On the Syntax and Semantics of English Adverbials

by

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A Thesis Submitted in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF ARTS

in the Department of Linguistics

We accept this thesis as conforming
to the required standard

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ABSTRACT

In his 1966 presentation 'The Logical Form of Action Sentences', Donald Davidson proposed that a sentence such as (1) be represented as in (2), where (2) reads as in (3):

(1) I flew my spaceship to the Morning Star.
(2) $(\exists x)$(Flew(I, my spaceship, x) & To(the Morning Star, x)).
(3) There is an event x such that x is a flying of my spaceship by me and x is to the Morning Star.

Two main consequences of Davidson's proposal are examined in this thesis. First, sentence modifiers such as *possibly, allegedly,* and *fortunately* have no place in Davidson's representation. Second, Davidson's treatment of event-modifying adverb phrases as separate from the structural core (the transitive or intransitive relation denoted by the verb) runs counter to the venerable argument/adjunct distinction in syntactic theory since, in his system, (4) would have the logical form in (5):

(4) I gave my spaceship to NASA.
(5) $(\exists x)$(Gave(I, my spaceship, x) & To(NASA, x)).

In order to examine these two consequences, motivation is first given for the sentence modifier versus predicate modifier distinction, relying on convergence of the results of applying several syntactic and semantic tests which have been proposed for the distinction. The operator approach to the semantics of adverbials, as an alternative to Davidson's approach, is evaluated and the case made for aligning sentence modifiers with the operator approach and predicate modifiers with the Davidsonian approach. Finally, two tests for the argument/adjunct distinction—optionality and

iterability—are assessed in light of the absence of subcategorized adverb phrases in Davidson's logical form.

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ACKNOWLEDGMENTS

My thanks, first and foremost, go to my supervisor Tom Hukari. I have greatly appreciated that Tom did not impose a thesis topic on me but instead allowed me to choose my topic and to pursue the issues I found to be important. This is not to say that he left me on my own; his questions and comments all along the way have had a deep and positive influence on my thinking of linguistics. I have also greatly appreciated his answers to my questions, not so much for the answers themselves but rather for the process of considering many possible answers and assessing the consequences of taking different paths. I consider myself very fortunate to have had such excellent training due to Tom's guidance.

My thanks go to Leslie Saxon for her excellent teaching, for her inspiring enthusiasm for linguistics, for her words of encouragement (in person and by e-mail), and for her scrupulous reading of my thesis. Leslie pointed out many references which have important places in my thesis and made many suggestions and comments which kept me thinking and revising.

I give my thanks to Emmanuel Hérique and to Morgan Baker for agreeing to be on my examining committee and for their probing questions at my oral defense.

I want to thank all my friends in the Department of Linguistics at UVic. In particular, I thank my good friend and colleague Violet Bianco for all the conversations linguistic and especially the ones non-linguistic. Most of the laughs that I had in the last two years were during those conversations and I doubt I will ever forget certain of the quips which caused the laughs.

Thank you to my parents, Lawrence and Vivian. When I said "I want to quit my job to study linguistics," they said "Go for it!" before asking "What's linguistics?" I value that they have raised me to make my own decisions and especially value that they invariably support the decisions I make.

Finally, and also foremost, my thanks go to my best friend, Kevin Attewell, who distracted me from the (seemingly) never-ending school work to watch the sun set or to go for a hike, and thereby helped me to keep things in perspective.

CHAPTER ONE

1.1 OVERVIEW

As a part of speech category, the label 'adverb' applies to an exceedingly diverse set of items in the English language, including modifiers of verbs, adverbs, adjectives, clauses, and sentences. The label 'adverbial' extends the range to prepositional phrases, noun phrases, and clauses, all of which may have the same modifying functions as adverbs. The aim of this thesis is to cut through the diversity to examine three fundamental issues concerning English adverbials and to show how these issues impinge on each other.

The three issues, outlined in more detail in the sections below, are these:

(i) The distinction between sentence modifiers (e.g., *probably, fortunately, in my opinion*) and predicate modifiers (e.g., *quickly, with a knife, on the shelf*);

(ii) The differences between the two main formal semantic approaches to English adverbials—the underlying event account (Reichenbach, 1947; Davidson, 1967a) and the operator account (Clark, 1970; Parsons, 1970; Montague, 1970);

(iii) The distinction between adverbials which are required for grammaticality, and are called 'complements' or 'arguments' of a verb, and adverbials which are omissible, and are called 'modifiers' or 'adjuncts'.

In exploring these three issues, the following results surface: (1) Based on a number of tests, there is a robust sentence modifier versus predicate modifier distinction; (2) While the operator approach is needed for the semantics of sentence modifiers, it does not handle the semantics of predicate modifiers as

well as the Davidsonian approach does; and (3) Two tests for the argument/adjunct distinction can be accounted for without appeal to the notion of an underlying status as either argument or adjunct. This last result calls into question the robustness of the argument/adjunct distinction and the claim that adverbials may be arguments or adjuncts depending on the verbs with which they occur.

1.2 THE SENTENCE MODIFIER VERSUS PREDICATE MODIFIER DISTINCTION

Heny (1973:217) writes: "With a little pushing from [George] Lakoff, Thomason–Stalnaker identified two major logical classes of adverbs in English: (1) sentence adverbs like *necessarily*, and (2) predicate adverbs like *reluctantly* and *slowly*." Thomason and Stalnaker (1973) provided four semantically-based criteria for distinguishing the two kinds of adverbs. The first criterion is based on the notion of opacity and on the type of contrast demonstrated by (1) and (2) (from Thomason and Stalnaker, 1973:201-2, but originally from the philosophy literature):

(1) John walks slowly.
John is the mayor of New York.
Therefore the mayor of New York walks slowly.

(2) Necessarily nine is odd.
Nine is the number of the planets.
Therefore, necessarily the number of the planets is odd.

Substitution under identity is valid in (1) and not valid in (2). Thomason and Stalnaker showed that adverbials which create possible worlds (e.g., *in several restaurants, on a number of occasions,* and sentence modifiers such as *possibly* and *allegedly*) are capable of creating opacity. Predicate modifiers, on

the other hand, do not.[1]

Another one of Thomason and Stalnaker's criteria uses truth-focusing paraphrase, a test which has been extensively discussed by Bartsch (1976), Buysschaert (1982) and Koktova (1986). Essentially, sentence modifiers act like higher predicates and allow paraphrases which take the sentence as a complement, as illustrated in (3). The adverb in (4a), on the other hand, does not submit to the truth-focusing paraphrase in (4b):

(3a) Sean probably left the book at the station.
(3b) It is probably true that Sean left the book at the station.

(4a) Robin angrily slammed the door.
(4b) *It is angrily true that Robin slammed the door.

Several other syntactic and semantic tests have been proposed for the sentence modifier versus predicate modifier distinction. In chapter two, five of these tests are applied to a range of adverbs and prepositional phrase adverbials. The results of each test coupled with the cross-test consistency will be used to motivate a robust distinction between sentence modification and predicate modification.

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1 The Subject-oriented modifiers such as *willingly* and *deliberately* also create opacity, as demonstrated by these examples from the literature:

(i) John willingly trusted Harry
Harry is John's worst enemy.
Therefore, John willingly trusted his worst enemy.
(An invalid inference)

(ii) Oedipus intentionally married Jocasta.
Jocasta is the mother of Oedipus.
Therefore, Oedipus intentionally married his mother.
(An invalid inference)

Thomason and Stalnaker (1973) specify that the opacity criterion requires substitution failure in Subject position in order to be classified as a sentence modifier. The Subject-oriented modifiers are unable to create opacity in Subject position and are therefore predicate modifiers according to the test.

1.3 TWO SEMANTIC TREATMENTS OF ENGLISH ADVERBIALS

The second issue arises from an observation of Cresswell's (1974:455) in which he points out that there are essentially two formal semantic treatments of English adverbials—the underlying event approach and the operator approach. The underlying event approach to the semantics of adverbials was originally restricted to instrument, locative and temporal adverbials (Davidson, 1967a). The modified neo-Davidsonian approach (cf. Dowty, 1989) extended Davidson's treatment of adverbials to manner adverbs and to targets, as distinct from locations.[2] Davidson's account has two key features: (i) it makes use of Reichenbach's notion of the event argument and (ii) it treats (certain types of) adverbials as contributing structure to the logical representation of a sentence.

In *Elements of Symbolic Logic*, Reichenbach (1947:§48) applied a notion from modern physics to representation of natural language. The notion is that individuals may be of the 'thing type' or the 'event type', the latter being "space-time coincidences [which] do not endure" (p. 267). Events—Reichenbach's examples (pp. 267-8) are a coronation, an assassination, an earthquake, an automobile accident—are treated as arguments of sentences, just as 'things' are. In the representation, event arguments are variables which are bound by the existential quantifier. In this way, the existence of an event is captured in the representation of an expression which contains the notion that an event occurs, has occurred, will occur, etc.

