncts and absolutes may relate to the speaker's interval; in most cases, however, adjuncts and absolutes of category MTA relate to some interval satisfying the same tense predicate as the interval to which their superordinate clause relates, and additionally bearing some sort of relation to it. (This relation is represented by the free variable $M_g$ in an expression such as (31)—

\[(31) Vt[K(L)(V_{t_1}[M_g(t,t_1) \& AT(t_1, Vx^S[R(x^S,x^I) \& \neg \text{ING}('\text{walk-home'}(x^S)])])(\text{past}(t) \& AT(t, John-finds-a-dollar'))]).\]

In some cases, this relation is highly constrained by time adverbs; in (32), for instance, the adverbs at 5:01 and at 5:07 require that the value of $M_g$ in (33) be a relation holding between 5:01 and 5:07.

\[(32) \text{Leaving the station at 5:01, he arrived at the bank at 5:07.}\]

\[(33) Vt[K(L)(V_{t_1}[M_g(t,t_1) \& [5:01' = t_1 \& AT(t_1, Vx^S[R(x^S,x^I) \& \neg \text{ING}('\text{leave-the-station'}(x^S)])]])(\text{past}(t) \& AT(t, he-arrives-at-the-bank'))]].\]

In most cases, however, language users must infer the precise nature
of the temporal relation holding between an adjunct or absolute of
category MTA and its superordinate clause. The relative duration of
the event or state of affairs to which an adjunct or absolute relates
and that to which the main clause relates can form the basis for such
an inference. There are three broad cases to be considered: 1) that
in which the free adjunct/absolute and the main clause both relate to
instantaneous events; 2) that in which the free adjunct/absolute
relates to an instantaneous event and the main clause to a state of
affairs or noninstantaneous event, or vice versa; and 3) that in which
the free adjunct/absolute and the main clause both relate to states
of affairs or noninstantaneous events. Each of these cases will be
discussed in turn.

1) The adjunct/absolute and the main clause both relate to instan-
taneous events.

This case covers sentences in which both the adjunct/absolute and
the main clause have instantaneous achievement predicates. In such
instances, language users infer that the events to which the adjunct/
absolute and the main clause relate are simultaneous or successive.
In sentence (34), for example, we may infer that John realized Bill's
house was on fire just as he noticed the smoke or sometime afterwards.

(34) Noticing the smoke, John realized Bill's house was on
fire.

The nature of instantaneousness precludes the possibility that a
relation of proper containment should be inferred.

Note here that states aren't normally felt to be instantaneous;
for instance, it's very difficult to come up with a convincing example
of a sentence in which a state may be inferred to be no more than simultaneous with an instantaneous event--this despite the fact that a stative predication true at interval i is true at every moment in i. Perhaps the truth of a stative predication p at some moment m entails the truth of p at some proper superinterval of m. If this is the case, then whenever an inference of simultaneity can be drawn between a state and an instantaneous event, the stronger inference can be drawn that the interval of the state properly contains the instant of the event; the ever-present possibility of this stronger inference accounts for the apparent incompatibility of stativity and instantaneousness.

2) The adjunct/absolute relates to an instantaneous event and the main clause to a state or noninstantaneous event, or vice versa.

In sentences covered by case 2, the free adjunct/absolute has an instantaneous achievement predicate while the main clause has a stative, activity, accomplishment, or noninstantaneous achievement predicate; or vice versa. In such instances, language users infer a relation of proper containment or of succession. For example, in (35), we may infer that Mary spotted the heron while she was walking home or, somewhat less probably, after she got home; in (36), it seems quite natural to infer a relation of succession.

(35) Walking home, Mary spotted a heron.

(36) John climbed down the well, discovering a sealed metal box at the bottom.

In no case is a relation of simultaneousness inferrable, owing to the sorts of predicates involved.
3) The adjunct/absolute and the main clause both relate to states or noninstantaneous events.

Subsumed under this case are sentences in which both the adjunct/absolute and the main clause have stative, activity, accomplishment, or noninstantaneous achievement predicates. In such instances, language users may infer that the intervals to which the adjunct/absolute and the main clause relate stand in a relation of identity, proper containment, or succession. In (37), we might infer that John sang throughout or at some period during his walk beside the river.

(37) Walking beside the river, John sang.

In (38), we may infer that the lowering preceded the lying.

(38) Lowering himself laboriously onto the cot, Bill lay exhausted.

Clearly, sentences subsumed under case 3 are subject to the broadest range of possible inferences: since both the adjunct/absolute and the main clause relate to events or states having duration, the possibility of inferring a relation of proper containment isn't ruled out (as it is in case 1), nor is the possibility of inferring a relation of simultaneity (as it is in case 2). Observe that a relation of succession is, in principle, possible for all cases.

Thus, the nature of the temporal relation holding between an adjunct or absolute of category MTA and its superordinate clause is inherently limited by the duration of the events or states of affairs to which these relate. Although I won't demonstrate this in detail here, it can be analogously shown that the set of intervals denoted by an adjunct or absolute (of category TA) restricting a
relative frequency adverb/generalization operator is inherently limited in an analogous way.

3.3 **Word order.** One purely syntactic characteristic of free adjuncts and absolutes which seems to influence language users when they infer a logical role for such expressions is word order. The most important respect in which word order appears to affect language users' inferences is as an iconic indication of temporal succession. In (39), for instance, the counting may be understood to follow the shouting (or, on a less likely interpretation, to overlap), but not to precede it.

(39) Hilary shouted his name, counting the number of echoes. This is surely the effect of a familiar perceptually-based phenomenon whereby a succession of words is felt to mirror the succession of the events they describe (the same phenomenon guides our understanding of coordinate structures—cf. so-called 'asymmetric conjunction'—and of separate sentences in discourse). If the free adjunct and the main clause of (39) are placed in the reverse order, as in (40), the counting may be understood to precede the shouting—this is in fact the most likely interpretation.⁷

(40) Counting the number of echoes, Hilary shouted his name.

3.4 **Knowledge of the world.** A language user's knowledge of the world can impose enormous constraints on the sorts of logical roles s/he will infer for a free adjunct or absolute.⁸ Knowledge of the world may, for instance, determine the nature of the temporal relation inferred to hold between an adjunct/absolute and its superordinate clause, as when a language user concludes from (41) that the interval of Bill's driving from Cheyenne to Salt Lake City properly contains
that of his crossing the Rockies, on the basis of his/her knowledge of geography and of driving (note that a different inference is produced if we substitute the Nevada border for the Rockies in (41)).

(41) Bill drove from Cheyenne to Salt Lake City, crossing the Rockies while it was still light.

Similarly, a language user's expectations as to how certain kinds of events normally succeed one another might cause him/her to infer from (42) that John's gaining ownership followed his payment of enormous sums.

(42) Gaining full ownership of the company only after several years, John paid enormous sums to one stockholder after another.

(Observe that the iconicity of word order is overruled here.)

Knowledge of the world can also give rise to inferences about nontemporal relations between adjuncts/absolutes and their superordinate clauses. For example, our expectations regarding how a person's preferences influence what s/he agrees to do would lead us to infer an adversative role for the adjunct in (43).

(43) Preferring to go dancing, Mary eventually agreed to go skydiving.

(Knowledge of the world also enables language users to infer that a present participial adjunct or absolute with an accomplishment or achievement predicate is perfective (or imperfective), and thus to eliminate the unspecificity inherent in such constructions. For instance, our expectations regarding where cars drive would lead us to infer that the adjunct in (44) is imperfective.

(44) Crossing the street, John was hit by a car.)
Clearly, the role of language users' real world knowledge as a basis for drawing inferences about the logical connection between a free adjunct or absolute and its superordinate clause cannot be overestimated.

3.5 Connective adverbs. In certain cases, the logical relation borne by a free adjunct or absolute to its superordinate clause is spelled out explicitly by a specialized sort of adverb. Adverbs of this sort have been widely noted for their connective function (cf. Halliday and Hasan (1976:Ch.5), van Dijk (1977:Ch.3), and Warner (1979)); examples are those listed in (45).

(45) Connective adverbs:

<table>
<thead>
<tr>
<th>meanwhile</th>
<th>therefore</th>
</tr>
</thead>
<tbody>
<tr>
<td>then</td>
<td>hence</td>
</tr>
<tr>
<td>subsequently</td>
<td>thus</td>
</tr>
<tr>
<td>afterwards</td>
<td>consequently</td>
</tr>
<tr>
<td>beforehand</td>
<td>thereby</td>
</tr>
<tr>
<td>furthermore</td>
<td>still</td>
</tr>
<tr>
<td>in addition</td>
<td>nevertheless</td>
</tr>
<tr>
<td>besides</td>
<td>nonetheless</td>
</tr>
<tr>
<td>also</td>
<td>instead</td>
</tr>
</tbody>
</table>

As the reader can appreciate through careful inspection of the following examples, connective adverbs of this sort can determine the relation holding between a free adjunct or absolute and its superordinate clause.

(46) Very slowly, he began to draw out the wire, meanwhile shaking it enough to preserve the interest of whatever might be on the other end.

(CL, 21-22)

(47) Thought by some to be a part of an otherwise vanished circle, the standing stones of Kilchattan have also been described as possible remnants of a Druid astro-nomical observatory.

(CL, 146)
Goats were originally brought to Colonsay because it was known that they would assert territorial rights to the highest ground, thus keeping sheep away from the crags and contributing to their safety.

(Woodall's Trailer and RV Travel/West 12/77, 11)

Tourists who gawk at skyscrapers, look at maps, or window shop with all the awe of a child at Christmas stick out like sore thumbs, thereby becoming easy marks.

(Bleeding so profusely, amnesic and distraught, the doctor nonetheless backed his Land-Rover through the hedge, and, as if nothing had happened, went on to collect his milk.)

(Being very uncomfortable, he still fell asleep.)

Connective adverbs can be used to specify a temporal relation (as in (46)), a more or less neutral, conjunctive relation (as in (47)), a relation of consequence (as in (48) and (49)), or an adversative relation (as in (50) and (51)). Note that the adverb may appear either within the adjunct/absolute (as in (46), (48), and (49)) or within the main clause (as in (47), (50), and (51)).

Despite the fact that the connective adverbs in (46)-(51) explicitly indicate the logical role of the accompanying adjuncts, inference does enter into the comprehension of these sentences. In my judgment, a connective adverb should be thought of as indicating a logical connection between the proposition expressed by the clause (or adjunct/absolute) in which it occurs and some contextually salient proposition, which may be expressed by some other expression in the same sentence, by the preceding sentence or paragraph, etc., but whose identity must in any event be inferred. For example, I believe that (50) is
indeterminate with respect to the identity of the proposition whose
adversativeness to the main clause of (50) is indicated by the adverb
nonetheless, and that inferring that the adjunct of (50) expresses the
relevant proposition is one way (probably the most likely way) of
resolving this indeterminacy. 9

In this section, we have seen a broad array of factors on which
language users may base their inferences regarding the logical role of
a free adjunct or absolute: the 'ontological level' of the predication
expressed by the adjunct/absolute; the relative duration of the events
or states of affairs to which the adjunct/absolute and its super­
ordinate clause relate; the order of the adjunct/absolute with respect
to its superordinate clause; the language users' knowledge of the
world; and the presence of a connective adverb in either the adjunct/
absolute or its superordinate clause. I have discussed these factors
in five discrete sections; but they do overlap, and two or more of
them may jointly determine what sort of inference is drawn.

4. Specialized functions of free adjuncts and absolutes. In the
foregoing, we have seen that free adjuncts and absolutes are extra­
ordinarily versatile constructions: no single adverbial clause
could fulfil the same functions as the adjunct in all of the environ­
ments in (52), nor the same functions as the augmented absolute in all
of the environments in (53).

(52)

\[
\begin{align*}
\text{Walking home,} & \quad \begin{cases}
\text{John saw Mary.} \\
\text{John often watches for eagles.} \\
\text{John will see Mary.} \\
\text{John watches for eagles.} \\
\text{John would have seen the new billboard.}
\end{cases}
\end{align*}
\]
Several different sorts of adverbial clauses would be necessary to cover the range of functions served by the adjunct in (52) and the absolute in (53). But it is not simply as replacements for full adverbial clauses that free adjuncts and absolutes are useful. Kruisinga (1932:275) has observed that 'the use of free adjuncts in English is greatly promoted by the almost complete absence of conjunctions that can introduce a subordinate clause expressing attendant circumstances.' For example, the adjuncts in (54)-(56) cannot be paraphrased without rather elaborate circumlocution:

(54) Exhausted, John walked home.

(55) Bill drove along the crater's rim, steering skillfully to avoid falling one way or the other.

(56) Mary awoke, noticing she was late.

In this section, I shall briefly discuss some of the specialized functions which free adjuncts and absolutes may be inferred to serve, for which no other subordinate expressions are especially well suited.

One special function of free adjuncts and absolutes is to describe some 'component' of the event described by their superordinate clause (rather than to describe a separate event). In each of (57)-(61), for example, the adjunct is most naturally inferred to relate to an action that is indistinct from that to which the main clause relates.

(57) ... a man identified as Jimmy Lee Jones attacked another man who had been sleeping on a rock in the park, beating him with a wire litter basket.
(OSU Lantern 8/26/80, 8)
In other cases, the adjunct/absolute may be inferred to relate to an action or state of affairs distinct from that to which the main clause relates, but one which is nevertheless, in some sense, part of the same event; recall (54)-(56). Many examples of this sort suggest that simultaneous actions or states involving different parts of a person's body may count as components of a single event in the 'metaphysics' of English; consider, for example, sentences (62)-(66).

(62) White beard flowing, he drove the final spike...
    (CL, 122-123)

(63) She clapped her hands like a child, her lucid eyes sparkling.
    (OSI, 246)

(64) ... a female matador lies across the horse's back, her breasts bared, an espada still clutched in her lifeless hand.
    (NY 6/30/80, 57)

(65) When he was first acknowledged as chief, he stood on top of a cairn, holding in his hand a white rod that symbolized his responsibilities, ...
    (CL, 151)
Then he leaves, and the Carters and the Mondales stand there, waving to the crowd.
(NY 9/8/80, 99)

(Frozen expressions like hat in hand, head first, etc. are akin to the absolutes in (62)-(64).)

A related use of absolutes is found in sentences whose main clause describes an event or state of affairs involving a set $\zeta$; in such a sentence, an absolute may be inferred to characterize some specific member or subset of $\zeta$. Examples of this sort are (67)-(71).

... the Benbergs stood by, he clasping his hands and watching her closely, she wiping a plate round and round with a sodden cloth.
(Visser 1972:1152)

Several aides to Mayor Byrne—one an administrative assistant and another her patronage chief—turn up and stroll amid the delegation.
(NY 9/8/80, 77)

Donald McNeill has two [houses--G. T. S.], one right next to the other.
(CL, 17)

Two Fridays ago, about fifty House members, most of them relatively junior, gathered to try to figure out how to extricate the Party from Carter.
(NY 9/8/80, 41-42)

The tombstones were spaced out on the floor in long rows, each stone about six feet long and covered with carving in relief.
(CL, 70)

Absolutes of this sort may be elliptical (cf. Grady 1972:6):

Into the middle of this tide went many of the original clansmen of Colonsay, some early, some later on, some after long stays on the mainland, others more directly from the island, some settling in the Lowlands, notably in Renfrewshire, others going to Australia, Canada, or the United States. [the first four absolutes are elliptical]
(CL, 8)
(73) ... the orchestra played some blues, a gospel piece, and "I Got Rhythm," sometimes in unison, sometimes in harmony, and sometimes free.
(NY 7/16/79, 80)

In the preceding section, we saw that absolutes with being are commonly inferred to provide the reason or explanation for the truth of their superordinate clause. Absolutes of this sort may additionally be understood to explain other things that are in some way relevant. Consider, for example, sentences (74)-(76).

(74) To confront another person with one's head uncovered was a grave insult, the only exception being Taoist recluses and Buddhist priests.
(PM, 174)

(75) The loss to him was two hundred and fifty pounds, the equivalent of the savings of four good years—a good year being one in which the net income of the croft, including the government subsidies he gets for his sheep and cattle, is about a hundred and fifty pounds.
(CL, 33)

(76) Zelinsky once tried to answer the question of where the South ends by taking a horse-mule census within the territory in doubt—the theory being that farmers who used mules to pull their plows obviously lived in the South.
(NY 6/16/80, 107)

The absolutes in (74)-(76) are not naturally inferred to provide a reason or explanation for the truth of their superordinate clause; for instance, (74) is not felt to mean that confronting someone without a hat was an insult because it was not an insult for Taoist recluses and Buddhist priests to do so. Instead, the absolutes in (74)-(76) are most easily inferred to explain some notion ancillary to the meaning of the main clause. The main clause of (74) expresses an ancient Chinese rule of social behavior; the absolute is understood to explain when this rule could be suspended. Similarly, the main
clause of (75) indicates that a crofter's loss was the equivalent of four good years' savings; the absolute is understood to explain what a good year is. Thus, although absolutes like those in (74)-(76) are inferred to provide an explanation, they are not, strictly speaking, comparable to explicit because-clauses. Absolutes of this sort are usually postposed.

In this section, we have seen some specialized functions which free adjuncts and absolutes may be inferred to serve. These functions demonstrate quite clearly that adjuncts and absolutes are not simply 'reduced adverbial clauses', but have unquestionably independent status in the grammar of English.

5. Pragmatically admissible values for L and M. In this chapter, we have discussed a number of factors by which a language user might infer the logical role of a free adjunct or absolute; the implication of this discussion is that in any given case of a sentence that is indeterminate with respect to the relation holding between its adjunct/absolute and its main clause, the number of ways of resolving this indeterminacy will actually be fairly limited.

In Chapters II-V of this dissertation, the semantically indeterminate aspects of the meaning of a free adjunct/absolute were represented with the free variables L and M.

(77) Walking home, John saw Mary.

(78) Being a sailor, John smokes a pipe.

(79) \( \text{Vt}[K(L)(\neg \text{Vt}_1 \text{M}(t,t_1) \land \text{AT}(t_1, \text{Vx}^S[R(x^S,x^I) \land \text{Ing}(\neg \text{[walk-home']}(x^S))])(\neg \text{[past}(t) \land \text{AT}(t, \text{John-sees-Mary'}))]]) ])
(80) \( Vt[K(L)(\forall t_1[M(t,t_1) & AT(t_1, \text{Ing}('sailor'(x^0)))])]
\(\neg[\text{PRES}(t) & AT(t, \text{John-smokes-a-pipe})])\)]

For example, in the intensional logic translations of sentences (77) and (78), the variables L and M represent two sorts of indeterminacy:

1) L represents the range of nontemporal relations which a free adjunct/absolute may bear to its superordinate clause. Among the possible values for L are a relation of consequence or explanation, a relation of adversativeness, and a more or less neutral, conjunctive relation.

2) M represents the range of relations which may hold between the interval to which an adjunct/absolute relates and the interval to which its superordinate clause relates. (In a set-level adjunct/absolute, M represents the range of relations which may hold between some interval at which the adjunct/absolute is true and a member of the (set-level) denotation of the adjunct/absolute.) Possible values for M are the identity relation, relations of more or less proximate precedence and subsequence, and the relation holding between the speaker's interval and all intervals.

The inferences drawn by language users drastically limit the number of useful values for L and M in translations like (79) and (80). Thus, we may say that a value for L or M is pragmatically admissible just when it embodies one of the possible inferences by which language users might resolve the indeterminacy which it represents.

In this chapter, the inferences whereby language users resolve the inherent semantic indeterminacy of sentences with free adjuncts
and absolutes have been examined. We have found that a variety of factors contribute to such inferences, and that the logical roles inferred for adjuncts and absolutes are sometimes quite specialized. Most importantly, we have found that, just as there are definite semantic determinants of the logical role which an adjunct or absolute intuitively plays (as was demonstrated in Chapters II-V), there are quite obvious pragmatic determinants as well. This fact appears to validate the thesis defended here—that the intuitive logical role of a free adjunct or absolute is a product of both the semantics of English and the inferences of language users.
1 Actually, all expressions, whether sentential or not, may give rise to inferences.

2 Inferences of this sort are central to the intentional theory of comprehension developed by Clark (1978).

Formal linguists have from time to time argued that the semantics of English must include a deductive logic of some sort (cf. e.g. Lakoff (1971), Nash-Webber & Sag (1979)); as evidence, various phenomena have been cited which purportedly reflect the interaction of a grammatical rule with a deductive inference. Here, I won't be concerned with deductive inferences.

3 I do not mean to suggest that the relative 'permanence' of a property is always a reliable criterion for determining whether it is a property of stages or of individuals. It isn't: be a baby is individual-level, while alive is stage-level, even though the interval at which someone is a baby is normally shorter than that throughout which s/he is alive; and be a student is individual-level, even though it is possible to be a student at each of several discontinuous intervals, while one is normally alive only throughout a single, continuous interval. See Carlson (1977:122f).

4 Note, however, that for some speakers, adjuncts and absolutes with being can, in special circumstances, be inferred to bear an adversative relation, as in (i) (see section 3.5 below for discussion of examples like this).

(i) Being a gardener, he nevertheless knows nothing about greenhouses.

And, as was pointed out in Chapter II, be-phrases consisting of be plus a passive participial phrase are in fact stage-level; thus, the adjuncts in (ii)-(iv) can easily be inferred to bear a temporal rather than explanatory relation to their superordinate clause.

(ii) Being carried through the streets [sc. in a sedan chair—G. T. S.], crowded with early market-goers, he wondered how his colleague had managed to keep the fact that the dancer was dead from his host of servants.

(PM, 110)

(iii) Gerald Rafshoon, being interviewed on television, says that for Jimmy Carter "that's a badge of courage, to be unpopular."

(NY 9/8/80, 90)
(iv) At this moment she's languishing on a couch in my First Lady's room, being pampered with cold towels and what have you!

(PM, 102)

5Actually, this isn't quite correct. In sentences like I'll leave when I said I would, in which the 'extraction site' is embedded within the adverbial clause, the tense of the adverbial clause doesn't have to agree with that of the main clause. These can be safely ignored here, because free adjuncts and absolutes are never interpreted analogously to such adverbial clauses.

6For other ways in which word order tends to influence language users' inferences, see Jespersen (1940:60ff); cf. the discussion in Chapter I, section 3.

7Oddly, it still seems quite possible to infer that the shouting preceded the counting in (40).

8Properly speaking, knowledge of the world is ultimately responsible for the sorts of inferences examined in subsections 3.1 and 3.2 above; but the sorts of knowledge involved in such inferences are so specialized as to deserve separate consideration.

9In this connection, note that free adjuncts may themselves have relative frequency adverbs:

(i) ... with his heavy sword he has performed decapitations, sometimes retaining as trophies the heads he has severed.

(CL, 153)

(ii) The little people frequently used to dance by the Temple of the Glen in the night, always singing a monotonous song of theirs...

(CL, 138-139)

(iii) Families sat on hillsides, often in snow or rain, and watched their homes burn out.

(CL, 7)

In none of (i)-(iii) is the frequency adverb explicitly restricted by a set-level time adverb. Thus, we may regard the underlined adverbs in each of these sentences as having a free variable over sets of time intervals as its first argument (cf. Chapter III, section 2.1); this variable is evaluated by inference. As it happens, the main clause in each of (i)-(iii) provides the necessary information for inferring the relevant set of time intervals.
CONCLUSION

In this dissertation, I have argued that the meaning of a sentence with a free adjunct or absolute may be partially determined by the inferences of language users. This conclusion confirms Putnam's (1975) contention that a complete account of meaning cannot be purely referential, but must comprise psychological and social components as well as a referential one. Thus, the major implication of this dissertation for future research is the need for semanticists of all persuasions to explore both the mechanisms by which language users draw inferences from linguistic expressions and the complicated interaction between grammatically-determined aspects of meaning and those that are inferred. Very promising work on these issues is already being carried out within the artificial intelligence paradigm; it is now time to draw upon this work and the results of formal semantic research to synthesize a new and perhaps adequate theory of meaning.
APPENDIX

A FORMAL FRAGMENT FOR FREE ADJUNCTS
AND ABSOLUTES

In this appendix is presented a Montague fragment for the syntax and interpretation of free adjuncts and absolutes in English; the rules developed in Chapters II-V are given here in their final form. The fragment is presented in two parts: rules of syntax and model-theoretic interpretation for an intensional logic are given in section 1, and rules of syntax and intensional logic translation for a fragment of English are given in section 2.

1. Intensional logic. The version of intensional logic assumed for the fragment presented here is defined syntactically and interpreted in much the same way as in Montague (1973). Notable departures are: 1) the inclusion of the following among the letters of intensional logic: past, pres, fut, C, <, AT, PRES, FUT, NONPAST (Chapter III, section 1.1), xn and perf (Chapter IV, section 1.1); 2) the inclusion of the following expressions among the constants of intensional logic: cb, C, D (Chapter II, section 3.1), now, moment, NOW (Chapter III, section 1.1), and Ing (Chapter IV, section 2.1); 3) the sorting of entities into kinds, objects, and stages (Chapter II, section 4.1); 4) the addition of a new primitive type i—the type of time intervals—and of all complex types that can be derived by the usual recursive means using i (Chapter III, section 1.1); and 5) the inclusion of the
following in the structure of a model: a conversational background coordinate (Chapter II, section 3.1), a speaker's interval coordinate (Chapter III, section 1.1), and a function specifying the set of inertia worlds corresponding to a given index (Chapter IV, section 2.1). Certain of these departures receive comment as they arise in the following statement of the structure and interpretation of intensional logic.

The set of types, Type, may be defined as follows. Let s, e, i, and t be distinct objects (none should be an ordered pair): the set of types is then the smallest set Y containing e, i, and t; <a,b>, whenever a,b ∈ Y; and <s,a>, whenever a ∈ Y.

The set of sorts to be employed is {k, o, st} (the set containing the sort of kinds, of objects, and of stages, respectively), where k, o, and st are distinct from one another and from s, e, i, and t (and aren't ordered pairs). This forms the basis for the set of sorted types, SType, which is defined as follows (the account of sorting employed here is modeled on those of Cooper (1975) and Carlson (1977)): where i' and t' are distinct from each other and from each of s, e, i, t, k, o, and st (and aren't ordered pairs), the set of sorted types is the smallest set Y containing k, o, st, i', and t'; <a,b>, whenever a,b ∈ Y; <s,a>, whenever a ∈ Y; and [a,b], whenever a,b ∈ Y and for some c ∈ Type, a,b ∈ c. ∈ is a relation holding between certain members of SType and Type (deriving ultimately from a similar relation defined by Cooper (1975:92)); it can be recursively characterized as follows:
(i) \( t' \subseteq t \) (read: \( t' \) is included in \( t \))

(ii) \( i' \subseteq i \)

(iii) \( k, o, st \subseteq e \)

(iv) If \( a, b \in \text{Type} \), \( a' \subseteq a \), and \( b' \subseteq b \), then \( <a', b'> \subseteq <a, b> \)

(v) If \( a \in \text{Type} \) and \( a' \subseteq a \), then \( <s, a'> \subseteq s, a \)

(vi) If \( a \in \text{Type} \) and \( a', b' \subseteq a \), then \([a', b'] \subseteq a \)

(vii) For all \( a \in \text{Type} \), there is no \( a' \) such that \( a' \subseteq a \) except as provided for in (i)-(vi).