An event argument also allows the event itself to hold a place in the argument structure of the predicate signifying the event. When the sentence contains adverbials such as instrument, temporal, and locative phrases, the

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2 For example, Parsons (1995:636) distinguishes, in his neo-Davidsonian representation, the two *in*-phrases of "Brutus stabbed Caesar violently in the back with a knife in the agora". The first *in*-phrase is a target, the second a location.

adverbials are treated as predicates which take the event argument. For Davidson the sentence in (5) has the representation ('logical form') in (6), which reads roughly as in (7), ignoring tense:

(5) Jones flew the spaceship to the Morning Star.
(6) $(\exists x)$[Flew(Jones, the spaceship, x) & To(the Morning Star, x)]
(7) There is an event x such that x is a flying of the spaceship by Jones and x is to the Morning Star.

The thrust of Davidson's argument is that the logical form in (6) makes explicit the formal entailments in (8) and (9):

(8a) $(\exists x)$[Flew(Jones, the spaceship, x)]
(8b) Jones flew the spaceship.

(9a) $(\exists x)$[To(the Morning Star, x)]
(9b) The event (referring to the flying) was to the Morning Star.

While the Davidsonian approach works well for predicate modifiers, it does not extend to the sentence modifiers such as *probably* and *allegedly*. This motivated an alternative account—independently proposed by Clark (1970), Parsons (1970), and Montague (1970)—in which adverbials are treated as operators. On the operator account, adverbials derive more complex predicates or sentences from simpler ones. For example, (10) would have the representation as in (11):[3]

(10) John walks to the store.
(11) [To the store(walks)](John)

In (11), the adverbial *to the store* is an operator which takes the verb phrase *walks* and forms the more complex verb phrase *walks to the store*. This verb phrase then operates on the term *John* to form a sentence.

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[3] The sentence and the formalization of it are based on Thomason and Stalnaker (1973:208), but greatly simplified for clarity. For example, the use of lambda-abstraction in their representation is suppressed here but discussed below in §3.3.2.

In the operator approach as outlined here, there is no formal (structural) entailment of (12) by (10):

(12) John walks.

This is a desirable consequence in light of examples such as (13) in which the (a) sentence does not entail the (b) sentence:

(13a) Kerry probably solved the puzzle.
(13b) Kerry solved the puzzle.

Thus, Montague writes in regards to the interpretation of adverbial phrases (1970:213): "Notice, for instance, that 'Jones kills Smith in a dream' does not logically imply 'Jones kills Smith'; hence neither does 'Jones kills Smith with a knife',..."

If the tests in chapter two provide a reliable means of identifying sentence modifiers and predicate modifiers, then nothing precludes the use the operator approach for sentence modifiers and Davidson's approach for predicate modifiers. Arguments for making this move are given in the last section of chapter three.

1.4 ON THE ARGUMENT/ADJUNCT DISTINCTION

An interesting question which arises from the Davidsonian treatment of adverbials is whether there is an underlying distinction between arguments of a verb and adjuncts to a verb. Although at no point does Davidson make reference to an argument/adjunct distinction, Kratzer (1993:103) interprets Davidson (1967a) in this way: "In his analysis of action sentences, Donald Davidson drew a clear distinction between arguments and adjuncts." However, there is nothing in Davidson (1967a,b) to suggest that the sentence in (14) would not have a representation in (15):

(14) Robin gave the book to Lee.
(15) $(\exists x)$[Gave(Robin, the book, x) & To(Lee, x)]

The obligatory *to*-phrase, then, is taken as separate from the ditransitive verb *give* and is treated in exactly the same way as *to*-phrases of verbs such as *walk* and *fly*. Unless Kratzer (1993) takes the obligatory *to*-phrase in (14) to be an adjunct, it does not follow that Davidson was proposing an argument/adjunct distinction in his descriptive representation of action sentences. Another alternative is that Davidson would represent *give* as a four-place predicate, as shown in (16):

(16) $(\exists x)$[Gave(Robin, the book, (to) Lee, x)]

Taking a step back from this issue of representational detail (which nevertheless comes with consequences), the real question is whether or not the venerable claim in linguistic theory that verbs subcategorize for their arguments but not for their adjuncts is correct. The optionality test, discussed in §4.2, picks out adjuncts in that they are always optional for the well-formedness of a sentence in isolation (i.e., without a discourse context). However, arguments are sometimes optional. For example, the items in brackets in (17) are omissible without compromising the grammaticality of the sentence and are therefore adjuncts; those in (18) are obligatory for grammaticality and are arguments; those in (19) are optional but are generally assumed to be arguments, specifically optional direct objects:

(17a) Lindsay devoured his lunch (from 11:30 to 11:33).
(17b) Andy gave the book to Jan (last Friday).
(17c) Dell sang (loudly) (in the shower).

(18a) Lindsay devoured *(his lunch).
(18b) Andy gave the book *(to Jan).
(18c) Andy put the book *(on the table).
(18d) Kim worded the letter *(carefully).
(18e) The conversation lasted *(from 11:30 to 11:33).

(19a) Lindsay ate (the rest of the cake).
(19b) Dell sang (a showtune).
(19c) Robin drives (a Mazda Miata).

One of the tests used to distinguish optional arguments (or complements[4]) from adjuncts, is the iterability test, which is discussed in §4.3. "In general, two or more instances of the same adjunct type can combine with the same head..., but this is impossible for complements" (Pollard and Sag, 1987:136). Section 4.3 shows that this statement does not hold for certain types of adjuncts (e.g., passive agents, instruments, and manner adverbs) and that the types which do allow iterability (e.g., locatives and temporals) require that the phrases refer to the same point or region of space or time. Furthermore, locatives of *put* are iterable in the same way that their putative adjunct counterparts are. Thus, reference to the semantic role which the phrase plays in relation to the verb accounts for exactly the behaviour which is often claimed as indicative of an argument/adjunct distinction. That the optionality and iterability tests fail to show a robust argument/adjunct distinction is compatible with the uniform representation of predicate modifiers and obligatory adverbials under the Davidsonian approach to action sentences.

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4 The term 'complement' as used in this thesis refers to any syntactic argument of a verb other than the Subject. This amounts to 'complement' referring to direct objects and obligatory adverbials such as the indirect object of *give*, locative of *put* and *reside*, and manner adverbial of *treat* and *behave*. The term 'argument' subsumes 'complement' and extends to grammatical Subjects.

CHAPTER TWO

2.1 SOME SORTINGS OF ENGLISH ADVERBIALS

In traditional grammars of the English language, adverbs constitute a very large and diverse part of speech category that includes modifiers of verbs, adjectives, other adverbs, clauses, and whole sentences. McCawley (1988) attributes this "lumping together" as "a prejudice that the number of 'parts of speech' should be small..., a prejudice that has as little basis as the once equally common prejudice that the number of chemical elements should be small" (p. 631). The term *adverbial* further extends this class of modifiers to include prepositional phrases, noun phrases, and clauses, all of which may be functionally coextensive with the single word adverbs.

It should come as no surprise that there are several sortings of English adverbials. Quirk *et al.* (1985:§8.24) sort adverbials into conjuncts (sentence connectives such as *however, nevertheless,* and *first*), disjuncts (e.g., *probably, fortunately, frankly*), subjuncts (e.g., *morally, willingly, deliberately,* and the various focusing adverbs, intensifiers, and downtoners), and adjuncts (of space, time, manner, means, instrument, purpose, cause, etc.). Each of these groups is extensively subdivided, primarily on the basis of semantic contribution.

Jackendoff (1972) classifies adverbs into the verb phrase (VP) adverbs, the Subject-oriented adverbs, and the speaker-oriented adverbs. Bellert (1977) points out five distinct groups within Jackendoff's speaker-oriented adverbs: the evaluative adverbs (e.g., *fortunately, surprisingly*), the modal adverbs (e.g., *probably, possibly*), the domain adverbs (e.g., *logically, mathematically*), the conjunctive adverbs (e.g., *therefore, finally*), and the pragmatic adverbs (e.g., *sincerely, precisely*).

McConnell-Ginet (1982) discusses the passive sensitivity of the Subject-oriented adverbs. Adverbs such as *reluctantly, wisely,* and *unwillingly* "induce non-synonymy of actives and related passives" (McConnell-Ginet, 1982:145), as demonstrated by the sentences in (1):

(1a) Reluctantly, Joan instructed Mary.
(1b) Reluctantly, Mary was instructed by Joan.

In (1a), it is Joan, the sentence subject, who is reluctant. In (1b) it can be Mary or Joan who is reluctant. McConnell-Ginet also discusses the potential for interpretive differences between the sentences in (2):

(2a) Louisa rudely answered Patricia.
(2b) Louisa answered Patricia rudely.