[So, for example, \(<s, \langle st, t'\rangle, \langle[o, k], t'\rangle \subseteq \langle s, \langle e, t\rangle, \langle e, t\rangle\rangle, \]

Where \( E, W, I \) are any sets (to be taken as the set of possible entities, the set of possible worlds, and the set of intervals of time, respectively), the set \( D_{a, E, W, I} \) of possible denotations of type \( a \) relative to \( E, W, I \) is characterized by recursive definition:

\[
D_{e, E, W, I} = E \\
D_{i, E, W, I} = I \\
D_{t, E, W, I} = \{A, \{A\}\} \text{ (where the empty set is identified with falsehood, the unit set with truth)}
\]

\[
D_{<a, b>, E, W, I} = \{x: x \text{ a total or partial function from } D_{a, E, W, I} \text{ into } D_{b, E, W, I}\}
\]

\[
D_{<s, a>, E, W, I} = \{x: x \text{ a total or partial function from } W \times I \text{ into } D_{a, E, W, I}\}
\]

\[
= S_{a, E, W, I}, \text{ the set of senses of type } a \text{ relative to } E, W, I.
\]

The set \( D_{a', E, W, I} \) of possible denotations of sorted type \( a' \) relative to \( E, W, I \) is similarly characterized:
\[ D_{k,E,W,I} = k'(E) \]
\[ D_{o,E,W,I} = o'(E) \]
\[ D_{st,E,W,I} = st'(E) \]

\( k' \), \( o' \), and \( st' \) are functions connected with the respective sorts; \( k'(E) \), \( o'(E) \), and \( st'(E) \) are all subsets of \( E \), and are to be taken as the set of kinds, of objects, and of stages, respectively. \( k' \), \( o' \), and \( st' \) must be so structured that \( k'(E) \cap o'(E) = k'(E) \cap st'(E) = o'(E) \cap st'(E) = \Lambda \), and that \( k'(E) \cup o'(E) \cup st'(E) = E \).

\[ D_{\lambda',E,W,I} = I \]
\[ D_{\tau',E,W,I} = \{\Lambda, \{\Lambda\}\} \]

\[ D_{<a',b'>,E,W,I} = \{x: x \in D_{<a,b>,E,W,I} \text{ (where } a,b \in \text{Type, } a' \subseteq a, \text{ and } b' \subseteq b) \text{ and } x \text{ has a total subfunction from } D_{a',E,W,I} \text{ into } D_{b',E,W,I}\} \]

(The total subfunction \( x' \) of \( x \) is simply that total function having as domain the set \( A \) of all and only arguments for which \( x \) has a defined value, such that for all \( y \in A \), \( x(y) = x'(y) \).)

\[ D_{<s,a'>,E,W,I} = \{x: x \in D_{<s,a>,E,W,I} \text{ (where } a \in \text{Type and } a' \subseteq a) \text{ and } x \text{ has a total subfunction from } W \times I \text{ into } D_{a',E,W,I}\} \]

\[ = S_{a',E,W,I} \]

\[ D_{[a',b'],E,W,I} = \{x: x \in D_{a',E,W,I} \text{ or } x \in D_{b',E,W,I}\} \]

[It will have been noted that kinds, objects, and stages are here treated as sorts of entities, while intervals are treated as things of a distinct type from entities. In Dowty's (1979:326) words, 'the primary motivation for sorting is to allow certain variables and constants to range over the whole domain of entities, as well as allowing]
other variables to range over only a part of it.' Since it is important that there be variables ranging over kinds, objects, and stages--for example, the variable $x^i$ over individuals in $\lambda x^i V x^s[R(x^s,x^i) \& \text{asleep}'(x^s)]$ must be of the sorted type $[0,k]$--we must treat these as different sorts of entities; but no expression of the fragment requires that there be variables ranging over intervals and entities, so that the type of intervals can be treated as distinct from that of kinds, objects, and stages.

We allow some denotations of type $<a,b>$ and $<s,a>$ ($a,b \in \text{Type}$) to be partial functions so that the set of possible denotations of sorted types $<a',b'>$ and $<s,a'>$ ($a',b' \in \text{SType}$, $a' \subseteq a$, $b' \subseteq b$) can simply be characterized as a certain subset of the set of possible denotations of types $<a,b>$ and $<s,a>$; as we will see below, this does entail some complications in the definitions of the denotations of certain expressions.]}

The language $L_0$ of intensional logic is assumed to have denumerably many variables and an infinite number of constants of each sorted type. Given any nonnegative integer $n$ and any $a' \in \text{SType}$, $v_{n,a'}$ is the $n$th variable of sorted type $a'$; $\text{Con}_{a'}$ is the set of constants, $\text{Var}_{a'}$, the set of variables, of sorted type $a'$.

The set $\text{ME}_{L_0}$ of meaningful expressions of $L_0$ is recursively characterized. Whenever $a,b \in \text{Type}$,

(1) Every variable and constant of sorted type $a'$ is in the set $\text{ME}_a$ of meaningful expressions of type $a$,

where $a' \subseteq a$;

(2) now, NOW $\in \text{ME}_i$; moment $\in \text{ME}_{<i,t>}$; ing $\in \text{ME}_{<s,t>,t>}$;
\[ cb \in ME_{<s,<s,t>,t>}; \]
\[ C \in ME_{<s,<s,t>,t>}; \]
\[ D \in ME_{<s,<s,t>,t>,<s,t>,<s,<<s,t>,t>,t>}; \]

(3) If \( a \in ME_a \) and \( u \) is a variable of type \( b \), then
\[ \lambda u a \in ME_{<b,a>}; \]

(4) If \( a \in ME_{<a,b>} \) and \( b \in ME_a \), then \( a(b) \in ME_b \);

(5) If \( a,b \in ME_a \), then \( [a = b] \in ME_t \);

(6) If \( \phi, \psi \in ME_t \), then \( \lor \phi, \land \phi, \neg \phi, [\phi \& \psi], [\phi \lor \psi], [\phi \to \psi], [\phi \equiv \psi] \in ME_t \);

(7) If \( \phi \in ME_t \) and \( u \) is a variable, then \( \forall u \phi, \Lambda u \phi \in ME_t \);

(8) If \( \phi \in ME_t \) and \( u \) is a variable of type \( e \), then
\[ \nu u \phi \in ME_e; \]

(9) If \( a \in ME_a \), then \( \check{\gamma} a \in ME_{<s,a>} \);

(10) If \( a \in ME_{<s,a>} \), then \( \forall a \in ME_a \);

(11) If \( a \in ME_i \) and \( \phi \in ME_t \), then \( \forall T(a,\phi) \in ME_t \);

(12) If \( a \in ME_i \), then \( \text{past}(a), \text{pres}(a), \text{fut}(a), \text{perf}(a), \text{xn}(a), \text{PRES}(a), \text{FUT}(a), \text{NONPAST}(a) \in ME_t \);

(13) If \( a,b \in ME_i \), then \( [a \subseteq \beta], [a < \beta] \in ME_t \);

(14) Nothing is in any set \( ME_a \) except as required by (1)-(13).

The following three abbreviatory conventions are used:

\( \gamma(a,b) \) is \( \gamma(\beta)(a) \);

\( \gamma(a) \) is \( [\forall \gamma](a) \);

\( \hat{\gamma} \psi \) is \( ^\sim \lambda u \phi \), where \( \phi \in ME_t \).

An interpretation of \( L_0 \) is an octuple \( <E, W, I, \leq, F, i^*, K, \text{Inr}> \), where \( E, W, I \) are as above; \( \leq \) is a linear ordering of \( I \); \( F \) is a
function with the set of all constants as its domain, such that for any sorted type \( a' \) and any \( \beta \in \text{Con}_{a'} \), \( F(\beta) \in D_{<s,a'>,E,W,I} \); \( i^* \) is a member of \( I \);

\( [i^* \text{ is to be thought of as the speaker's interval relative to which nonshifting temporal expressions are interpreted.}] \)

\( K \) is a function with \( W \times I \) as its domain and the set of sets of subsets of \( W \) as its range;

\( [K \text{ is to be thought of as the conversational background relative to which modals are interpreted.}] \)

\( \text{Inr} \) is a function with \( W \times I \) as its domain and the set of subsets of \( W \) as its range, such that for any index \( <w,i> \), \( \text{Inr}(<w,i>) \) is a subset of the set of worlds identical to \( w \) up to interval \( i \).

\( [\text{For any index} \ <w,i>, \ \text{Inr}(<w,i>) \text{ is the set of 'inertia worlds' corresponding to} \ <w,i>; \ 'these are to be thought of as worlds which are exactly like the given world up to the time in question and in which the future course of events after this time develops in ways most compatible with the past course of events' (Dowty 1979:148).] \)

Assume an interpretation \( \mathcal{I} \) of the form \( <E, W, I, \preceq, F, i^*, K, \text{Inr}> \) and an \( \mathcal{O} \)-assignment \( g \) (a function with the set of variables as its domain such that for any variable \( u \) of sorted type \( a' \), \( g(u) \in D_{a',E,W,I} \)). For any meaningful expression \( \alpha \) of \( L_0 \), \( [\alpha]_{\mathcal{O}\text{wig}} \) is the denotation of \( \alpha \) with respect to the interpretation \( \mathcal{O} \), the index \( <w,i> \) (\( \in W \times I \)), and the \( \mathcal{O} \)-assignment \( g \). In particular,

1. If \( \alpha \) is a constant, then \( [\alpha]_{\mathcal{O}\text{wig}} \) is \( F(\alpha)(<w,i>) \); if \( \alpha \) is a variable, then \( [\alpha]_{\mathcal{O}\text{wig}} \) is \( g(\alpha) \);

2. \( [\text{now}]_{\mathcal{O}\text{wig}} \) is \( i \); \( [\text{NOW}]_{\mathcal{O}\text{wig}} \) is \( i^* \); \( [\text{moment}]_{\mathcal{O}\text{wig}} \) is
that subset $S$ of $I$ such that for all $i' \in I$, $i'' \in S$, $i'$ is not a proper subinterval of $i''$; $[\text{In}g]^{\text{awg}}$ is that function $h$ such that for any subset $p$ of $W \times I$, $h(p) = \{A\}$ if and only if for some interval $i'$ such that $i \subset i'$ and $i$ is not a final subinterval for $i'$, and for all $w' \in \text{Inr}(<w,i>)$, $p(<w',i'>) = \{A\}$, and otherwise $\Lambda$; $[\text{cb}]^{\text{awg}}$ is $K$; $[C]^{\text{awg}}$ is that function $h$ such that for any function $f$ from $W \times I$ to sets of subsets of $W \times I$ and any $<w',i'> \in W \times I$, $h(f(<w',i'>))$ is the set of all consistent subsets of $f(<w',i'>)$.

$[D]^{\text{awg}}$ is that function $h$ such that for any function $f$ from $W \times I$ to sets of subsets of $W \times I$, any subset $p$ of $W \times I$, and any $<w',i'> \in W \times I$, $h(f)(p(<w',i'>))$ is the set of all consistent subsets of $f(<w',i'>) \cup \{p\}$ which contain $p$.

(3) If $a \in ME_a$ and $u$ is a variable of sorted type $b'$, then $[\lambda uc]^{\text{awg}}$ is that function $h$ with domain $D_{b',E,W,I}$ (where $b' \subseteq b$) whose total subfunction has domain $D_{b',E,W,I}$ and is such that for all $x \in D_{b',E,W,I}$, $h(x)$ is $[a]^{\text{awg}}$, where $g'$ is the $\mathcal{R}$-assignment like $g$ except for the possible difference that $g'(u)$ is $x$;

(4) If $a \in ME_{<a,b>}$ and $\beta \in ME_a$, then $[\alpha(\beta)]^{\text{awg}}$ is $[\alpha]^{\text{awg}}([\beta]^{\text{awg}})$;

(5) If $\alpha, \beta \in ME_a$, then $[[\alpha = \beta]]^{\text{awg}}$ is $\{A\}$ if and only if $[\alpha]^{\text{awg}}$ and $[\beta]^{\text{awg}}$ are defined and identical; $\Lambda$ if and only if $[\alpha]^{\text{awg}}$ and $[\beta]^{\text{awg}}$ are defined and nonidentical; and otherwise
undefined;

(6) If \( \phi, \psi \in \text{ME}_t \), then \([\forall \phi] \mathcal{A} \psi \) is \( \{\lambda\} \) iff \( [\phi] \mathcal{A} \psi \) is \( \lambda \); \( \lambda \) iff \( [\phi] \mathcal{A} \psi \) is \( \{\lambda\} \); and otherwise undefined;
[\( \Box \phi \)] \( \mathcal{A} \psi \) is \( \{\lambda\} \) iff for every \( <w',i'> \in W \times I \), \([\phi] \mathcal{A} \psi \) is \( \{\lambda\} \); \( \lambda \) iff for some \( <w',i'> \in W \times I \), \([\phi] \mathcal{A} \psi \) is \( \lambda \); and otherwise undefined;
[[\( \phi \land \psi \)] \( \mathcal{A} \psi \) is \( \{\lambda\} \) iff both \( [\phi] \mathcal{A} \psi \) and \( [\psi] \mathcal{A} \psi \) are \( \{\lambda\} \); \( \lambda \) iff \( [\phi] \mathcal{A} \psi \) or \( [\psi] \mathcal{A} \psi \) is \( \lambda \) and both are defined; and otherwise undefined; similarly for \( \forall \), \( \exists \), \( \in \);

(7) If \( \phi \in \text{ME}_t \) and \( \alpha \) is a variable of sorted type \( a' \), then \([\forall \phi] \mathcal{A} \psi \) is \( \{\lambda\} \) iff \( [\phi] \mathcal{A} \psi \) is defined for all \( g' \) and there exists \( x \in D_{a',E,W,I} \) such that \( [\phi] \mathcal{A} \psi \) is \( \{\lambda\} \), where \( g' \) is the \( \mathcal{A} \)-assignment like \( g \) except for the possible difference that \( g'(u) \) is \( x \); \( \lambda \) iff \( [\phi] \mathcal{A} \psi \) is defined for all \( g' \) and for all \( x \in D_{a',E,W,I} \), \( [\phi] \mathcal{A} \psi \) is \( \lambda \), where \( g' \) is as above; and otherwise undefined; similarly for \( \forall \alpha \);

(8) If \( \phi \in \text{ME}_t \) and \( u \) is a variable of sorted type \( a' \) (where \( a' \equiv e \)), then \([\forall u \phi] \mathcal{A} \psi \) is that unique member \( x \) of \( D_{a',E,W,I} \) such that \( [\phi] \mathcal{A} \psi \) is \( \{\lambda\} \), where \( g' \) is the \( \mathcal{A} \)-assignment like \( g \) except for the possible difference that \( g'(u) \) is \( x \); and otherwise undefined;

(9) If \( a \in \text{ME}_a \), then \([\forall a] \mathcal{A} \psi \) is that function \( h \) with domain \( W \times I \) such that whenever \( <w',i'> \in W \times I \), \( h(<w',i'>) = [a] \mathcal{A} \psi \) if \( [a] \mathcal{A} \psi \) is defined; and otherwise undefined;

(10) If \( a \in \text{ME}_{<s,a>} \), then \([\forall a] \mathcal{A} \psi \) is \([a] \mathcal{A} \psi (<w,i>) \);
(11) If \( \phi \in ME_t \) and \( a \in ME_i \), then \([AT(a, \phi)] \mathcal{O}_\text{wig} \) is \( \{A\} \) iff \( [\phi] \mathcal{O}_\text{wig} \) is \( \{A\} \), where \( i' \) is \([a] \mathcal{O}_\text{wig} \); \( A \) iff \([\phi] \mathcal{O}_\text{wig} \) is \( \Lambda \), where \( i' \) is as above; and otherwise undefined;