The meaning difference can be described this way: "[2a] can be construed as saying that Louisa's rudeness consisted in her having answered Patricia (who perhaps is of such a high position that etiquette dictates she should not be addressed at all), whereas [2b] locates the flaw in the manner of answering" (McConnell-Ginet, 1982:159). Ultimately, McConnell-Ginet proposes that the passive-sensitive adverbs allow VP-external (attitude) readings and VP-internal (manner) readings. The VP-external adverbs are taken to be outside the VP but not outside the sentence. Thus, McConnell-Ginet's VP-external adverbs align with Jackendoff's Subject-oriented adverbs and her VP-internal adverbs contain his manner adverbs.

For Quirk *et al.* (1985), adjuncts are classified as sentence adjuncts or predication adjuncts, based on the notion of how closely the adverbial is related to the verb's meaning. For example, they contrast the sentence adjuncts in (3), in italics, with the predication adjuncts in (4), also in italics:

(3a) She kissed her mother *on the platform.*
(3b) The show lasts for 4 hours, *usually.*

(4a) She kissed her mother *on the cheek.*
(4b) The show lasts *for 4 hours*, usually.

The predication adjuncts in (4) seem to be more dependent on the verb's meaning than are the sentence adjuncts. In fact, the prepositional phrase adverbial in (4b) is obligatory since (4c) is ungrammatical:

(4c) *The show lasts, usually.

Thus, Quirk *et al.* (1985:§8.26) subcategorize predication adjuncts as either optional, as in (4a), or obligatory, as in (4b).

Some useful sortings of adverbials appear in Bartsch (1976), Ernst (1984), and Parsons (1990). The following chart provides a rough summary of the splits as they appear in Quirk *et al.* (1985), Bellert (1977), and Parsons (1990) and gives a very approximate alignment of them.

Table 2.1: Some Sortings of English Adverbials

Quirk, Greenbaum, Leech, and Svartvik (1985)	Bellert (1977)	Parsons (1990)
1. CONJUNCTS {*first, therefore, in that case, as a consequence, in other words, alternatively, ...*}	1. CONJUNCTIVE ADVERBS {*however, nevertheless, hence, therefore, firstly, finally, ...*}	1. SPEECH-ACT MODIFIERS a. Conjunctive {*therefore, however, finally, in conclusion, ...*}
2. DISJUNCTS a. Style {*candidly, seriously, ...*}	2. PRAGMATIC ADVERBS {*frankly, sincerely, ...*} {*briefly, precisely, ...*}	b. Pragmatic {*frankly, sincerely, honestly, in my opinion, ...*}
b. Content (Attitudinal) i. Value judgment {*wisely, cleverly, fortunately, happily, rightly, remarkably, of course, certainly, to our surprise, oddly, ...*}	3. EVALUATIVE ADVERBS {*luckily, fortunately, happily, surprisingly, ...*} (Also, Subject-oriented adverbs as a separate class, e.g., *cleverly, wisely,* etc.)	c. Evaluative {*happily, surprisingly, thanks to God, ...*}
ii. Degree of truth {*probably, possibly, definitely, perhaps, certainly, undeniably, evidently, assuredly, allegedly, ...*}	4. MODAL ADVERBS {*probably, possibly, certainly, surely, evidently, ...*}	d. Epistemic Modal {*perhaps, probably, certainly, ...*} 2. SENTENCE MODIFIERS (*possibly, necessarily, according to x, in the story*)
3. SUBJUNCTS a. Wide orientation (e.g., viewpoint) {*linguistically, economically, morally, politically, ...*}	5. DOMAIN ADVERBS {*logically, mathematically, morally, aesthetically, ...*}	
b. Narrow orientation (e.g., volitionals) {*intentionally, with reluctance, willingly, ...*} Also, see last row.		3. SUBJECT-ORIENTED MODIFIERS {*willingly, intentionally, deliberately, rudely, wisely, carefully, ...*}
4. ADJUNCTS a. Sentence i. Adjuncts of space ii. Adjuncts of time iii. Adjuncts of contingency		
b. Predication i. Adjuncts of space ii. Adjuncts of time iii. Adjuncts of process (e.g., manner, instrument)		4. VP MODIFIERS (*gently, quietly, smoothly, with a knife, in the back,* and certain readings of *rudely, wisely, carefully*)
		5. TEMPORAL MODIFIERS {*soon, at midnight, during the afternoon, from 2:00 to 3:00, usually, never, twice, ...*}
Narrow orientation SUBJUNCTS (continued) {*merely, only, just, ...*} + many other subtypes		6. OTHER MODIFIERS {*just, merely, only*}

2.2 SENTENCE MODIFIERS VERSUS PREDICATE MODIFIERS

In the early seventies, Richmond Thomason and Robert Stalnaker, "with a little pushing from [George] Lakoff,...identified two major logical classes of adverbs in English: (1) sentence adverbs like *necessarily*, and (2) predicate adverbs like *reluctantly* and *slowly*" (Heny, 1973:217). Thomason and Stalnaker (1973) provided four semantically-based criteria for distinguishing the two kinds of modifiers. Extensive work has further illuminated the properties associated with sentence modification and the complementary properties associated with predicate modification (Bartsch, 1976; Buysschaert, 1982; Koktova, 1986).

The first purpose of this chapter is to motivate the claim that there is indeed a robust distinction between sentence modifiers and predicate modifiers.[1] Five tests have been selected for the demonstration that sentence modifiers and predicate modifiers, as two groups, each have clusters of properties associated with them. The crucial assumption for this chapter is that the observed convergence of the results, i.e., cross-test consistency, is indicative of a reliable distinction. The second purpose is to show that obligatory predication adjuncts (using Quirk *et al.*'s terminology) pattern with the other predicate modifiers. The reason for doing this will become clear in chapter four in regards to the argument/adjunct distinction.

Due to the sheer size and diversity of the corpus of words and phrases which take the label 'adverbial', it will be necessary to exclude certain types and also necessary to circumscribe the set to a small number of representative

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1 It may well be more accurate to refer to the distinction as one between sentence and predicate *modification*. This is in light of the fact that many adverbs (e.g., *however, clearly, slowly, carefully*) show sentence modifier properties in some sentences and predicate modifier properties in other sentences. Thus the sentence modifier versus predicate modifier distinction need not be a property of the adverb itself but could, in theory, be a consequence of differences in processing the adverbs in their sentence contexts.

adverbs and prepositional phrases. This may result in the force of this chapter being somewhat programmatic. However, the intention is fundamentally to motivate a distinction between sentence and predicate modification. This will provide a useful context for chapters three and four of the thesis.

First of all, the adverbials which are of the syntactic category noun phrase (e.g., *last week, home, that way*)[2] and those which are clausal adverbials (e.g., *before he went to lunch, where the two armies once clashed, for you to put documents into*) are excluded. Second, the conjuncts (e.g., *however, first, therefore, in other words*) are excluded since they necessarily require a discourse context of at least two sentences for their full interpretation and all of the tests demonstrated in this chapter are based on single sentences. Third, the narrow orientation subjuncts are excluded. In Quirk *et al.*'s sorting, this is a large, diverse group which contains the volitionals (e.g., *deliberately, reluctantly*) and adverbs such as *very, really, yet, just, only, always, almost, nearly, partly, sort of*, etc. The complexity which they add due to, for example, the quantificational nature of most of them would take us too far afield if attempts were made to apply the sentence modifier versus predicate modifier tests to them. Finally, the frequency modifiers such as *always, never, sometimes, on several occasions*, etc. will also be left out because of the effect the quantifiers have in the sentences containing them.

The adverbials which will be used to demonstrate the tests and the convergence of the results are listed in (5). The labels accompanying each pair of adverbials (and the singles in two cases) are solely for convenience in referring to them and purport no theoretical significance with respect to the present work.

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2 McCawley (1988) gives an interesting discussion of adverbial NPs.

(5) a. *probably, supposedly* (Epistemic/Modal)
b. *fortunately, to our surprise* (Evaluative)
c. *frankly, in my opinion* (Pragmatic)
d. *horticulturally, morally* (Domain)
e. *in the bathroom, on the platform* (Spatial—sentence)
f. *on the cheek* (Spatial—predication)
g. *at midnight, before lunch* (Time position)
h. *for a long time, until noon* (Time duration)
i. *quickly, in a particular way* (Manner)
j. *surgically, by car* (Means)
k. *with a knife* (Instrument)

2.3 FIVE TESTS FOR THE SENTENCE MODIFIER/PREDICATE MODIFIER DISTINCTION

2.3.1 Sentence Position

Of course, the number of possible sentence positions for adverbials depends on the number of words in a token sentence. For example, Quirk *et al.* (1985:490) identify the positions shown in (6) for a passive sentence containing two auxiliary verbs (in addition to the passive *be*). *I* is for initial, *M* for medial, and *E* for end.

(6)

The book	must	have	been	placed	on the shelf	.
↑ *I*	↑ *iM*	↑ *M*	↑ *mM*	↑ *eM*	↑ *iE*	↑ *E*

Regardless of semantic class, the prepositional phrase adverbials rarely appear in medial positions. Quirk *et al.* (1985:501) give these figures for positional norms for PP adverbials, based on their Survey of English Usage Corpus (~4500 PP adverbials in the corpus of written and spoken English): 9.5% *I*, 1% *iM*, 1.5% *M*, 0% *m/eM*, 9% *iE*, and 79% *E*. Quirk *et al.* (1985:499) note that the initial end position (*iE*) is often the result of heavy NP shift of one of the obligatory verbal elements, as illustrated by their example given here in (7):

(7a) She kept writing in feverish rage long, violent letters of complaint.
(7b) *She kept writing in feverish rage letters.
(7c) She kept writing letters in feverish rage.

The adverbial is in initial end position in (7a) and (7b) and in end position in (7c). With (7b) ungrammatical, the indication is that initial end position for prepositional phrase adverbials is more of a conditional exception than a free variant.

There are two variants of end position which Quirk *et al.* (1985) seem to overlook: a pauseless end position and a sentence-final position set off from the rest of the sentence by a sharp intonational break, or comma pause. Many have noticed that sentence modifiers in final position require a comma pause while predicate modifiers occur freely in pauseless end position (e.g., Jackendoff, 1972:50; Buysschaert, 1982:102; McConnell-Ginet, 1982:148; McCawley, 1988:632). Focusing on the pauseless end position, it is possible to derive a generalization for predicate modifiers. The statement of this generalization in (8) is in the form of a test; the sentences in (9) to (19) apply the test to the eleven sorts of adverbials, given in (5) above, to show how well the test works.

(8) A FORMULATION OF THE TEST: If the adverbial can occur sentence finally with no intonational break immediately preceding it, then it is a predicate modifier (P). If it cannot, it is a sentence modifier (S).

(9a) *He left the book at the station probably. S
(9b) He left the book at the station, probably.

(10a) *He took the job to our surprise. S
(10b) He took the job, to our surprise.

(11a) *He shouldn't have quit his other job frankly. S
(11b) He shouldn't have quit his other job, frankly.

(12a) *He shouldn't have quit his other job morally. S
(12b) He shouldn't have quit his other job, morally.

(13) She kissed her mother on the platform. P

(14) She kissed her mother on the cheek. P

(15) He left the house at midnight. P

(16) He stayed at work until noon. P

(17) He left the house quickly. P

(18) He traveled across Canada by car. P

(19) Jones buttered the toast with a knife. P

The (a) sentences in (9), (10), (11), and (12) are ungrammatical since the sentence final adverbial cannot modify the action denoted by the main verb. The absence of the comma pause, or intonational break, seems to try to force this anomalous reading. The (b) sentences with the comma pause before the adverbial show a marked improvement and are clearly modifying the entire sentence.[3] The adverbials in (13) to (19) can occur sentence finally with or without a comma pause. The comma pause reading supplies a parenthetical focus on the adverbial. The crucial point for the test as formulated in (8) is that each adverbial in (13) to (19) occurs sentence finally with no intonational break and without rendering the sentence unacceptable.

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[3] Particular care is required with the domain adverbs because, as Ernst (1984:40) points out, they are often homonymous with a means adverb counterpart. For example, *biochemically* may mean 'biochemically speaking' in one sentence and 'by means of the techniques of biochemistry' in another. The sentences in (i) and (ii) illustrate this:

(i) Cholesterol has many important functions, biochemically. (i.e., biochemically speaking)
(ii) He assayed the blood for cholesterol biochemically. (i.e., by means of biochemical techniques)

This is an example of an adverb which functions as a sentence modifier in some sentences and as a predicate modifier in others (cf. footnote 1).

2.3.2 Modification of Embedded Non-Tensed Clauses

The second test is derived from an observation made by Terence Parsons that some adverbials occur freely in non-tensed clauses while other adverbials do not. He extrapolates to this (Parsons, 1985:251-2):

> As a guide, notice that normal nontemporal adverbials, unlike intensional ones, all have the capacity of occurring in nontensed clauses ... Intensional adverbials cannot occur in such clauses ... when they are interpreted grammatically the intensional adverbials that they contain are part of the containing sentence, not part of the embedded untensed clause.

The caveat "when they are interpreted grammatically" indicates that the test is sensitive to meaning; it is not simply a co-occurrence restriction of an adverbial with a particular clause type. Because of this sensitivity to the context, it is necessary to constrain the variables somewhat.

The first constraint on the test is that the adverbial to be tested be placed in sentence final position and, if necessary, be placed after a comma pause. The sentence position test showed that sentence modifiers require the comma pause for grammaticality. Thus, to ensure that it is not merely sentence position that is rendering a sentence ungrammatical, the constraint that it be in sentence final position and the flexibility that it be with or without comma pause are required. This move changes the intent of Parsons' test[4] since there will be no ungrammaticality.

The second constraint follows from the test itself: to embed a non-tensed clause inside a sentence requires that the main verb be a causative verb (e.g., *make, force, have*) or a verb of perception (e.g., *watch, see, hear*). Thus, the main verb must be one of these types of verbs. The prediction following from Parsons' observation is that sentence modifiers should not be

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4 Parsons (1985) did not necessarily intend this to be a test. The observation quoted above provides the insight which is the basis for the test.

able to modify the non-tensed verb in the embedded clause to the exclusion of the main causative/perceptual verb. Predicate modifiers may modify either the main verb or the embedded verb, though this seems to be highly sensitive to the type of adverbial being tested.

Using the test as formulated in (20), consider the examples in (21) to (30):[5]

(20) A FORMULATION OF THE TEST: If the adverbial can create an interpretation in which it exclusively modifies the non-tensed verb in an embedded clause, then it is a predicate modifier. Otherwise, it is a sentence modifier.

(21)	The teacher saw Robin goofing off in class, probably.	S
(22)	We heard Chris leaving, fortunately.	S
(23)	Brooke's supervisor makes her work too hard, in my opinion.	S
(24)	I forced her to kiss her mother on the platform.	P
(25)	I forced her to kiss her mother on the cheek.	P
(26)	He made me finish my work before lunch.	P
(27)	I made him sit in the corner for a long time.	P
(28)	I watched him prepare the sauce in a particular way.	P
(29)	The doctor saw him remove the tumour surgically.	P
(30a)	I watched him eating peas with a knife.	P
(30b)	I watched him eating peas with binoculars.	P

In (21), the most salient reading is one in which the teacher probably saw Robin goofing off in class. The probability cannot refer solely to Robin's goofing off. Thus, *probably* (and by extrapolation, the other modal adverbials) fail the test as formulated. In (22), the reading in which the adverb

[5] The domain adverbs are not represented as they do not appear to submit to the test. There may be a restriction on specifying a viewpoint for a sentence of the type used in the test.

unambiguously asserts an evaluation of just the leaving event (and not the hearing event) seems to be difficult to obtain. The salient reading in which the leaving event was fortunately heard and the ambiguous reading in which either event could be judged as fortunate happenings are certainly present. Because there is no reading in which the adverb *fortunately* modifies the embedded verb to the exclusion of the main verb, it fails the test. For the same reason, the adverbial in (23) also fails the test.

The sentences in (24) to (30), in contrast, easily allow interpretations in which adverbial modifies the embedded verb to the exclusion of the main verb. For example, the forcing action in (24) need not have occurred on the platform. It could have occurred somewhere else at some time prior to the kissing event, which would then require the kissing to be on the platform in order for the sentence to be true. (25) unequivocally disallows the adverbial to be modify the forcing event. The rest of the examples pass the test easily. Even (30b) allows the bizarre reading in which the subject of the embedded clause uses binoculars to eat peas (or has binoculars with him as he eats peas). It is a significant result that this reading is available when the instrumental phrase is typical for events of watching.[6]

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6 Whether or not the formulation of the test in (20) is sufficient and/or correct remains to be seen. A rigorous means of data collection and analysis is required in order to ensure the validity of the test. That is not the purpose of this thesis. Rather the intention here is to examine the criteria and to assess the general degree of convergence of results.