(12) If \( a \in ME_i \), then \([\text{past}(a)] \mathcal{O}_\text{wig} \) is \( \{A\} \) iff there is some nonempty \( i' \in I \) such that \([a] \mathcal{O}_\text{wig} \) is \( i' \); \( \Lambda \) iff \([a] \mathcal{O}_\text{wig} \) is defined but there is no such nonempty \( i' \in I \); and otherwise undefined;
\([\text{pres}(a)] \mathcal{O}_\text{wig} \) is \( \{A\} \) iff \([a] \mathcal{O}_\text{wig} \subseteq i \); \( \Lambda \) iff \([a] \mathcal{O}_\text{wig} \) is defined but isn't a subinterval of \( i \); and otherwise undefined;
\([\text{fut}(a)] \mathcal{O}_\text{wig} \) is \( \{A\} \) iff \( i < [a] \mathcal{O}_\text{wig} \); \( \Lambda \) iff \([a] \mathcal{O}_\text{wig} \) is defined but it is not the case that \( i < [a] \mathcal{O}_\text{wig} \); and otherwise undefined;
\([\text{perf}(a)] \mathcal{O}_\text{wig} \) is \( \{A\} \) iff (i) there is some nonempty \( i' \subseteq [a] \mathcal{O}_\text{wig} \) such that \( i' < i \) and (ii) there is no \( i' \subseteq [a] \mathcal{O}_\text{wig} \) such that \( i < i' \); \( \Lambda \) iff \([a] \mathcal{O}_\text{wig} \) is defined but conditions (i) and (ii) aren't both met; and otherwise undefined;
\([\text{xml}(a)] \mathcal{O}_\text{wig} \) is \( \{A\} \) iff \( i \) is a final subinterval for \([a] \mathcal{O}_\text{wig} \); \( \Lambda \) iff \([a] \mathcal{O}_\text{wig} \) is defined but \( i \) is not a final subinterval for \([a] \mathcal{O}_\text{wig} \); and otherwise undefined;
\([\text{PRES}(a)] \mathcal{O}_\text{wig} \) is \( \{A\} \) iff \([a] \mathcal{O}_\text{wig} \subseteq i^* \); \( \Lambda \) iff \([a] \mathcal{O}_\text{wig} \) is defined but is not a subinterval of \( i^* \); and otherwise undefined;
[FUT(a)] ogl is \{A\} iff i* < [a] ogl; \Lambda iff [a] ogl is defined but it is not the case that i* < [a] ogl; and otherwise undefined;

[NONPAST(a)] ogl is \{A\} iff there is no i' \subseteq [a] ogl such that i' < i*; \Lambda iff [a] ogl is defined but there is some i' \subseteq [a] ogl such that i' < i*; and otherwise undefined;

(13) If a, b \in MEt, then [[a \subseteq b]] ogl is \{A\} iff [a] ogl is a subinterval of [b] ogl; \Lambda iff [a] ogl and [b] ogl are defined but the former isn't a subinterval of the latter; and otherwise undefined;

[[a < b]] ogl is \{A\} iff [a] ogl < [b] ogl; \Lambda iff [a] ogl and [b] ogl are defined but the former doesn't precede the latter; and otherwise undefined.

If \phi \in MEt, then \phi is true with respect to \omega and \langle w, i \rangle iff

[\phi] ogl is \{A\} for every \omega-assignment g. If \langle w, i \rangle \in W \times I, then

\langle w, i \rangle is an index of possible utterance iff i = i*.

2. Syntax and translation rules for a fragment of English. In this section, a fragment of English is formally defined and translated into the intensional logic presented in section 1.

2.1 Syntax. The set of categories of English is the smallest set Cat such that (1) t, COND, t', t'', PREDs, INFs, PRPLs, PSPLs, ADJs, PPs, IVs, TVs, PREDi, INFi, PRPLi, PSPLi, ADJi, Ppi, NOM, IVi, TVi, QN, MOD, TA, RFA, TAB, Meas, TSC \in Cat, and (2) if A, B \in Cat, then A/B, A//B, A///B \in Cat. The categories employed in the fragment are:
<table>
<thead>
<tr>
<th>Category name</th>
<th>Description</th>
<th>Basic expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>t</td>
<td>the basic category of declarative sentences</td>
<td>{(it) [rains]}</td>
</tr>
<tr>
<td>COND</td>
<td>the basic super-category of conditional expressions</td>
<td>(B_t \cup B_{t''})</td>
</tr>
<tr>
<td>t'</td>
<td>the basic category of primal adjuncts and absolutes</td>
<td>(A)</td>
</tr>
<tr>
<td>t''</td>
<td>the basic category of conditional clauses</td>
<td>(A)</td>
</tr>
<tr>
<td>PRED_S</td>
<td>the basic super-category of stage-level predicative phrases</td>
<td>(B_{INF_S} \cup B_{PRPL_S} \cup B_{PSPL_S} \cup B_{ADJS_S} \cup B_{PPS})</td>
</tr>
<tr>
<td>INF_S</td>
<td>the basic category of stage-level infinitive phrases</td>
<td>(A)</td>
</tr>
<tr>
<td>PRPL_S</td>
<td>the basic category of stage-level present participial phrases</td>
<td>(A)</td>
</tr>
<tr>
<td>PSPL_S</td>
<td>the basic category of stage-level past participial phrases</td>
<td>(A)</td>
</tr>
<tr>
<td>ADJS</td>
<td>the basic category of stage-level adjective phrases</td>
<td>{asleep, ready, awake, happy, available, unavailable, drunk, a little cold, unaware of her}</td>
</tr>
<tr>
<td>PP_S</td>
<td>the basic category of stage-level prepositional phrases</td>
<td>{in first gear}</td>
</tr>
<tr>
<td>IV_S</td>
<td>the basic category of stage-level intransitive verb phrases</td>
<td>{[laugh], [dance], [walk], [drive], [lie], [run] for president, [bark], [go] dancing, [go] skydiving, [go] for a walk, [go] back to school, [stand], [shake], [snarl], [work], [watch] TV, [walk] home, [sing]}</td>
</tr>
<tr>
<td>Category name</td>
<td>Description</td>
<td>Basic expressions</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>IV$^S$</td>
<td>[continued]</td>
<td>[leave], [arrive], [leak], [stroll] by, [coast] gently, [downhill] [make] a lot of progress, [have] nightmares about the war, [live] in it, [stop] by it, [stay] on it, [think] of her, [run] into her</td>
</tr>
<tr>
<td>TV$^S$</td>
<td>the basic category of stage-level transitive verb phrases</td>
<td>{chase], [hit], [kiss], [unravel], [see], [arrest], [mow], [trim], [figure], [use], [touch], [reach], [wear], [cross], [hear], [smoke], [carry], [braid], [make], [answer], [finish], [leave], [knock] over, [sing], [lose], [fool], [lead], [set] up, [eat]}</td>
</tr>
<tr>
<td>PRED$^i$</td>
<td>the basic super-category of individual-level predicative phrases</td>
<td>(B_{INF} U B_{PRPL} U B_{PSPL} U B_{ADJ} U B_{PRPL} U B_{NOM})</td>
</tr>
<tr>
<td>INF$^i$</td>
<td>the basic category of individual-level infinitive phrases</td>
<td></td>
</tr>
<tr>
<td>PRPL$^i$</td>
<td>the basic category of individual-level present participial phrases</td>
<td></td>
</tr>
<tr>
<td>PSPL$^i$</td>
<td>the basic category of individual-level past participial phrases</td>
<td></td>
</tr>
<tr>
<td>ADJ$^i$</td>
<td>the basic category of individual-level adjective phrases</td>
<td>{fat, intelligent, American, smart, widespread, rare, thirty-three years old, thirty-five years old}</td>
</tr>
<tr>
<td>PPI$^i$</td>
<td>the basic category of individual-level prepositional phrases</td>
<td></td>
</tr>
<tr>
<td>NOM</td>
<td>the basic category of individual-level predicative noun phrases</td>
<td></td>
</tr>
<tr>
<td>Category name</td>
<td>Description</td>
<td>Basic expressions</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>IV^1</td>
<td>the basic category of individual-level intransitive verb phrases</td>
<td>A</td>
</tr>
<tr>
<td>TV^1</td>
<td>the basic category of individual-level transitive verb phrases</td>
<td>{[love], [know], [admire], [resemble], [fear], [have], [remind] of her}</td>
</tr>
<tr>
<td>CN</td>
<td>the basic category of common-noun phrases</td>
<td>{post office, room, beach, drunk, businessman, license, hat, master of disguise, street, tax, calculator, new outfit, chair, barrel, sailor, hill, truck, longest piece of twine in town, ceiling, doctor, neighbor, unusually long arm, roof, lawn, cat, dog, car, pipe, cigar, load of over 1500 lbs., over 1500 lbs., hedge, question, train, hair, mailman, song, bridge, funny noise, horse, mother, child, water, wife, father, wheat farmer, family, project, way to it, top of it}</td>
</tr>
<tr>
<td>MOD</td>
<td>the basic category of modal verbs</td>
<td>{[must], [can], [would], [might]}</td>
</tr>
<tr>
<td>TA</td>
<td>the basic category of set-level time adverbs</td>
<td>{yesterday, today, tomorrow, in the morning, in 1984, in 1940, shortly after, during the past summer}</td>
</tr>
<tr>
<td>RFA</td>
<td>the basic category of relative frequency adverbs</td>
<td>{always, often, frequently, sometimes, occasionally, never}</td>
</tr>
<tr>
<td>TAB</td>
<td>the basic category of temporal abstracts</td>
<td>A</td>
</tr>
<tr>
<td>Meas</td>
<td>the basic category of measure phrases</td>
<td>{almost a half mile, only a few tons, four tons}</td>
</tr>
<tr>
<td>TSC</td>
<td>the basic category of temporal subordinating conjunctions</td>
<td>{before, after, when, while}</td>
</tr>
<tr>
<td>Category name</td>
<td>Description</td>
<td>Basic expressions</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>IQ</td>
<td>the category t//t of indirect questions</td>
<td>{exactly why it\textsubscript{2} derailed}</td>
</tr>
<tr>
<td>t/t</td>
<td>the category of adsentential modifiers</td>
<td>{necessarily, nevertheless, actually, obviously}</td>
</tr>
<tr>
<td>t///t</td>
<td>the category of implicitly conditioned modals</td>
<td>(\Lambda)</td>
</tr>
<tr>
<td>PP(^S/T)</td>
<td>the category of stage-level prepositions</td>
<td>{on, in, at}</td>
</tr>
<tr>
<td>IV(^S/PRED(^S))</td>
<td>the category of (\text{be}_4) (see Chapter II, section 4.2.4)</td>
<td>{{be}}</td>
</tr>
<tr>
<td>IV(^S/INF(^i))</td>
<td>the category of stage-level (INF(^i)-) taking verb</td>
<td>{{agree}, {decide}}</td>
</tr>
<tr>
<td>IV(^S/t)</td>
<td>the category of stage-level sentence-complement verbs</td>
<td>{{claim}, {discover}, {say}, {think}, {announce}, {promise}}</td>
</tr>
<tr>
<td>IV(^S/IV(^S))</td>
<td>the category of stage-level verb phrase adverbs</td>
<td>{very dangerously}</td>
</tr>
<tr>
<td>IV(^S/ADJ(^i))</td>
<td>the category of stage-level (ADJ(^i)-) taking verbs</td>
<td>{{look}}</td>
</tr>
<tr>
<td>TV(^S/IV(^i))</td>
<td>the category of stage-level (IV(^i)-) taking transitive verbs</td>
<td>{{make}}</td>
</tr>
<tr>
<td>ADJ(^i/INF(^i))</td>
<td>the category of individual-level (INF(^i)-) taking adjectives</td>
<td>{eligible}</td>
</tr>
<tr>
<td>Category name</td>
<td>Description</td>
<td>Basic expressions</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>PP^1/T</td>
<td>the category of individual-level prepositions</td>
<td>{from}</td>
</tr>
<tr>
<td>IV^1/PRED^s</td>
<td>the category of be_1 (see Chapter II, section 4.2.1)</td>
<td>{[be]}</td>
</tr>
<tr>
<td>IV^1/PRED^i</td>
<td>the category of be_2 (see Chapter II; section 4.2.2)</td>
<td>{[be]}</td>
</tr>
<tr>
<td>IV^1/IQ</td>
<td>the category of individual-level IQ-taking verbs</td>
<td>{[know]}</td>
</tr>
<tr>
<td>IV^1/Meas</td>
<td>the category of individual-level measure verbs</td>
<td>{[measure], [weigh]}</td>
</tr>
<tr>
<td>IV^1/INF^i</td>
<td>the category of individual-level INFI^-taking verbs</td>
<td>{[prefer]}</td>
</tr>
<tr>
<td>MTA</td>
<td>the category TAB/TAB of main tense adverbs</td>
<td>{at-that-time_n, since noon}</td>
</tr>
<tr>
<td>TAB//TAB</td>
<td>the category of perfect have</td>
<td>{[have]}</td>
</tr>
<tr>
<td>T</td>
<td>the category t/IV^i of terms</td>
<td>{John, Mary, Bill, Jane, Fido, we, us, he_{4n}, him_{4n}, she_{4n+1}, her_{4n+1}, it_{4n+2}, they_{4n+3}, them_{4n+3}, that, this, enough money, everyone, the Med Center, the Board of Trade, Wales, Columbus, Paris, dinner, supper}</td>
</tr>
<tr>
<td>T/CN</td>
<td>the category of determiners</td>
<td>{that, this, a, the, his_{4n}, her_{4n+1}, its_{4n+2}, their_{4n+3}, our}</td>
</tr>
</tbody>
</table>

[A number of the basic expressions of the fragment are intuitively complex; since their internal syntax is irrelevant to the analysis of free adjuncts and absolutes, I shall leave such expressions unanalyzed in the interests of keeping the fragment as simple as possible. This
practice is, of course, not unknown in Montague's own work—cf.
especially Montague (1970a).]

For any category $A \in \text{Cat}$, $B_A$ is the set of basic expressions of
$A$; a basic expression of the present fragment is a member of
$U_A \in \text{Cat} B_A$.