2.3.3 Appearance in Imperative Clauses

A similar test based on the co-occurrence of an adverbial with a particular clause type, which involves clearer judgments than the last, makes use of imperative clauses. Buysschaert (1982:95-6) very briefly mentions the oddity of S-modifiers occurring with imperatives: "In fact, the semantic anomaly ... consists in ordering that S 'must' happen—implying that S has as yet no reality whatever—and simultaneously either assessing the truth-value of S (*probably*) or taking S as a fact and giving an opinion (fact-modifiers: e.g. *fortunately*)" (Buysschaert, 1982:95). The formulation of this observation as a test is in (31); its application to a subset of the adverbials in (5) gives the results in (32) to (42). For the pragmatic adverbials in (34), it is crucial that the grammaticality be judged for the sentence in isolation and not as plausible, felicitous replies to the question 'What should I do?' Nor should they be read as elliptical forms of '(You should) do X'. Rather, the grammaticality judgments[7] are based on the imperative as a subjectless command.

(31) A FORMULATION OF THE TEST: If the adverbial cannot appear with an imperative clause, then it is a sentence modifier. If it can, then it is a predicate modifier.

(32) *Probably, go home! S

(33) *Be on time, to our surprise! S

(34a) *Frankly, be on time! S
(34b) *In my opinion, work hard! S

(35) *Morally, apologize! S

(36) Wash your hands in the bathroom! P

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[7] More precisely, the grammaticality judgments are based on the acceptability of the utterances. Newmeyer (1983:§2.2.1) points out that "since 'grammaticality'...is a theoretical construct, it is not directly accessible to the intuitions of the speaker of the language" (p. 51). Intuitions about the acceptability of an utterance are accessible and are assumed to indirectly reflect grammaticality. See Newmeyer (1983:48-50) for a defense of the use of introspective data in linguistics.

(37) Kiss your mother on the cheek! P

(38) Before lunch, call the office. P

(39) Wait at the corner for a long time. P

(40) Quickly, clear the building! P

(41) Drive across Canada by car. P

(42) With a knife, apply the putty. P

Most of the imperative sentences in (32) to (42) seem to be either clearly acceptable or clearly unacceptable. As mentioned above, the pragmatic adverbials can occur with imperatives in a discourse context, which is beside the point for the purposes of the test. The domain adverbs are similar to the pragmatic adverbs in this regard. The acceptability of (35) may be recovered in context in the same way that this is true for (34). The commands in (36) to (42) are plausible utterances, though (39) is slightly odd. In any case, the test gives relatively clear results.

2.3.4 Truth-Focusing Paraphrase

Thomason and Stalnaker (1973) provide as one of their criteria for sentence modifiers that "Only if *Q-ly* occurs as a sentence modifier can one paraphrase the sentence by deleting the adverb and prefacing the resulting sentence by *It is Q-ly true that*" (p. 205). The paraphrase test for sentence modifiers also appears in Buysschaert (1982:88) as the *that*-test, in Quirk *et al.* (1985:512) as 'truth-focusing paraphrase', and in Koktova (1986:10) as "*salva veritate* paraphrasing of adverbial expressions by syntactically more complex constructions (such as higher predicates)." Buysschaert (1982:88) demonstrates the *that*-test with the example in (43)—which contains two adverbs—and the four paraphrase versions for each adverb in (44) and (45):

(43) John fortunately walked slowly.

(44a) It is fortunate that John walked slowly.
(44b) That John walked slowly is fortunate.
(44c) It is fortunately so that John walked slowly.
(44d) Fortunately, it is so that John walked slowly.

(45a) *It is slow that John fortunately walked.
(45b) *That John fortunately walked is slow.
(45c) *It is/was slowly so that John fortunately walked.
(45d) *Slowly, it is so that John fortunately walked.

It needs to be said that applying the test to a sentence containing two adverbs complicates the results: the unacceptability of the sentences in (45) may well be due to placing one adverb inside the scope of another, and not simply due to an unacceptable paraphrase. The examples do, however, illustrate most of the paraphrase formulae, as compiled in (46):

(46a) It is ADVERBIAL { true / so / a fact / the case } that...

(46b) ADVERBIAL, it is { true / so / a fact / the case } that...

(46c) It is ADJECTIVE that... (where the ADJECTIVE directly corresponds to the ADVERB being tested)

(46d) That... is ADJECTIVE.

The versions in (46c and d) take greater liberties in that an adjective which corresponds to the adverb must be used, as illustrated in (47). For prepositional phrase adverbials, a corresponding noun phrase may be required, as exemplified in (48b).

(47a) It is { probable / unfortunate / evident } that Sean left too late.

(47b) That Sean left it too late is { probable / unfortunate / evident }.

(48a) It is { (to) Kim's surprise / (in) Kim's opinion } that Sean left it too late.

(48b) That Sean left it too late is { Kim's surprise / Kim's opinion }.

Koktova (1986:60) takes even greater liberties, paraphrasing the evaluative *Regrettably* with *I regret that* and the pragmatic *Frankly* with *Frankly speaking, If I may be frank,* and *In all frankness.* To avoid complications which could arise from liberal paraphrasing, the formulation of the test in (49) will be based on the most direct formula, that in (46a):

(49) A FORMULATION OF THE TEST: If the adverbial may be paraphrased in the form 'It is, ADVERBIAL, true that...', it is a sentence modifier. Otherwise, it is a predicate modifier. (For *ly*-adverbs, the comma pauses are unnecessary, though allowable.)

Applying the test gives the following results:

(50a) Cats are supposedly his favourite pet.
(50b) It is supposedly true that cats are his favourite pet. S

(51a) Fortunately, I am not allergic to cats
(51b) It is fortunately true that I am not allergic to cats. S

(52a) In my opinion, Chris works too hard.
(52b) In my opinion, it is true that Chris works too hard.
(52c) It is, in my opinion, true that Chris works too hard. S

(53a) Horticulturally, tree-pruning in the fall is unwise.
(53b) It is horticulturally true that tree-pruning in the fall is unwise.[8] S

(54a) She kissed her mother on the cheek.
(54b) *On the cheek, it is a fact that she kissed her mother.[9] P

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8 It may be wise to prune in the fall from other points of view, such as economics. Horticulturally speaking, though, it is hard on the tree for it to be pruned as it is going into dormancy.

9 Example from Quirk *et al.*, 1985:512.

(55a) Her plane arrives at midnight.
(55b) *At midnight, it is true that her plane arrives.[10] P

(56a) Taylor waited until noon.
(56b) *Until noon, it was true that Taylor waited.[11] P

(57a) They prepare the sauce in a particular way.
(57b) *It is, in a particular way, true that they prepare the sauce. P

(58a) Surgically, the doctor treated his warts.
(58b) *It is surgically true that the doctor treated his warts. P

(59a) Mary beats her dog with a stick.
(59b) *It is true with a stick that Mary beats her dog.[12] P

Absent from the set of sentences in (50) to (59) is an example with a sentence adjunct of space. The following examples and judgments appear in the relevant literature: (60) from Quirk *et al.* (1985:512), (61) from Buysschaert (1982:90), and (62) from Thomason and Stalnaker (1973:206):

(60) On the platform, it is a fact that she kissed her mother.

(61a) In Cambridge, it was so that John worked hard.
(61b) It was so, in Cambridge, that John worked hard.

(62a) It was true in the kitchen that Henri dropped the soufflé.
(62b) It is true in several restaurants that women in trouser suits will not be admitted.

Koktova (1986) excludes spatial modifiers from her survey of sentence adverbials. Contrary to the judgments in (60), (61), and (62), Bartsch (1976) indicates in her table of results (pp. 20-1) that locative adverbials fail a variety of truth-focusing paraphrase tests.

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10 This sentence is unacceptable on the grounds that it asserts that the truth only holds for a point in time, in which case the lack of endurance of truth conditions renders truth useless.
11 After noon, it would still be true that Taylor waited.
12 This example and the grammaticality judgment are from Thomason and Stalnaker (1973:206).

There is an important implication of the judgments in (60), (61), and (62), namely that the fact or claim expressed by an embedded sentence may be restricted to a location specified by the spatial adverbial. When truth-focusing paraphrase is possible, it is the fact or claim which is modified. This is the case for the paraphrases in (50) to (53)—the truth of the embedded sentence is modified (*supposedly*), commented on (*fortunately*), or restricted to a point of view, either internal (*in my opinion*) or external (*horticulturally*). What Quirk *et al.* (1985), Buysschaert (1982), and Thomason and Stalnaker (1973) seem to suggest is that the truth of an assertion may also be modified with respect to points or regions in space.

However, an observer who is not on the platform should be able to assert the truth of the kissing event in (60). If this is the case, then the preposed phrase *on the platform* is modifying the event and not the fact. In (61), it would still be true outside of Cambridge that John worked hard (in Cambridge) and thus the truth of John's working hard cannot be restricted to just in Cambridge. Thomason and Stalnaker (1973) do comment that "Locative adverbs seem to be borderline cases for this criterion. Sentence [(62a)] is at best awkward as a paraphrase of [*Henri dropped the soufflé in the kitchen*]" (p. 206). Thus the locative adverbials in (60), (61), and (62) are not accepted here as fact or claim modifiers; the acceptability of the sentences stems from their interpretation as event modifiers. Therefore, they fail the truth-focusing paraphrase test and this result is recorded in Table 2.2 below.

2.3.5 Scope of Negation

The fifth test for the sentence modifier versus predicate modifier distinction is related to scope of negation. Parsons (1990:66-7) claims that speech-act modifiers and Subject-oriented modifiers do not give rise to scopal

ambiguity when occurring with simple negated sentences. Recall that, for Parsons, the speech-act modifiers include the conjunctives (e.g., *however, finally*), the pragmatics (e.g., *sincerely, briefly*), the evaluatives (e.g., *fortunately, surprisingly*), and the epistemic (knowledge-based) modals (e.g., *probably, certainly*). Consider his examples in (63) and (64):

(63) Fortunately, Mary did not show up.
(64) Rudely, Mary didn't answer.

In (63), "the main assertion is that Mary did not show up, and this is what is said to be fortunate" (Parsons, 1990:66). The negation in the sentence does not apply to the adverb to give an interpretation along the lines 'It is unfortunate that Mary showed up'. In (64), where *rudely* is the Subject-oriented adverb and not the manner adverb, the sentence "can mean only 'It was rude of Mary not to answer,' not 'For Mary to answer was not rude'" (Parsons, 1990:67).

The epistemic modal adverbs show the same effect, as demonstrated in (65):

(65a) Probably, they aren't at home.
(65b) Possibly, Brooke did not receive the note.
(65c) Evidently, Gerry does not know the answer.

In the sentences in (65), there is no interpretation in which the negation is of the adverb. A relevant observation is made by Bellert (1977:343):

> The modal adverbs have no corresponding negative adverbs that would function as sentential adverbs, nor can they be negated independently. We have no sentences such as [(66)]...

[(66)] { *Improbably / *Impossibly / *Uncertainly / *Not evidently / *Not probably }, John { has / will } come.

Bellert also points out (1977:348) that "domain adverbs have no corresponding negative sentential adverbs. In fact, it would be strange to restrict the truth of a proposition to the complement of a given domain (to all other domains but not the one referred to by the adverb)." Bellert claims that this also holds for pragmatic adverbs. (67) and (68) illustrate this point:

(67a) *John is immorally right. (Bellert, 1977:348)
(67b) *Not linguistically, bachelors are men.

(68) *Dishonestly, I did it myself. (Bellert, 1977:349)

With the respect to the test, the crucial point is that when the sentence adverbial is combined with a negative declarative clause, there is no reading in which it is negated. (63) and (65) show this for the evaluative and epistemic modal adverbs, respectively. (69) and (70) show this for the pragmatic and domain adverbials:

(69) In my opinion, Francis didn't try.
- Asserts that Francis didn't try
- Does not assert that Francis tried S

(70) Horticulturally, tree-pruning in the fall is not wise.
- Asserts that tree-pruning in the fall is not wise
- Does not assert that tree-pruning is wise from a point of view other than horticulture S

For the rest of the types of modifiers which have been used in the last four tests, the behaviour with respect to the scope of negation differs from the epistemic modal, evaluative, pragmatic, and domain adverbials. Negation may be of the whole sentence or it may apply only to the modifier. As a result, a negative declarative sentence with one of these types of modifiers can be felicitously followed by two different types of sentences. The examples in (71) to (77) illustrate this. For each example, the (a) sentence may be felicitously followed by either the (b) sentence or the (c) sentence:

(71a) Taylor didn't forget the book in the bathroom.
(71b) She didn't forget the book at all.
(71c) She forgot it in the kitchen.

(72a) She didn't kiss her mother on the cheek.
(72b) She didn't kiss her mother at all.
(72c) She kissed her mother on the forehead.

(73a) Kerry didn't leave the party at midnight.
(73b) He stayed all night.
(73c) He left before midnight.

(74a) That fad didn't last for a long time.
(74b) It was a flash in the pan that didn't last at all.
(74c) It lasted for a short time.

(75a) Agatha didn't run quickly.
(75b) She didn't run at all.
(75c) She ran slowly.

(76a) She didn't surgically treat her cancer.
(76b) She let it spread.
(76c) She treated it by some other means.

(77a) Jones didn't butter the toast with a knife.
(77b) He didn't butter it at all.
(77c) He used something else to butter it.

Parsons (1990:67) includes an important word of caution with respect to this test:

> A factor that interacts with the negation tests has to do with what is called "focus" and its effect on presupposition....It is a subtle matter to formulate an adequate account of this phenomenon, but one cannot deny its reality, and it must be taken into account when testing modifiers for status.

An examination of the nature of presupposition and focus is well beyond the scope of this thesis. Thus, the examples above will be taken as indicating a sentence modifier/predicate modifier distinction, though a correct

formulation of the test would likely require constraints to account for the effect of focus on presupposition.

2.3.6 Summary of the Correspondence Between the Tests

The results of the tests in sections 2.3.1 to 2.3.5 are summarized in Table 2.2. 'S' indicates sentence modifier and 'P' indicates predicate modifier, as determined by the tests as formulated and assuming the judgments and interpretations of the examples are accurate.

Table 2.2: Correspondence between the Tests for the Sentence Modifier versus Predicate Modifier Distinction

	Sentence Position	Embedded Non-Tensed Clauses	Imperative Clauses	Truth-Focusing Paraphrase	Scope of Negation
a. MODAL	S	S	S	S	S
b. EVALUATIVE	S	S	S	S	S
c. PRAGMATIC	S	S	S	S	S
d. DOMAIN	S	? (Fn.5)	S	S	S
e. SPATIAL (Sentence Adjunct)	P	P	P	P	P
f. SPATIAL (Predication Adjunct)	P	P	P	P	P
g. TIME POSITION	P	P	P	P	P
h. TIME DURATION	P	P	P	P	P
i. MANNER	P	P	P	P	P
j. MEANS	P	P	P	P	P
k. INSTRUMENT	P	P	P	P	P

One of the potentially confusing results in table 2.2 is that the spatial sentence adjuncts are predicate modifiers according to the tests. As mentioned above in section 2.1, Quirk *et al.* (1985:505) distinguish sentence adjuncts from

predication adjuncts and further distinguish predication adjuncts as either optional or obligatory. Their examples in (78), (79), and (80) illustrate the three types:

(78)	*In Chicago*, he studied metaphysics.	SENTENCE ADJUNCT
(79)	I found the letter *in the kitchen.*	OPTIONAL PREDICATION ADJUNCT
(80)	He lived *in Chicago.*	OBLIGATORY PREDICATION ADJUNCT

It is important to point out that Quirk *et al.* (1985) make descriptive use of the intuitive notion of relative centrality of the elements of a clause or sentence. Predication adjuncts are said to be more central to the clause and sentence adjuncts more peripheral (pp. 511-2). However, adjuncts in general are more central to the clause than the other grammatical categories of adverbials, which, in Quirk *et al.*'s sorting, are subjuncts, disjuncts, and conjuncts: "it is only the adjuncts that closely resemble other sentence elements such as S[ubject], C[omplement], and O[bject]" (Quirk *et al.*, 1985:504). Thus, the term 'sentence adjunct' does not mean sentence modifier. In fact, Quirk *et al.* (1985:52) use the term 'sentence adverbial' for adverbials which are more peripheral than adjuncts, such as conjuncts and disjuncts.

With respect to cross-test consistency of results, there is clear convergence which would tend to indicate a robust distinction between sentence modifiers and predicate modifiers. This meets the first purpose of this chapter: to motivate a distinction between sentence and predicate modification. The second purpose was to apply the tests to verbal complements, where the term 'complement' means a phrase which is required by the particular meaning of the verb. Omitting a complement leads to ungrammaticality of the sentence in a way that omitting a modifier does not. The next section shows that verbal complements pattern with the predicate modifiers with respect to the five tests.

2.4 APPLYING THE TESTS TO VERBAL COMPLEMENT

The adverbials which will be tested are the manner and space adverbials in (81) as they occur in the sentences in (82). That they are required for grammaticality is shown in (83):

(81a) poorly
(81b) in a particular way
(81c) in the bathroom
(81d) to the dog

(82a) Robin treated Kim poorly.
(82b) Sam worded the letter in a particular way.
(82c) Terry put the brush in the bathroom.
(82d) Val gave the sweater to the dog.

(83a) *Robin treated Kim.
(83b) *Sam worded the letter.
(83c) *Terry put the brush.
(83d) *Val gave the sweater.

The sentence position test trivially shows what is already demonstrated by the sentences in (82), namely that the adverbials in (81) can occur sentence finally with no comma pause.

The second test shows that in embedded non-tensed clauses, the verbal complements are unambiguously part of the meaning of the embedded verb and do not modify the main causative/perceptual verb:

(84a) Drew made Robin treat Kim poorly.
(84b) Chris made Sam word the letter in a particular way.
(84c) Brett saw Terry put the brush in the bathroom.
(84d) Ashley watched Val give the sweater to the dog.