The set $P_A$ of phrases of category $A$ (for $A \in \text{Cat}$) is defined
recursively by the rules of syntax. Employed in these rules are the
following morphological functions (see section 5 of Chapter I):

Where $a$ is of the form $[\theta]$,

$$
\text{PRPL}(a) \text{ is the present participle of } a; \\
\text{PSPL}(a) \text{ is the past participle of } a; \\
\text{PRES}_1(a) \text{ is the third singular present form of } a; \\
\text{PRES}_2(a) \text{ is the third plural present form of } a; \\
\text{PAST}_1(a) \text{ is the third singular preterit form of } a; \\
\text{PAST}_2(a) \text{ is the third plural preterit form of } a; \\
\text{BASE}(a) \text{ is the base form of } a \text{ (if } a \in B_{\text{MOD}}, \text{ BASE}(a) \text{ is}
\text{undefined)}; \\
$$

where $a$ is a common noun,

$$
\text{PLUR}(a) \text{ is the plural form of } a.
$$

In addition, the following syntactic subroutines are employed: for
any expressions $\alpha, \beta, \gamma$,

$$
\text{EN}(\alpha) \text{ is the result of replacing every expression of the
form } [\theta] \text{ in } \alpha \text{ with PSPL([\theta]) (and is undefined if some
bracketed expression in } \alpha \text{ lacks a past participial
form);} \\
\text{ING}(\alpha) \text{ is the result of replacing every expression of the
}
form [δ] in α with PRPL([δ]) (and is undefined if some bracketed expression in α lacks a present participle form);

NONF(α) is the result of replacing every expression of the form [δ] in α with BASE([δ]) (and is undefined if some bracketed expression in α lacks a base form);

DB(α) is the result of deleting all brackets from α;

DP(α) is the result of deleting all brackets and parentheses from α;

SSDELₙ(α) is the result of deleting the subscript n from every occurrence of heₙ, himₙ, hisₙ, sheₙ, herₙ, itₙ, itsₙ, theyₙ, themₙ, theirₙ in α;

PRET(α) is the result of replacing each expression of the form [δ] in α with PAST₁([δ]) if [δ] is PRES₁([δ]) and with PAST₂([δ]) if [δ] is PRES₂([δ]) (and is undefined if some expression of the form [δ] in α is such that PRES₁([δ]), PRES₂([δ]), PAST₁([δ]), or PAST₂([δ]) is undefined);

SUBJ(α) is the result of replacing each expression of the form [δ] in α with PAST₂([δ]) (and is undefined if some expression of the form [δ] in α is such that PAST₂([δ]) is undefined);

DEL(α, β) is the result of deleting every instance of α in β;

ROS(α, β) is the result of placing α immediately after the first parenthesized expression in β (and is undefined if β has no parenthesized expressions);
RB(α, β) is ROS(α, DB(NONF(β)));

PRB(α, β) is ROS(V(α), DB(EN(β))), where V is the morphological function such that the first expression of the form [δ] in β is V(δ) (and is undefined if β has no bracketed expressions);

RWRAP(α, β) is the result of placing β after the first word of α;

AGR(α, β) is the result of replacing each expression of the form [δ] in β with PRES1([δ]) if α ∈ [-Plural] and with PRES2([δ]) if α ∈ [+Plural] (AGR is undefined if α ∉ [-Plural] U [+Plural] or if there is some expression [δ] in β such that PRES1([δ]) and PRES([δ]) are undefined);

SUB(α, β, γ) is the result of replacing the first occurrence of β in γ with α (and is undefined if γ has no occurrences of β);

ALLSUB(α, β, γ) is the result of replacing every occurrence of β in γ with α.

The set PA of phrases of category A (for A ∈ Cat) is defined as follows.

50. (i) B_A ⊆ P_A for every category A; P_t U P_t" = P_COND;
    P_INFs U P_PRPLs U P_PSPi U P_ADJs U P_pps = P_PREDs;
    P_INFi U P_PRPLi U P_PSPi U P_ADji U P_ppi U P NOM = P_PREDi.
    (ii) P_t U P_TAB = [-Tense] U [+Tense]; [-Tense] ∩ [+Tense] = Λ; B_t ⊆ [-Tense].
    (iii) [+Tense] = [-Past] U [+Past];
[-Past] ∩ [+Past] = Λ.

(iv) \( P_t U P^\text{Tab} U P^\text{IV}i = [-\text{Perfect}] U [+\text{Perfect}] \);
[-Perfect] ∩ [+Perfect] = Λ; \( B_t \subseteq [-\text{Perfect}] \).

(v) \( P_T = [-\text{Plural}] U [+\text{Plural}] \); [-Plural] ∩ [+Plural] = Λ; they\(_{4n+3}\), them\(_{4n+3}\), we, us ∈ [+Plural];
all members of \( B_T \) other than they\(_{4n+3}\), them\(_{4n+3}\), we, us are members of [-Plural].

(vi) \( P_T = [-\text{Object}] U [+\text{Object}] \); he\(_{4n}\), she\(_{4n+1}\),
they\(_{4n+3}\), we ∈ [-Object]; him\(_{4n}\), her\(_{4n+1}\), them\(_{4n+3}\), us ∈ [+Object]; all other members of \( B_T \) besides these are
members of both [-Object] and [+Object].

(vii) \( P_{TA} = [-\text{Adjunct}] U [+\text{Adjunct}] \); [-Adjunct] ∩ [+Adjunct] = Λ; \( B_{TA} \subseteq [-\text{Adjunct}] \).

S1. If \( \alpha \in P^\text{Preds} \), then \( F_{1,n}(\alpha) \in P_t \), where \( F_{1,n}(\alpha) \) is \( \alpha \). [Chapter II, 4.3]

S2. If \( \alpha \in P^\text{Preds} \), \( \notin P^\text{Adj} \), then \( F_{2,n}(\alpha) \in P_t \), where \( F_{2,n}(\alpha) \) is \( \alpha \). [Chapter II, 4.3]

S3. If \( \alpha \in P^\text{MTA} \) and \( \beta \in P_t \), then \( F_{3}(\alpha,\beta) \in P_t \), where \( F_{3}(\alpha,\beta) \) is \( \Gamma_{\beta} \alpha \). [Chapter III, 4.3]

S4. If \( \alpha \in P_T \) and \( \beta \in P^\text{Preds} \), then \( F_{4}(\alpha,\beta) \in P_t \), where \( F_{4}(\alpha,\beta) \) is \( \Gamma_{\alpha} \beta \). [Chapter V, 1]

S5. If \( \alpha \in P_T \) and \( \beta \in P^\text{Preds} \), \( \notin P^\text{Adj} \), then \( F_{5}(\alpha,\beta) \in P_t \),
where \( F_{5}(\alpha,\beta) \) is \( \Gamma_{\alpha} \beta \). [Chapter V, 1]

S6. If \( \alpha \in P_T \), [+Object] and \( \beta \in P^\text{Preds} \), then \( F_{6}(\alpha,\beta) \in P_t \),
where \( F_{6}(\alpha,\beta) \) is \( \Gamma_{\text{with} \alpha} \beta \). [Chapter V, 1]
S7. If $a \in P_T$, [+Object] and $\beta \in P_{\text{PRED}}$, $\not\in P_{\text{ADJ}}$, then $F_7(a,\beta) \in P_t^t$, where $F_7(a,\beta)$ is $\overline{\text{with } a\beta}$.
[Chapter V, 1]

S8. If $a \in P_T$, [+Object] and $\beta \in P_{\text{PRED}}$, then $F_8(a,\beta) \in P_t^t$, where $F_8(a,\beta)$ is $\overline{\text{without } a\beta}$. [Chapter V, 1]

S9. If $a \in P_T$, [+Object] and $\beta \in P_{\text{PRED}}$, $\not\in P_{\text{ADJ}}$, then $F_9(a,\beta) \in P_t^t$, where $F_9(a,\beta)$ is $\overline{\text{without } a\beta}$.
[Chapter V, 1]

S10. If $a \in P_t$, then $F_{10,n}(a) \in P_{\text{TA}}$, [+Adjunct], where $F_{10,n}(a)$ is $a$. [Chapter III, 2.2]

S11. If $a \in P_{\text{MTA}}$ and $\beta \in P_t$, then $F_{11,n}(a,\beta) \in P_{\text{TA}}$, [+Adjunct], where $F_{11,n}(a,\beta)$ is $\overline{\text{for } a\beta}$.
[Chapter III, 4.3]

S12. If $a$ is when or while and $\beta \in P_t$, then $F_{12}(a,\beta) \in P_{\text{TA}}$, [-Adjunct], where $F_{12}(a,\beta)$ is $\overline{\text{a } \beta}$.
[Chapter III, fn 35]

S13. If $a \in P_{\text{TA}}$, [+Adjunct], then $F_{13,n}(a) \in P_{\text{MTA}}$, where $F_{13,n}(a)$ is $a$. [Chapter III, 4.3]

S14. If $\phi \in P_t$, [+Tense], then $F_{14}(\phi) \in P_t^t$, where $F_{14}(\phi)$ is $\overline{\text{if } \phi}$.

S15. If $\phi \in P_t$, [-Tense], then $F_{15}(\phi) \in P_t^t$, where $F_{15}(\phi)$ is $\overline{\text{if } \phi}$ and $\phi'$ is SUBJ($\phi$).

S16. If $a \in P_{\text{MOD}}$, then $F_{16}(a) \in P_{t//t}$, where $F_{16}(a)$ is $a$.
[Chapter II, 3.1]

S17. If $a \in P_{t//t}$ and $\phi \in P_t$, [-Tense, $\beta$Perfect], then $F_{17}(a,\phi) \in P_t$, [-Tense, $\beta$Perfect], where $F_{17}(a,\phi)$ is
RB(α,φ).  [Chapter II, 3.1]

S18. If α ∈ P_{MOD;} φ ∈ P_{COND;} and ψ ∈ P_τ, [-Tense, βPerfect],
then F_{18}(α,φ,ψ) ∈ P_τ, [-Tense, βPerfect], where
F_{18}(α,φ,ψ) is \( \Gamma_\phi \), and ψ' is RB(α,ψ).
[Chapter II, 3.1]

S19. If α ∈ P_τ, [-Object] and β ∈ P_{IVi}, [γPerfect], then
F_{19}(α,β) ∈ P_τ, [-Tense, γPerfect], where F_{19}(α,β) is
\( \Gamma(α) β \) and β' is AGR(α,β).  [Chapter II, 4.1]

S20. If α ∈ P_{IVs}, then F_{20}(α) ∈ P_{IVi}, [-Perfect], where
F_{20}(α) is α.  [Chapter II, 4.1]

S21. If α ∈ P_{IVs}, then F_{21}(α) ∈ P_{IVi}, [-Perfect], where
F_{21}(α) is α.

S22. If α ∈ P_{IVS/PREDs} and β ∈ P_{PSPLs}, then F_{22}(α,β) ∈ P_{IVs},
where F_{22}(α,β) is \( \Gamma_α β \).  [Chapter II, 4.2.4]

S23. If α ∈ P_{IVi/PREDs} and β ∈ P_{PRPLs}, P_{ADJs}; or P_{PPs}, then
F_{23}(α,β) ∈ P_{IVi}, [-Perfect], where F_{23}(α,β) is \( \Gamma_α β \).
[Chapter II, 4.2.1]

S24. If α ∈ P_{IVi/PREDs} and β ∈ P_{ADJs}., P_{NOM}.; P_{Ppi}, or P_{PSPLs},
then F_{24}(α,β) ∈ P_{IVi}, [-Perfect], where F_{24}(α,β) is
\( \Gamma_α β \).  [Chapter II, 4.2.2]

S25. If α ∈ P_{IVS/t} and φ ∈ P_τ, [+Tense], then F_{25}(α,φ) ∈ P_{IVS}, where F_{25}(α,φ) is \( \Gamma_α \text{ that } φ \) and φ' is DP(φ).
[Chapter I, 5]

S26. If α ∈ P_{IVS/t}, then F_{26,n}(α) ∈ P_{IVS}, where F_{26,n}(α)
is \( \Gamma_α \text{ that }_n \).  [Chapter III, 1.5]
S27. If \( \alpha \in P_{TVs} \) and \( \beta \in P_T \), [+Object], then \( F_{27}(\alpha, \beta) \in P_{IVs} \), where \( F_{27}(\alpha, \beta) \) is \( RW\alpha\beta \). [Chapter II, 4.2.4]

S28. If \( \alpha \in P_{TVi} \) and \( \beta \in P_T \), [+Object], then \( F_{28}(\alpha, \beta) \in P_{IVi} \), [-Perfect], where \( F_{28}(\alpha, \beta) \) is \( RW\alpha\beta \). [Chapter II, 4.2.4]

S29. If \( \alpha \in P_{IVi} /Meas \) and \( \beta \in P_{Meas} \), then \( F_{29}(\alpha, \beta) \in P_{IVi} \), [-Perfect], where \( F_{29}(\alpha, \beta) \) is \( \Gamma \alpha \beta \).

S30. If \( \alpha \in P_{IVS/INF} \) and \( \beta \in P_{INF} \), then \( F_{30}(\alpha, \beta) \in P_{IVS} \), where \( F_{30}(\alpha, \beta) \) is \( \Gamma \alpha \beta \).

S31. If \( \alpha \in P_{IVi/INF} \) and \( \beta \in P_{INF} \), then \( F_{31}(\alpha, \beta) \in P_{IVi} \), [-Perfect], where \( F_{31}(\alpha, \beta) \) is \( \Gamma \alpha \beta \).

S32. If \( \alpha \in P_{TVs/IVi} \) and \( \beta \in P_{IVi} \), then \( F_{32}(\alpha, \beta) \in P_{TVs} \), where \( F_{32}(\alpha, \beta) \) is \( \Gamma \alpha \beta \) and \( \beta \) is \( DB(\beta) \).

S33. If \( \alpha \in P_{IVS/ADJ} \) and \( \beta \in P_{ADJ} \), then \( F_{33}(\alpha, \beta) \in P_{IVS} \), where \( F_{33}(\alpha, \beta) \) is \( \Gamma \alpha \beta \).

S34. If \( \alpha \in P_{IVi/IQ} \) and \( \beta \in P_{IQ} \), then \( F_{34}(\alpha, \beta) \in P_{IVi} \), [-Perfect], where \( F_{34}(\alpha, \beta) \) is \( \Gamma \alpha \beta \).

S35. If \( \alpha \in P_{ADJ/INF} \) and \( \beta \in P_{INF} \), then \( F_{35}(\alpha, \beta) \in P_{ADJ} \), where \( F_{35}(\alpha, \beta) \) is \( \Gamma \alpha \beta \).

S36. If \( \alpha \in P_{t/t} \) and \( \phi \in P_t \), [\( \beta \)Tense, \( \gamma \)Past, \( \delta \)Perfect], then \( F_{36a}(\alpha, \phi), F_{36b}(\alpha, \phi), F_{36c}(\alpha, \phi) \in P_t \), [\( \beta \)Tense, \( \gamma \)Past, \( \delta \)Perfect], where \( F_{36a}(\alpha, \phi) \) is \( \Gamma \alpha \phi \), \( F_{36b}(\alpha, \phi) \) is \( \Gamma \phi \alpha \), and \( F_{36c}(\alpha, \phi) \) is \( ROS(\Gamma \alpha \phi, \phi) \). [Chapter II, 1]

S37. If \( \alpha \in P_{IVS/IVs} \) and \( \beta \in P_{IVs} \), then \( F_{37}(\alpha, \beta) \in P_{IVs} \), where \( F_{37}(\alpha, \beta) \) is \( \Gamma \beta \alpha \). [Chapter I, 5]
S38. If $a \in P_{IV}s$ and $\beta \in P_{pp}s$, then $F_{38}(a, \beta) \in P_{IV}s$, where $F_{38}(a, \beta)$ is $\overline{a \beta}$.  