There is no restriction on verbal complements occurring in imperative clauses, as demonstrated in (85):

(85a) Treat Kim poorly!
(85b) Word the letter in a particular way!
(85c) Put the brush in the bathroom!
(85d) Give the sweater to the dog!

Like verbal modifiers, verbal complements do not allow paraphrase of the type used in section 2.3.4:

(86a) Robin treated Kim poorly.
(86b) *It is poorly true that Robin treated Kim.

(87a) Sam worded the letter in a particular way.
(87b) *It is, in a particular way, a fact that Sam worded the letter.

(88a) Terry put the brush in the bathroom.
(88b) *It is true in the bathroom that Terry put the brush.

(89a) Val gave the sweater to the dog.
(89b) *It is true to the dog that Val gave the sweater.[13]

Finally, in negative declarative clauses, negation can have scope over the verbal complements. Focus on a verbal complement, usually by intonational stress, elicits the interpretation in which negation has narrow scope over the complement; otherwise the reading is one in which negation has wide scope over the whole event:

(90a) Robin didn't treat Kim poorly.
(90b) Robin treated Kim well.
(90c) Robin didn't even go near Kim.

(91a) Sam didn't word the letter carefully.
(91b) Sam worded the letter sloppily.
(91c) Sam didn't even bother writing the letter.

(92a) Terry didn't put the brush in the bathroom.
(92b) Terry put it in the kitchen.
(92c) Terry didn't touch the brush.

(93a) Val didn't give the sweater to the dog.
(93b) Val gave the sweater to the dog's owner.
(93c) The dog took the sweater himself.

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[13] The reading of *to the dog* with the interpretation 'from the viewpoint of the dog' is not relevant here; *to the dog* as it occurs with *give* is a directive or goal adjunct (using Quirk *et al.*'s terminology).

The explanation as to why obligatory adverbials pattern with the predicate modifiers is deferred until chapter four, a discussion on the argument/adjunct distinction. Before that, chapter three outlines two approaches to the semantics of adverbials. Having motivated a sentence modifier versus predicate modifier distinction, the stage is set for a synopsis of the issues associated with the two approaches and how these issues play on the properties of sentence and predicate modification.

CHAPTER THREE

3.1 TWO APPROACHES TO THE SEMANTICS OF ADVERBIALS

In regards to formal semantic treatments of English adverbials, Cresswell (1974:455) made the following observation:

> There are two basic approaches to the analysis of adverbial constructions in formalized representations of English. One is to follow Richard Montague and treat them as sentential operators of the same syntactical category as ***not***. The other is to follow Donald Davidson and represent them in the predicate calculus with the aid of an extra argument place in the verb to be modified.

The purposes of this chapter are to outline the Davidsonian approach and then the operator approach[1] and to examine the key issues and empirical results associated with each. This follows naturally from the previous chapter on the distinction between sentence and predicate modifiers in that, while they provided diagnostics for the split between sentence and predicate modifiers, Thomason and Stalnaker (1973) treated both as a type of operator. Since Davidson's approach to adverbials preceded the operator approach, at least in the contemporary linguistic literature, it is discussed first in section 3.2. The operator approach, which appears to be a reaction to Davidson's 1967 paper, is discussed in section 3.3. Finally, in section 3.4, the case is made for the alignment of predicate modification with the Davidsonian approach, owing greatly to the insights of McConnell-Ginet (1982).

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[1] It will be referred to as the operator approach rather than the Montagovian approach in light of the fact that this approach was put forward independently by Terence Parsons (1970), Romane Clark (1970), and Richard Montague (1970). Furthermore, Montague gives partial credit to Hans Kamp for his (Montague's) treatment of adjectives and adverbs.

3.2 THE DAVIDSONIAN APPROACH TO THE SEMANTICS OF ADVERBIALS

3.2.1 The 'Pure' Davidsonian Approach

The need to make reference to a 'pure' Davidsonian approach is warranted in light of some misinterpretation of Davidson's original program, as pointed out by Dowty (1989:84, 1991:548).[2] Davidson's approach to adverbials is contained in his influential paper (1967a) in which he "is devoted to trying to get the logical form of simple sentences about actions straight" (p. 81).[3] Davidson begins this enterprise with the token given in (1):

(1) Jones buttered the toast slowly, deliberately, in the bathroom, with a knife, at midnight.

Davidson sets aside the adverbs *deliberately* and *slowly* because of the larger philosophical issue of intention associated with the first and because of the relative nature of the second. The intentional adverb draws in the concept of agency in that it attributes something to the agent of the action and not to the action itself. As Davidson (1967a) puts it: "To say someone did something intentionally is to describe the action in a way that bears a special relation to the beliefs and attitudes of the agent..." (p. 94). It is not until the end of the paper that, in passing, Davidson makes a suggestion as to how to incorporate intentional adverbs into his logical representation.

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2 Dowty caught Chomsky misinterpreting Davidson, as discussed in §2.2.1. Fodor and Fodor (1980) also appear to misconstrue Davidson. They claim (p. 763) that Davidson is responsible for the representation in which the event argument, the agent, and the patient are all separate so that (i) would have the logical form as in (ii):

(i) John kissed Mary
(ii) $\exists x$(x is a kissing & x is by John & x is of Mary)

This is not what Davidson suggested.

3 As Kratzer (1993:104) points out, this 'logical form' should not be confused with the syntactic Logical Form (or LF) used in Government Binding and related theories.

The scope of Davidson's program is even further narrowed in that the attributive *slowly* is excluded because (i) "'Slowly,' unlike the other adverbial clauses [in (1)], fails to introduce a new entity" (p. 82) and (ii) because of the special problem of its relative nature. The sentence in (1) may prompt the question "Slowly? Compared to what?" Davidson uses the example of crossing the Channel in fifteen hours: by boat, this would be a slow crossing; by means of swimming, this would be a fast crossing. In this instance, the interpretation of the adverb depends not on the action ("the crossing") but on the means ("by boat" or "by swimming"). As will be seen in section 3.2.2.2, some who use the Davidsonian approach to adverbials (e.g., Parsons, 1985, 1990, 1995) do not see these relative attributives as problematic. Nevertheless, Davidson's discussion is limited at the outset to locative, instrumental, and temporal modifiers and the token in (1) is revised to (2) (Davidson himself removed the commas):

(2) Jones buttered the toast in the bathroom with a knife at midnight.

3.2.1.1 *The 'Variable Polyadicity' Problem – Kenny (1963)*

The first problem which Davidson addresses is the one of 'variable polyadicity'. "The *polyadicity* of a predicate is the number and kind of arguments it has" (Bresnan, 1982:156). The term 'arguments' as used here refers to semantic arguments of a predicate argument structure and Bresnan assumes in giving this definition of polyadicity that "the independence of predicate argument structure from syntactic constituent structure representations [e.g., subject, direct object, indirect object] has been established very clearly..." (Bresnan, 1982:151). The problem of variable polyadicity, as pointed out by Kenny (1963:159-61) and addressed by Davidson (1967a), is this: if the verb in (2) is treated as a five-place predicate in the logical form, then

the logical entailments are obscured. In other words, if (2) were represented as in (3), then, according to Davidson (1967a:83), the entailment of the two-place predicate in (4) by the five-place predicate in (2) is not clear from their respective representations in (5) and (3):

(3) Buttered (Jones, the toast, in the bathroom, with a knife, at midnight)
(4) Jones buttered the toast.
(5) Buttered (Jones, the toast)

One possible solution is that the verb in (4) is in fact a five place predicate, something like in (6), where three of the places are not explicitly filled, though they are underlyingly present.

(6) Buttered (Jones, the toast, somewhere, with something, at some time)

But then, as Kenny (1963:160) writes:

> ...we might say that Brutus killed Caesar in Pompey's theatre with a knife out of jealousy clumsily on the Ides of March. In order, then, to safeguard the possibility of inferring from this that Brutus killed Caesar, we shall have to say that "Brutus killed Caesar" is an elliptical form of "(Ez)(Ey)(Ex)(Ew)(Ev) (Brutus killed Caesar in v with a w out of x $y$ly on z)". Even, so, we have obviously hardly begun. If we cast our net widely enough, we can make "Brutus killed Caesar" into a sentence which describes, with a certain lack of specification, the whole history of the world.

Davidson seems to imply (1967a:83 Fn.3) that this problem could be resolved if there were a mechanism to restrict the number of standby positions in a way that makes "each addition to the sentence one that irreducibly modifies the killing as opposed, say, to Brutus or Caesar, or the place or the time."