S39. If $a \in P_{IV}s$, then $F_{39}(a) \in P_{INF}s$, where $F_{39}(a)$ is $\overline{to a \beta}$ and $a^\prime$ is $DB(a)$.  

S40. If $a \in P_{IV}i$, then $F_{40}(a) \in P_{INF}i$, where $F_{40}(a)$ is $\overline{to a \beta}$ and $a^\prime$ is $DB(a)$.  

S41. If $a \in P_{TV}s$, then $F_{41}(a) \in P_{PSPL}s$, where $F_{41}(a)$ is $DB(EN(a))$. [Chapter II, 4.2.4]  

S42. If $a \in P_{TV}s$ and $\beta \in P_{T}$, [Object], then $F_{42}(a, \beta) \in P_{PSPL}s$, where $F_{42}(a, \beta)$ is $\overline{a^\prime by \beta}$ and $a^\prime$ is $DB(EN(a))$. [Chapter II, 4.2.4]  

S43. If $a \in P_{TV}i$, then $F_{43}(a) \in P_{PSPL}i$, where $F_{43}(a)$ is $DB(EN(a))$. [Chapter II, 4.2.4]  

S44. If $a \in P_{TV}i$ and $\beta \in P_{T}$, [Object], then $F_{44}(a, \beta) \in P_{PSPL}i$, where $F_{44}(a, \beta)$ is $\overline{a^\prime by \beta}$ and $a^\prime$ is $DB(EN(a))$. [Chapter II, 4.2.4]  

S45. If $a \in P_{IV}s$, then $F_{45}(a) \in P_{PRPL}s$, where $F_{45}(a)$ is $DB(ING(a))$. [Chapter IV, 2.2]  

S46. If $a \in P_{IV}i$, then $F_{46}(a) \in P_{PRPL}i$, where $F_{46}(a)$ is $DB(ING(a))$. [Chapter IV, 2.2]  

S47. If $\phi \in P_e$, [-Tense, aPerfect] and is of the form $\overline{(he_n) \beta}$, $\overline{(she_n) \beta}$, $\overline{(it_n) \beta}$, or $\overline{(they_n) \beta}$, then $F_{47,n}(\phi) \in P_{IV}i$, [aPerfect], where $F_{47,n}(\phi)$ is $SSDEL_n(NONF(\beta))$. [Chapter IV, 1.2]  

S48. If $a \in P_{CN}$, then $F_{48}(a) \in P_{NOM}$, where $F_{48}(a)$ is $\overline{a \alpha}$.  

S49. If $\alpha \in P_{T/CN}$ and $\beta \in P_{CN}$, then $F_{49}(\alpha, \beta) \in P_T$, [+Plural, +Object, -Object], where $F_{49}(\alpha, \beta)$ is $\overline{\alpha \beta}$.

S50. If $\alpha \in P_{CN}$, then $F_{50}(\alpha) \in P_T$, [+Plural, +Object, -Object], where $F_{50}(\alpha)$ is $\text{PLUR}(\alpha)$.

S51. If $\alpha \in P_T$ and is John, Mary, Bill, Jane, or Fido, then $F_{51}(\alpha) \in P_{T/CN}$, where $F_{51}(\alpha)$ is $\overline{\alpha}$.

S52. If $\alpha \in P_{PPS/T}$ and $\beta \in P_T$, [+Object], then $F_{52}(\alpha, \beta) \in P_{PPS}$, where $F_{52}(\alpha, \beta)$ is $\overline{\alpha \beta}$.

S53. If $\alpha \in P_{PPI/T}$ and $\beta \in P_T$, [+Object], then $F_{53}(\alpha, \beta) \in P_{PPI}$, where $F_{53}(\alpha, \beta)$ is $\overline{\alpha \beta}$.

S54. If $\alpha \in P_T$, [+Object, -Object] and $\phi \in P_T$, [$\beta$Tense, $\gamma$Past, $\delta$Perfect], then $F_{54,n}(\alpha, \phi) \in P_T$, [$\beta$Tense, $\gamma$Past, $\delta$Perfect], where:

(i) if $\phi$ is of the form $\overline{\tau \eta \epsilon \zeta}$, where $\eta$ is (he$_n$), (she$_n$), (it$_n$), or (they$_n$), $F_{54,n}(\alpha, \phi)$ is $\text{SSDE}_{n}(\text{SUB}(\overline{\tau(\alpha)}, n, \phi))$;

(ii) if $\phi$ is not as in (i), then $F_{54,n}(\alpha, \phi)$ is $\text{SSDE}_n(\text{SUB}(\alpha, n, \phi))$, where $\eta$ is he$_n$, him$_n$, she$_n$, her$_n$, it$_n$, they$_n$, or them$_n$;

(iii) there is some nonnegative integer $m$ such that $n = 4m+3$ iff $\alpha \in [+\text{Plural}]$.

S55. If $\phi \in P_T$, [-Tense, $\beta$Perfect], then $F_{55}(\phi) \in P_{TAB}$, [+Tense, +Past, $\beta$Perfect], where $F_{55}(\phi)$ is $\text{ALLSUB}(\text{that}^PA_n, \text{that}^n, \text{PRET}(\phi))$.

[Chapter III, 1.3.1; 1.5]
SS6. If $\phi \in P_t$, [-Tense, $\beta$Perfect], then $F_{56}(\phi) \in P_{TAB}$, 
[+Tense, -Past, $\beta$Perfect], where $F_{56}(\phi)$ is ALLSUB($that^\eta, that^\eta, \phi$). [Chapter III, 1.3.1; 1.5]

SS7. If $\phi \in P_t$, [-Tense, $\beta$Perfect], then $F_{57}(\phi) \in P_{TAB}$, 
[+Tense, -Past, $\beta$Perfect], where $F_{57}(\phi)$ is ALLSUB($that^\eta, that^\eta, RB([will], \phi)$).
[Chapter III, 1.3.1; 1.5]

SS8. If $\alpha \in P_{TAB}$, [$\beta$Tense, $\gamma$Past, $\delta$Perfect], then $F_{58}(\alpha) \in P_t$, [$\beta$Tense, $\gamma$Past, $\delta$Perfect], where $F_{58}(\alpha)$ is $\alpha$. [Chapter III 1.3.1]

SS9. If $\alpha \in P_{MTA}$ and $\beta \in P_{TAB}$, [$\gamma$Tense, $\delta$Past, $\zeta$Perfect], then $F_{59a}(\alpha, \beta), F_{59b}(\alpha, \beta) \in P_{TAB}$, [$\gamma$Tense, $\delta$Past, $\zeta$Perfect], where $F_{59a}(\alpha, \beta)$ is $\Gamma_\alpha', \beta', F_{59b}(\alpha, \beta)$ is $\Gamma_\beta \alpha', \gamma'$, $\alpha'$ is ALLSUB($that^\eta, that^\eta, \alpha$), and $\eta$ is 'pa' if $\beta \in [+Past]$ and 'np' if $\beta \in [-Past]$.
[Chapter III, 1.3.2; 4.2]

S60. If $\phi \in P_t$, [-Tense] and $\psi \in P_t$, [+Tense, $\beta$Past, $\gamma$Perfect], then $F_{60,n}(\phi, \psi) \in P_t$, [+Tense, $\beta$Past, $\gamma$Perfect], where $F_{60,n}(\phi, \psi)$ is ALLSUB($\Gamma that^\eta, that^\eta, that^\eta, \psi$ and $\phi$' is ALLSUB($that^\eta, that^\eta, DP(PRET(\phi))$). [Chapter III, 1.5]

S61. If $\phi \in P_t$, [-Tense] and $\psi \in P_t$, [+Tense, $\beta$Past, $\gamma$Perfect], then $F_{61,n}(\phi, \psi) \in P_t$, [+Tense, $\beta$Past, $\gamma$Perfect], where $F_{61,n}(\phi, \psi)$ is ALLSUB($\Gamma that^\eta, that^\eta, that^\eta, \psi$ and $\phi$' is ALLSUB($that^\eta, that^\eta, DP(\phi)$). [Chapter III, 1.5]
S62. If $\phi \in P_{t}$, [-Tense] and $\psi \in P_{t}$, [+Tense, BPast, $\gamma$Perfect], then $F_{62}(\phi, \psi) \in P_{t}$, [+Tense, BPast, $\gamma$Perfect], where $F_{62}(\phi, \psi)$ is 
\text{ALLSUB}('that $\phi'$, that $\phi_{n}$, $\psi$) and $\phi'$ is 
\text{ALLSUB}('that $\phi_{n}$, that $\psi$, DP(RB([would], $\phi$))). 
[Chapter III, 1.5]

S63. If $\phi \in P_{t}$, [-Tense] and $\psi \in P_{t}$, [+Tense, BPast, $\gamma$Perfect], then $F_{63}(\phi, \psi) \in P_{t}$, [+Tense, BPast, $\gamma$Perfect], where $F_{63}(\phi, \psi)$ is 
\text{ALLSUB}('that $\phi'$, that $\phi_{n}$, $\psi$) and $\phi'$ is 
\text{ALLSUB}('that $\phi_{n}$, that $\psi$, DP(RB([will], $\phi$))). 
[Chapter III, 1.5]

S64. If $\alpha \in P_{RF}, \beta \in P_{TA}$, and $\gamma \in P_{TAB}$, [$\delta$Tense, $\zeta$Past, $\eta$Perfect], then $F_{64a}(\alpha, \beta, \gamma), F_{64b}(\alpha, \beta, \gamma) \in P_{TAB}$, 
[$\delta$Tense, $\zeta$Past, $\eta$Perfect], where $F_{64a}(\alpha, \beta, \gamma)$ is 
$\Gamma_{\beta}, \gamma', F_{64b}(\alpha, \beta, \gamma)$ is $\Gamma_{\gamma'} \beta'$, and $\gamma'$ is ROS($\alpha, \gamma$). 
[Chapter III, 2.1]

S65. If $\alpha \in P_{RF}$ and $\beta \in P_{TAB}$, [$\gamma$Tense, $\delta$Past, $\zeta$Perfect],
then $F_{65}(\alpha, \beta) \in P_{TAB}$, [$\gamma$Tense, $\delta$Past, $\zeta$Perfect],
where $F_{65}(\alpha, \beta)$ is ROS($\alpha, \beta$). [Chapter III, 2.1]

S66. If $\alpha \in P_{TA}$ and $\beta \in P_{TAB}$, [$\gamma$Tense, $\delta$Past, $\zeta$Perfect],
then $F_{66a}(\alpha, \beta), F_{66b}(\alpha, \beta) \in P_{TAB}$, [$\gamma$Tense, $\delta$Past, $\zeta$Perfect],
where $F_{66a}(\alpha, \beta)$ is $\Gamma_{\alpha}, \beta'$ and $F_{66b}(\alpha, \beta)$ is $\Gamma_{\beta} \alpha$. [Chapter III, 3.2]

S67. If $\alpha \in P_{TA}$, [-Adjunct], then $F_{67}(\alpha) \in P_{MTA}$, where $F_{67}(\alpha)$ is $\alpha$. [Chapter III, 1.2]
2.2 Translation. The type assignment for the categories of English is a function $f$ with Cat as its domain and Type as its range, such that:
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(1) \( f(t) = f(\text{COND}) = f(t') = f(t'') = t; \)

(2) \( f(\text{PRED}^S) = f(\text{INF}^S) = f(\text{PRPL}^S) = f(\text{PSPL}^S) = f(\text{ADJ}^S) = f(\text{PP}^S) \)

= \( f(\text{IV}^S) = f(\text{PRED}^i) = f(\text{INF}^i) = f(\text{PRPL}^i) = f(\text{PSPL}^i) = f(\text{ADJ}^i) \)

= \( f(\text{PP}^i) = f(\text{NOM}) = f(\text{IV}^i) = f(\text{CN}) = f(\text{Meas}) = <e,t>; \)

(3) \( f(\text{TV}^S) = f(\text{TV}^i) = <e,<e,t>>; \)

(4) \( f(\text{MOD}) = <s,<s,t>,t>,<s,t>,t>,<s,t>,t>; \)

(5) \( f(\text{TA}) = f(\text{TAB}) = <i,t>; \)

(6) \( f(\text{RFA}) = <i,t>,<i,t>,t>; \)

(7) \( f(\text{TSC}) = <s,i,t>,<i,t>,t>; \)

(8) \( f(\text{A/B}) = f(\text{A}/\text{B}) = f(\text{A}/\text{B}) = <s,f(\text{B}),f(\text{A})> \) whenever \( \text{A,B} \in \text{Cat}. \)

For any \( \text{A} \in \text{Cat}, \) if \( \alpha \in \text{PA}, \) then \( \alpha \) translates as an intensional logic expression of type \( f(\text{A}). \)

The sorted type assignment for basic expressions of English is a function \( c \) with \( U_A \in \text{Cat} B_A \) as its domain and \( \text{SType} \) as its range, such that the following hold. (Here and throughout, \( \text{in}^i \) abbreviates the sorted type \( [[<s,<o,t'>,<s,<o',t'>],[<s,<k,t'>]],[<s,<o,k,t'>]]; \) \( o' \) abbreviates the sorted type \( [s,<o,t'>],[<s,<o,k,t'>]]; \) \( k' \) abbreviates the sorted type \( [s,<k,t'>],[s,<o,k,t'>]]; \) and \( \text{in}'' \) abbreviates the sorted type \( [[<s,<o',t'>],[s,<k',t'>]],<s,<\text{in}',t'>]]. \)

(1) \( c(\text{[it][rains]}) = t'; \)

(2) \( \text{for all } \alpha \in B_{\text{ADJ}^S} U B_{\text{PP}^S} U B_{\text{IV}^S}, c(\alpha) = <\text{st},t'>; \)

(3) \( \text{for all } \alpha \in B_{\text{TV}^S}, c(\alpha) = <\text{st},<\text{st},t'>>; \)

(4) \( c(\text{[widespread]}) = c(\text{[rare]}) = <k,t'>; \) for all other \( \alpha \in B_{\text{ADJ}^i} U B_{\text{CN}} U B_{\text{Meas}}, c(\alpha) = <o,t'>; \)

(5) \( \text{for all } \alpha \in B_{\text{TV}^i}, c(\alpha) = <[o,k],[o,t']>; \)
(6) for all $\alpha \in B_{\text{MOD}}$, $c(\alpha) = \langle \langle \langle s, \langle t', t' \rangle \rangle, \langle t', t' \rangle, \langle s, t', t' \rangle \rangle,$

(7) for all $\alpha \in B_{\text{TA}}$, $c(\alpha) = \langle i', t' \rangle$;

(8) for all $\alpha \in B_{\text{RFA}}$, $c(\alpha) = \langle \langle i', t' \rangle, \langle i', t' \rangle, \langle t', t' \rangle \rangle$;

(9) for all $\alpha \in B_{\text{IQ}} \cup B_{\ell / \ell}$, $c(\alpha) = \langle \langle s, t' \rangle, t' \rangle$;

(10) for all $\alpha \in B_{\text{PPS}}$, $c(\alpha) = \langle \langle \langle i', t' \rangle \rangle, \langle s, t', t' \rangle \rangle$;

(11) for all $\alpha \in B_{\text{IVS}} \cup B_{\text{IVS}} \cup B_{\text{IVS}} / \text{IVS}$, $c(\alpha) = \langle \langle s, t', t' \rangle, \langle s, t', t' \rangle \rangle$;

(12) for all $\alpha \in B_{\text{IVS}} / \text{INF}$, $c(\alpha) = \langle \langle i', t' \rangle \rangle$;

(13) for all $\alpha \in B_{\text{IVS}}$, $c(\alpha) = \langle \langle s, t' \rangle, \langle s, t' \rangle \rangle$;

(14) for all $\alpha \in B_{\text{IVS}} / \text{ADJ}$, $c(\alpha) = \langle \langle i', t' \rangle \rangle$;

(15) for all $\alpha \in B_{\text{IVS}} / \text{IV}$, $c(\alpha) = \langle \langle i', \langle \langle s, t', t' \rangle \rangle \rangle$;

(16) for all $\alpha \in B_{\text{ADJ}} / \text{INF} \cup B_{\text{IVS}} / \text{INF}$, $c(\alpha) = \langle \langle i', \langle o, t' \rangle \rangle \rangle$;

(17) for all $\alpha \in B_{\text{PP}}, c(\alpha) = \langle \langle i', \langle o, t' \rangle \rangle \rangle$;

(18) for all $\alpha \in B_{\text{PP}} / \ell$, $c(\alpha) = \langle \langle s, \langle s, t' \rangle, \langle s, t' \rangle \rangle \rangle$;

(19) for all $\alpha \in B_{\text{PP}} / \text{ADJ}$, $c(\alpha) = \langle \langle \langle i', \langle o, t' \rangle \rangle \rangle, \langle \langle o, \langle k, t' \rangle \rangle \rangle \rangle$;

(20) for all $\alpha \in B_{\text{IVS}} / \ell$, $c(\alpha) = \langle \langle i', \langle o, t' \rangle \rangle \rangle$;

(21) for all $\alpha \in B_{\text{IVS}} / \text{Meas}$, $c(\alpha) = \langle \langle s, \langle o, t' \rangle \rangle \rangle$;

(22) for all $\alpha \in B_{\text{TSC}} \cup B_{\text{MTA}} \cup B_{\text{TAB}} \cup B_{\text{TAB}}$, $c(\alpha) = \langle \langle s, \langle i', t' \rangle \rangle \rangle$;

(23) $c(\text{they}^{4n+3}) = c(\text{them}^{4n+3}) = \langle \langle i', t' \rangle \rangle$; for all other $\alpha \in B_{T}$, $c(\alpha) = \langle o', t' \rangle$;

(24) for all $\alpha \in B_{\text{T/CN}}$, $c(\alpha) = \langle o', \langle o', t' \rangle \rangle$.

For any $A \in \text{Cat}$, if $\alpha \in B_{A}$, then $\alpha$ translates as an intensional logic expression of sorted type $c(\alpha)$. 
The following variable conventions will be followed in the translation rules:

\[ x^s, y^s, z^s \] are of sorted type \( st \)
\[ x^o, y^o, z^o \] are of sorted type \( o \)
\[ x^k, y^k, z^k \] are of sorted type \( k \)
\[ x^i, y^i, z^i \] are of sorted type \([o,k]\)
\[ p^s, Q^s \] are of sorted type \(<s,\langle st, t'\rangle>\)
\[ p^o, Q^o \] are of sorted type \(<o,\langle t'\rangle>\)
\[ p^k, Q^k \] are of sorted type \(<k,\langle t'\rangle>\)
\[ p^i, Q^i \] are of sorted type \(<in',\langle t'\rangle>\)
\[ P^i \] are of sorted type \(<in''.,\langle t'\rangle>\)

In addition, the following constants of intensional logic are assumed:

- \( \text{unaware-of}^o \), \( \text{live-in}^o \), \( \text{stop-by}^o \), \( \text{stay-on}^o \), \( \text{think-of}^o \), \( \text{run-into}^o \) are constants of sorted type \(<[o,k],\langle st, t'\rangle>\); \( \text{remind-of}^o \) is a constant of sorted type \(<[o,k],[o,k],\langle o, t'\rangle>\); \( \text{way-to}^o \), \( \text{top-of}^o \) are constants of sorted type \(<[o,k],[o, t'\rangle>\); \( \text{Poss}^o \) is a constant of sorted type \(<[o,k],[o, t'\rangle>\); \( \text{morning}^i \), \( \text{summer}^i \), \( \text{noon}^i \), \( \text{day}^i \) are constants of sorted type \(<i',t'>\); \( \text{John}^i \), \( \text{Mary}^i \), \( \text{Bill}^i \), \( \text{Jane}^i \), \( \text{Fido}^i \), \( \text{we}^i \), \( \text{this}^i \), \( \text{that}^i \) are constants of sorted type \(<i',\langle i', t'\rangle>\); \( \text{K}^i \) is a constant of sorted type \(<[i',\langle i', t'\rangle,t']>,\langle i',\langle i', t'\rangle,t'\rangle>\); \( \text{R}^i \) is a constant of
sorted type <[o,k],[st,t']>; R' is a constant of sorted type <k,<o,t'>; G is a constant of sorted type <<s,<st,t'>,<[o,k],t'>>; and G' is a constant of sorted type <<i',t'>,<<i',t'>,t'>.

Translations for the fragment of English are produced by the following rules:

(i) unaware of her_1 translates as unaware-of'(x_1^0);
(ii) [live] in it_2 translates as live-in'(x_2^0);
   [stop] by it_2 translates as stop-by'(x_2^0);
   [stay] on it_2 translates as stay-on'(x_2^0);
   [think] of her_1 translates as think-of'(x_1^0);
   [run] into her_1 translates as run-into'(x_1^0);
(iii) [remind] of her_1 translates as remind-of'(x_1^0);
(iv) way to it_2 translates as way-to'(x_2^0);
   top of it_2 translates as top-of'(x_2^0);
(v) today (ε B_TA) translates as
   \[ \lambda tVt_1[\text{day}'(t_1) \& [\text{NOW} \subseteq t_1 \& t \subseteq t_1]] \ (= \text{today}') \];
yesterday (ε B_TA) translates as
   \[ \lambda tVt_1[[\text{day}'(t_1) \& \Lambda t_2[\text{today}'(t_2) \Rightarrow [t_1 < t_2 \&
   \Lambda t_3[[t_2 < t_3 \& t_3 < t_1] \Rightarrow \text{today}'(t_3)]]]]] \& t \subseteq t_1];
tomorrow (ε B_TA) translates as
   \[ \lambda tVt_1[[\text{day}'(t_1) \& \Lambda t_2[\text{today}'(t_2) \Rightarrow [t_2 < t_1 \&
   \Lambda t_3[[t_2 < t_3 \& t_3 < t_1] \Rightarrow \text{today}'(t_3)]]]]] \& t \subseteq t_1];
in the morning (ε B_TA) translates as
   \[ \lambda tVt_1[\text{morning}'(t_1) \& t \subseteq t_1];
during the past summer (ε B_TA) translates as
   \[ \lambda tVt_1[[\text{summer}'(t_1) \& t_1 < \text{now}] \& \Lambda t_2[[\text{summer}'(t_2)]]] \&
\& t_2 < \text{now}] + [t_2 < t_1 \lor t_2 = t_1]] \& t \leq t_1];

(vi) \[\text{before} \ (e \text{PIV}^s/\text{PRED}^s) \text{translates as } \lambda p^s[vp^s];
\]
\[\text{before} \ (e \text{PIV}^i/\text{PRED}^i) \text{translates as}
\lambda p^s \lambda x^i v x^s[R(x^s, x^i) \& P^i(x^s)];
\]
\[\text{before} \ (e \text{PIV}^i/\text{PRED}^i) \text{translates as } \lambda p^i[vp^i];
\]

(vii) \[\text{before} \text{translates as}
\lambda \text{P}^t \lambda \text{t} \text{Vt}_1[[t < t_1 \& M(t, t_1)] \& P^t(t_1)];
\]
\[\text{after} \text{translates as}
\lambda \text{P}^t \lambda \text{t} \text{Vt}_1[[t_1 < t \& M(t, t_1)] \& P^t(t_1)];
\]
\[\text{when} \text{translates as}
\lambda \text{P}^t \lambda \text{t} \text{Vt}_1[t = t_1 \& P^t(t_1)];
\]
\[\text{while} \text{translates as}
\lambda \text{P}^t \lambda \text{t} \text{Vt}_1[[t \leq t_1 \& \neg \text{moment}(t_1)] \& P^t(t_1)];
\]

(viii) \[\text{at-that-time} \text{translates as}
\lambda \text{P}^t \lambda \text{t}[t = t_n \& P^t(t)];
\]
\[\text{since-noon} \text{translates as}
\lambda \text{P}^t \lambda \text{t}[[\text{xn}(t) \& Vt_1[[\text{noon'}(t_1) \& Vt_2[\text{day'}(t_2) \&}

[t_1 \leq t_2 \& \text{now} \leq t_2]]] \& t_1 < t] \& P^t(t)];
\]

(ix) \[\text{have} \ (e \text{B TAB/\text{TAB}')} \text{translates as}
\lambda \text{P}^t \lambda \text{t}[\text{perf}(t) \& Vt_1[t_1 \leq t \& P^t(t_1)]];
\]

(x) \[\text{John, Mary, Bill, Jane, and Fido translate as}
\lambda p^o[\text{John'}], \lambda p^o[\text{Mary'}], \lambda p^o[\text{Bill'}], \lambda p^o[\text{Jane'}],
\]
\[\lambda p^o[\text{Fido'}], \text{respectively; we and us translate as}
\lambda p^o[\text{we'}]; \_n, \_n, \_n, \_n, \_n \ (e \text{B}_n), \text{it}_n \text{translate as}
\lambda p^o[\_n]; \text{that and this translate as } \lambda p^o[\_n];
\]
\[\text{and } \lambda p^o[\text{this'}], \text{respectively;}
\]
they
, them translate as \( \lambda P^i(x^i_n) \);

(xi) his
, her \((\in B_T/C_n)\), its translate as
\( \lambda P^0\lambda Q^0[Q^0(\forall x^0[\text{Poss}(x^0_n, x^0) \& P^0(x^0)])] \);
their translates as \( \lambda P^0\lambda Q^0[Q^0(\forall x^0[\text{Poss}(x^i_n, x^0) \& P^0(x^0)])] \); our translates as
\( \lambda P^0\lambda Q^0[Q^0(\forall x^0[\text{Poss}(we^i, x^0) \& P^0(x^0)])] \);

(xii) where \( g \) is a biunique function whose domain is the set \( S \) of members of \( U_A \in \text{Cat} \) not mentioned in (i)-(xi) above, \( g(a) \in \text{Con}_{c(a)} \) whenever \( a \in S \).

T1. If \( a \in P_{\text{PRED}}^S \) and \( a \) translates as \( a' \), then \( F_{1,n}(a) \) translates as \( \forall x^S[R(x^S_n, x^i_n) \& a'(x^S)] \).

T2. If \( a \in P_{\text{PRED}}^i \) and \( a \) translates as \( a' \), then \( F_{2,n}(a) \) translates as \( a'(x^0_n), a'(x^k_n), \) or \( a'(x^i_n) \), according as \( a' \) is of sorted type \((<o,t'>, <k,t'>, \) or \( <[o,k],t'>, \) respectively.

T3. If \( a \in P_{\text{MTA}}, b \in P_{t'} \), and \( a,b \) translate as \( a',b' \), then \( F_{3}(a,b) \) translates as \( \forall t[\alpha'([\alpha(t_1[A(t_1, b)])(t])] \).

T4. If \( a \in P_T, b \in P_{\text{PRED}}^S \), and \( a,b \) translate as \( a',b' \), then \( F_{4}(a,b) \) translates as \( \alpha'([\alpha(\forall x^S[R(x^S_n, x^i)] \& b'(x^S)]) \).

T5. If \( a \in P_T, b \in P_{\text{PRED}}^i \), and \( a,b \) translate as \( a',b' \), then \( F_{5}(a,b) \) translates as \( a'('b') \).

T6. If \( a \in P_T, b \in P_{\text{PRED}}^S \), and \( a,b \) translate as \( a',b' \), then \( F_{6}(a,b) \) translates as \( \alpha'([\alpha(\forall x^S[R(x^S_n, x^i)] \& b'(x^S)]) \).

T7. If \( a \in P_T, b \in P_{\text{PRED}}^i \), and \( a,b \) translate as \( a',b' \), then \( F_{7}(a,b) \) translates as \( a'('b') \).
T8. If $\alpha \in P_T$, $\beta \in P_{\text{RED}}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_8(\alpha, \beta)$ translates as $\alpha'(\hat{x}^i \forall x^S[R(x^S, x^i) \land \sim \beta'(x^S)])$.

T9. If $\alpha \in P_T$, $\beta \in P_{\text{RED}}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_9(\alpha, \beta)$ translates as $\alpha'(\hat{x}^0[\sim \beta'(x^0)]), \alpha'(\hat{x}^k[\sim \beta'(x^k)]),$ or $\alpha'(\hat{x}^i[\sim \beta'(x^i)])$, according as $\beta'$ is of sorted type $\langle a, t \rangle$, $\langle k, t' \rangle$, or $\langle [0, k], t' \rangle$, respectively.

T10. If $\alpha \in P_T$, and $\alpha$ translates as $\alpha'$, then $F_{10, n}(\alpha)$ translates as $\lambda tV_t[M_n(t, t_1) \land \text{AT}(t_1, \alpha')]$.

T11. If $\alpha \in P_{\text{MTA}}$, $\beta \in P_T$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{11, n}(\alpha, \beta)$ translates as $\lambda tV_t[M_n(t, t_1) \land \alpha'(\hat{t}_2[\text{AT}(t_2, \beta')])(t_1)]$.

T12. If $\alpha \in P_{\text{TSC}}$, $\beta \in P_T$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{12}(\alpha, \beta)$ translates as $\alpha'(\hat{t}[\text{AT}(t, \beta')])$.

T13. If $\alpha \in P_{\text{TA}}$ and $\alpha$ translates as $\alpha'$, then $F_{13, n}(\alpha)$ translates as $\lambda p_\alpha t[\text{K}(L_n)(\forall [\alpha'(t)])(\forall [p^t(t)])]$.

T14. If $\phi \in P_T$ and $\phi$ translates as $\phi'$, then $F_{14}(\phi)$ translates as $\phi'$.

T15. If $\phi \in P_T$ and $\phi$ translates as $\phi'$, then $F_{15}(\phi)$ translates as $\phi'$.

T16. If $\alpha \in P_{\text{MOD}}$ and $\alpha$ translates as $\alpha'$, then $F_{16}(\alpha)$ translates as $\alpha'(C(cb))$.

T17. If $\alpha \in P_{T/\overline{t}}$, $\phi \in P_T$, and $\alpha, \phi$ translate as $\alpha', \phi'$, then $F_{17}(\alpha, \phi)$ translates as $\alpha'(\phi')$.

T18. If $\alpha \in P_{\text{MOD}}, \phi \in P_{\text{COND}}, \psi \in P_T$, and $\alpha, \phi, \psi$ translate as $\alpha', \phi', \psi'$, then $F_{18}(\alpha, \phi, \psi)$ translates as $\alpha'(D(cb)(\phi'))(\psi')$. 
T19. If \( \alpha \in P_T, \beta \in P_{IV}, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then
\[ F_{19}(\alpha, \beta) \text{ translates as } \alpha'('' \beta ')'. \]

T20. If \( \alpha \in P_{IVS} \) and \( \alpha \) translates as \( \alpha' \), then \( F_{20}(\alpha) \) translates as \( \lambda x^i Vx^S[R(x^S, x^i) \& \alpha'(x^S)] \).

T21. If \( \alpha \in P_{IVS} \) and \( \alpha \) translates as \( \alpha' \), then \( F_{21}(\alpha) \) translates as \( G('' \alpha ')'. \)

T22. If \( \alpha \in P_{IVS/PREDs}, \beta \in P_{PREDs}, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then \( F_{22}(\alpha, \beta) \) translates as \( \alpha'('' \beta ')'. \)

T23. If \( \alpha \in P_{IVS/PREDs}, \alpha \in P_{PREDs}, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then \( F_{23}(\alpha, \beta) \) translates as \( \alpha'('' \beta ')'. \)

T24. If \( \alpha \in P_{IVS/PREDi}, \beta \in P_{PREDi}, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then \( F_{24}(\alpha, \beta) \) translates as \( \alpha'('' \beta ')'. \)

T25. If \( \alpha \in P_{IVS/t}, \phi \in P_t, \) and \( \alpha, \phi \) translate as \( \alpha', \phi' \), then \( F_{25}(\alpha, \phi) \) translates as \( \alpha'('' \phi ')'. \)

T26. If \( \alpha \in P_{IVS/t} \) and \( \alpha \) translates as \( \alpha' \), then \( F_{26}(\alpha) \) translates as \( \alpha'(P_n) \).

T27. If \( \alpha \in P_{TVS}, \beta \in P_T, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then \( F_{27}(\alpha, \beta) \) translates as
\[ \lambda \mathcal{P} \lambda x^S \mathcal{P} \{y^i V y^S[R(y^S, y^i) \& \alpha'(y^S)(x^S)]\}('' \beta ')'. \]

T28. If \( \alpha \in P_{TVi}, \beta \in P_T, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then \( F_{28}(\alpha, \beta) \) translates as
\[ \lambda \mathcal{P} \lambda x^O_0 \mathcal{P} \{y^i [\alpha'(y^i)(x^O)]\}('' \beta ')'. \]

T29. If \( \alpha \in P_{IVi/Meas}, \beta \in P_{Meas}, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then \( F_{29}(\alpha, \beta) \) translates as \( \alpha'('' \beta ')'. \)

T30. If \( \alpha \in P_{IVS/INFi}, \beta \in P_{INFi}, \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then \( F_{30}(\alpha, \beta) \) translates as \( \alpha'('' \beta ')'. \)
T31. If $\alpha \in P_{IV}^{i}/INF^{i}, \beta \in INF^{i}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{31}(\alpha, \beta)$ translates as $\alpha'('\beta')$.

T32. If $\alpha \in P_{TV}^{s}/IV^{i}, \beta \in IV^{i}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{32}(\alpha, \beta)$ translates as $\alpha'('\beta')$.

T33. If $\alpha \in P_{IV}^{s}/ADJ^{i}, \beta \in ADJ^{i}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{33}(\alpha, \beta)$ translates as $\alpha'('\beta')$.

T34. If $\alpha \in P_{TV}^{i}/IQ, \beta \in IQ^{s}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{34}(\alpha, \beta)$ translates as $\alpha'('\beta')$.

T35. If $\alpha \in P_{ADJ^{i}}/INF^{i}, \beta \in INF^{i}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{35}(\alpha, \beta)$ translates as $\alpha'('\beta')$.

T36. If $\alpha \in P_{p/t}, \phi \in P_{t}$, and $\alpha, \phi$ translate as $\alpha', \phi'$, then $F_{36a}(\alpha, \phi), F_{36b}(\alpha, \phi), F_{36c}(\alpha, \phi)$ translate as $\alpha'('\phi')$.

T37. If $\alpha \in P_{IV}^{s}/IV^{s}, \beta \in IV^{s}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{37}(\alpha, \beta)$ translates as $\alpha'('\beta')$.

T38. If $\alpha \in P_{IV}^{s}, \beta \in P_{pps}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{38}(\alpha, \beta)$ translates as $\lambda x^{5}[\alpha'(x^{s}) \& \beta'(x^{s})]$.

T39. If $\alpha \in P_{IV}^{s}$ and $\alpha$ translates as $\alpha'$, then $F_{39}(\alpha)$ translates as $\alpha'$.

T40. If $\alpha \in P_{IV}^{i}$ and $\alpha$ translates as $\alpha'$, then $F_{40}(\alpha)$ translates as $\alpha'$.

T41. If $\alpha \in P_{TV}^{s}$ and $\alpha$ translates as $\alpha'$, then $F_{41}(\alpha)$ translates as $\lambda x^{5}y^{s}[\alpha'(x^{s})(y^{s})]$.

T42. If $\alpha \in P_{TV}^{s}, \beta \in P_{T}$, and $\alpha, \beta$ translate as $\alpha', \beta'$, then $F_{42}(\alpha, \beta)$ translates as $\lambda x^{5}[\beta'(y^{s})y^{i}, \alpha'(x^{s})(y^{s})]$.
T43. If $a \in P_{TV}$ and $a$ translates as $a'$, then $F_{43}(a)$ translates as $\lambda x^i \forall y^0[a'(x^i)(y^0)]$.

T44. If $a \in P_{TV}$, $b \in P_T$, and $a,b$ translate as $a',b'$, then $F_{44}(a,b)$ translates as $\lambda x^i[b'(y^0[a'(x^i)(y^0)])]$.

T45. If $a \in P_{IV}^s$ and $a$ translates as $a'$, then $F_{45}(a)$ translates as $\lambda x^s[\overbrace{\text{Ing}([a'(x^s)])}]$.

T46. If $a \in P_{IV}^i$ and $a$ translates as $a'$, then $F_{46}(a)$ translates as $\lambda x^0[\overbrace{\text{Ing}([a'(x^0)])}]$, $\lambda x^k[\overbrace{\text{Ing}([a'(x^k)])}]$, or $\lambda x^i[\overbrace{\text{Ing}([a'(x^i)])}]$, according as $a'$ is of sorted type $\langle 0,t' \rangle$, $\langle k,t' \rangle$, or $\langle [0,k],t' \rangle$, respectively.

T47. If $\phi \in P_t$ and $\phi$ translates as $\phi'$, then $F_{47}(\phi)$ translates as $\lambda x^i[\phi']$ if for some nonnegative integer $m$, $n = 4m+3$; otherwise, as $\lambda x^0[\phi']$.

T48. If $a \in P_{QN}$ and $a$ translates as $a'$, then $F_{48}(a)$ translates as $a'$.

T49. If $a \in P_{T/QN}$, $b \in P_{QN}$, and $a,b$ translate as $a',b'$, then $F_{49}(a,b)$ translates as $a'('b')$.

T50. If $a \in P_{QN}$ and $a$ translates as $a'$, then $F_{50}(a)$ translates as $\lambda P^k P^k\{x^k \forall x^0[R^1(x^0,x^k) \equiv a'(x^0)]\}$.

T51. If $a \in P_T$ and $a$ translates as $a'$, then $F_{51}(a)$ translates as $\lambda P^0 \forall Q^0[Q^0(x^0)[a'(x^0)P^0(x^0)]]$.

T52. If $a \in P_{PP^S/T}$, $b \in P_T$, and $a,b$ translate as $a',b'$, then $F_{52}(a,b)$ translates as $a'('b')$.

T53. If $a \in P_{PP^T}$, $b \in P_T$, and $a,b$ translate as $a',b'$, then $F_{53}(a,b)$ translates as $a'('b')$. 
T54. If $a \in P_T$, $\phi \in P_t$, and $a, \phi$ translate as $a', \phi'$, then $F_{54,n}(a, \phi)$ translates as $a'(\chi_n^a[\phi'])$ if there is some nonnegative integer $m$ such that $n = 4m+3$, and otherwise as $a'(\chi_n^0[\phi'])$.

T55. If $\phi \in P_t$ and $\phi$ translates as $\phi'$, then $F_{55}(\phi)$ translates as $\lambda t[past(t) \& AT(t, \phi')]$.

T56. If $\phi \in P_t$ and $\phi$ translates as $\phi'$, then $F_{56}(\phi)$ translates as $\lambda t[pres(t) \& AT(t, \phi')]$.

T57. If $\phi \in P_t$ and $\phi$ translates as $\phi'$, then $F_{57}(\phi)$ translates as $\lambda t[fut(t) \& AT(t, \phi')]$.

T58. If $a \in P_{TAB}$ and $a$ translates as $a'$, then $F_{58}(a)$ translates as $\lambda t[a'(t)]$.

T59. If $a \in P_{MTA}$, $b \in P_{TAB}$, and $a, b$ translate as $a', b'$, then $F_{59}(a, b)$, $F_{59b}(a, b)$ translate as $a'(b')$.

T60. If $\phi, \psi \in P_t$ and $\phi, \psi$ translates as $\phi', \psi'$, then $F_{60,n}(\phi, \psi)$ translates as $\lambda p_n[\psi'](\lambda t[pres(t) \& AT(t, \phi')]$.

T61. If $\phi, \psi \in P_t$ and $\phi, \psi$ translates as $\phi', \psi'$, then $F_{61,n}(\phi, \psi)$ translates as $\lambda p_n[\psi'](\lambda t[pres(t) \& AT(t, \phi')]$.

T62. If $\phi, \psi \in P_t$ and $\phi, \psi$ translates as $\phi', \psi'$, then $F_{62,n}(\phi, \psi)$ translates as $\lambda p_n[\psi'](\lambda t[fut(t) \& AT(t, \phi')]$.

T63. If $\phi, \psi \in P_t$ and $\phi, \psi$ translates as $\phi', \psi'$, then $F_{63,n}(\phi, \psi)$ translates as $\lambda p_n[\psi'](\lambda t[fut(t) \& AT(t, \phi')]$.

T64. If $a \in P_{RFA}$, $b \in P_{TA}$, $\gamma \in P_{TAB}$, and $a, b, \gamma$ translate as $a', b', \gamma'$, then $F_{64}(a, b, \gamma)$, $F_{64b}(a, b, \gamma)$ translate as $\lambda t[a'(b')](\lambda t_1[t_1 \in t \& \gamma'(t_1)]$).
T65. If \( \alpha \in P_{RFA}, \beta \in P_{TAB} \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then
\[
F_{65}(\alpha, \beta) \text{ translates as } \lambda t[a'(I_n)(\lambda t_1[t_1 \leq t \& \beta'(t_1)])].
\]

T66. If \( \alpha \in P_{TA}, \beta \in P_{TAB} \) and \( \alpha, \beta \) translate as \( \alpha', \beta' \), then
\[
F_{66a}(\alpha, \beta), F_{66b}(\alpha, \beta) \text{ translate as } \lambda t[\phi''(a') (\lambda t_1[t_1 \leq t \& \beta'(t_1)])].
\]

T67. If \( \alpha \in P_{TA} \) and \( \alpha \) translates as \( \alpha' \), then \( F_{67}(\alpha) \) translates as \( \lambda P^t \lambda t[a'(t) \& P^t(t)] \).

T68. If \( \alpha \in P_{TSC}, \phi \in P_{t} \) and \( \alpha, \phi \) translate as \( \alpha', \phi' \), then
\[
F_{68}(\alpha, \phi) \text{ translates as } \alpha'(\hat{t}[\phi']).
\]

T69. If \( \alpha \in P_{TSC}, \phi \in P_{t} \) and \( \alpha, \phi \) translate as \( \alpha', \phi' \), then
\[
F_{69}(\alpha, \phi) \text{ translates as } \alpha'(\hat{t}[\phi][\{\text{PAST}(t) \& \text{AT}(t, \phi')\}]).
\]

T70. If \( \alpha \in P_{TSC}, \phi \in P_{t} \) and \( \alpha, \phi \) translate as \( \alpha', \phi' \), then
\[
F_{70}(\alpha, \phi) \text{ translates as } \alpha'(\hat{t}[\{\text{NONPAST}(t) \& \text{AT}(t, \phi')\}]).
\]

T71. If \( \alpha \in P_{TSC}, \beta \in P_{MTA}, \phi \in P_{t} \) and \( \alpha, \beta, \phi \) translate as
\( \alpha', \beta', \phi' \), then \( F_{71}(\alpha, \beta, \phi) \) translates as
\[
\alpha'(\hat{t}[\text{PAST}(t) \& \text{AT}(t, \phi')]).
\]

T72. If \( \alpha \in P_{TSC}, \beta \in P_{MTA}, \phi \in P_{t} \) and \( \alpha, \beta, \phi \) translate as
\( \alpha', \beta', \phi' \), then \( F_{72}(\alpha, \beta, \phi) \) translates as
\[
\alpha'(\hat{t}[\{\text{NONPAST}(t) \& \text{AT}(t, \phi')\}]).
\]

T73. If \( \alpha \in P_{TAB/TAB}, \phi \in P_{t} \) and \( \alpha, \phi \) translate as \( \alpha', \phi' \), then \( F_{73}(\alpha, \phi) \) translates as \( \alpha'(\hat{t}[\text{AT}(t, \phi')]) \).
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