There is still another problem which would need to be resolved before specifying the number of places which a given predicate has. Both Bresnan (1982:167) and Dowty (1982:90) note that certain types of potential place

holders in the logical form—for example, instrumentals (*with x*) and benefactives (*for x*)—are present in one instance of a verb's use but unnecessary in another instance of the same verb's use. Bresnan's example (1982:165), *John escaped from prison with dynamite,* is later followed by the observation that "*John escaped from prison* does not entail that there was some *instrument* which John used to escape from prison *with* (he might simply have left one day, walking out the front door)" (p. 167). Dowty (1982) makes a similar observation for benefactives: "if I baked a cake...I might simply be a compulsive cake baker and baked the cake for no one at all" (p. 90). The issue requiring resolution is whether phrases such as *with nothing* or *for no one* are equivalent to an absence of an instrumental and benefactive, respectively. While this issue will not be resolved here, the suggestion is that a lack of entailed instrument or benefactive does not necessarily equate with a reduction in the polyadicity of a predicate.

3.2.1.2 *The Event Argument – Reichenbach (1947)*

Davidson's solution to the polyadicity problem has two essential ingredients. The first draws on work of Hans Reichenbach. In *Elements of Symbolic Logic,* Reichenbach (1947:§48) applied a notion from modern physics to representation of natural language. The notion is that individuals may be of the 'thing type' or the 'event type', the latter being "space-time coincidences [which] do not endure" (p. 267). Events—Reichenbach's examples (pp. 267-8) are a coronation, an assassination, an earthquake, an automobile accident—are treated as arguments of sentences, just as 'things' are. In the representation, event arguments are variables which are bound by the existential quantifier. In this way, the existence of an event is captured in the

representation of an expression which contains the notion that an event occurs, has occurred, will occur, etc.[4]

While Davidson parts company with Reichenbach with regards to the latter's proposal that 'an event x consists in the fact that x', he adopts the notation and the idea that events are arguments. An event argument allows the event itself to hold a place in the argument structure of the predicate signifying the event. Thus, Davidson would express the logical form of the sentence in (7) with the representation in (8) which would read as in (9), ignoring tense:

(7) Jones buttered the toast.
(8) $\exists x$ (buttered(Jones, the toast, x))
(9) There is an event x such that x is a buttering of the toast by Jones.

This representation at least describes, if not explains, the informal observation which Davidson makes at the start of his paper (1967a:81): "the 'it' of 'Jones did it slowly, deliberately, ...' seems to refer to some entity, presumably an action, that is then characterized in a number of ways." Anaphoric reference to an action can sometimes lead to ambiguity as the excerpt in (10) demonstrates:

(10) We walked to Weston one evening last week, and liked it very much. Liked *what* very much? Weston? No, *walking* to Weston. I have not expressed myself properly, but I hope you will understand me.

Jane to Cassandra Austen[5]

3.2.1.3 *Adding in Adverbials*

To show how the event argument can be used in representing the logical form of adverbials, Davidson gives the sentence in (11):

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4 The representation of tense, among other things, in the logical form is beyond the scope of this paper.

5 The source of this excerpt was *The Journal of Philosophy* 68(20), 690.

(11) I flew my spaceship to the Morning Star.

Davidson treats the locative 'to the Morning Star' as a modifier and gives the representation as in (12):

(12) $(\exists x)$(Flew(I, my spaceship, x) & To(the Morning Star, x))

This clearly captures the entailment 'I flew my spaceship', as represented in (13):

(13) $(\exists x)$(Flew(I, my spaceship, x))

It also captures the entailment in (14), which, in Davidson's words (1967b:118), amounts to "There was an event involving motion toward the Morning Star":

(14) $(\exists x)$(To(the Morning Star, x)) (Davidson, 1967b:118)

Furthermore, it allows for ease of substitution under identity. For example, if (16) is true (which it is since the Morning Star and the Evening Star both name the planet Venus), then (15) entails (17):

(15) $(\exists x)$(Flew(I, my spaceship, x) & To(the Morning Star, x))
(16) the Morning Star = the Evening Star
(17) $(\exists x)$(Flew(I, my spaceship, x) & To(the Evening Star, x))

There is a particularly interesting incongruity in the literature in regards to this representation of the *to*-relation. Davidson states: "In general we conceal logical structure when we treat prepositions as integral parts of verbs; it is a merit of the present proposal that it suggests a way of treating prepositions as contributing structure" (1967a:93). However, Kratzer (1993:103) interprets Davidson (1967a) in this way: "In his analysis of action sentences, Donald Davidson drew a clear distinction between arguments and adjuncts."

The potential problem in reconciling these two statements is that there is nothing in Davidson (1967a,b) which would lead us to believe that the representation of a ditransitive verb such as *give* in (18) would not have a representation as in (19):

(18) Robin gave the book to Lee.
(19) $(\exists x)$(Gave(Robin, the book, x) & To(Lee, x))

In most theories of English grammar, the *to*-phrase of *give* is taken to be an argument, specifically a complement of *give* as opposed to a modifier (or adjunct). Unless Kratzer views the obligatory *to*-phrase in (18) as an adjunct, Davidson's statement on prepositional phrases and Kratzer's statement on Davidson's argument/adjunct distinction are incongruous. This will serve as the point of departure into the discussion on the argument/adjunct distinction in the chapter 4. The discussion in the next sub-section on the exchange between Davidson and Castañeda (1967) should clarify between what two parts of logical form Davidson was drawing a line.

3.2.1.4 *On Separating Agents and Patients*

Castañeda (1967), commenting on Davidson's proposal, suggests a change to the representation of the logical form of action sentences. Essentially, Castañeda separates agents from patients so that a sentence such as in (20) would be represented as in (21):

(20) I flew my spaceship to the Morning Star.
(21) $(\exists x)$(Flew(I, x) & Flew(x, my spaceship) & To(x, the Morning Star))

One of Castañeda's motivations for this change is so that entailments of (22) and (23) by (20) are expressed formally.

(22) I flew to the Morning Star.
(23) I flew.

More importantly, he wants to capture active/passive synonymy while maintaining the agent/patient distinction. This is under the assumption that active/passive pairs are truth-conditionally identical, such that "[(24)] is exactly the same statement as [(25)]" (Castañeda, 1967:106).

(24) I flew my spaceship to the Morning Star.
(25) My spaceship was flown by me to the Morning Star.

This synonymy requires that the sentences in, for example, (26) and (27) have the same logical form, the one given in (28):

(26) I flew my spaceship.
(27) My spaceship was flown by me.
(28) $(\exists x)$(Flew(I, x) & Flew(x, my spaceship))

Castañeda (1967:106) introduces "the simple device of putting the event or action variable 'x' to the [right] of the agent, and to the [left] of every other object or person involved in the action or event in question."[6] Thus, we have a way of representing the distinction between the sentences in (29) and (30):

(29) The horse kicked.
(30) The horse was kicked.

Davidson's reply to Castañeda (Davidson, 1967b) points out the crucial meaning difference between transitive and intransitive verbs such that whereas 'I flew my spaceship' seems to entail 'I flew' (on the reading where the flying is not of one's own volition), 'I sank the Bismarck' certainly does not entail 'I sank'. Parsons (1985:256) provides the striking contrast between (31) and (32) where the first clearly does not entail the second:

(31) I flew my kite over city hall.
(32) I flew over city hall.

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6 The changes made in this quote are because of an apparent error in Castañeda's paper, an error in which left and right are switched, contrary to the notation used throughout.

The original entailment in Castañeda (1967) fails to go through on the same reading of 'I flew' as in (32). Davidson clarifies that in his program "simple sentences containing transitive verbs do not, as a matter of logical form, entail sentences with intransitive verbs" (Davidson, 1967b:117).

> On the issue of active/passive synonymy, Davidson (1967b:117) replies:
>
> If I sank the Bismarck, the Bismarck was sunk and the Bismarck sank. But "The Bismarck was sunk" and "The Bismarck sank" are not equivalent, for the second does not entail the first. Thus even if we were to accept Castañeda's view that "The Bismarck was sunk" has a logically intransitive verb, the passivity of the subject remains a feature of this verb distinguishing it from the verb of "The Bismarck sank." Thus there is no obvious economy in Castañeda's idea of indicating the distinction between agent and patient by position in verbs of action.

Davidson explicitly opposes the move to split the two participants of a transitive verb: "I remain unconvinced of the advantages in splitting transitive verbs up in this way" (1967b:118). If the agentless passive form (e.g., "The Bismarck was sank") and the active intransitive form (e.g., "The Bismarck sank") are both treated as logically intransitive, there still remains a difference in the verb form which serves to distinguish the two. The distinction might be as in (33) and (34):

(33a) The Bismarck was sunk.
(33b) $(\exists x)$(Was sunk(the Bismarck, x))

(34a) The Bismarck sank.
(34b) $(\exists x)$(Sank(the Bismarck, x))

The question of interest, then, is as posed by Davidson: "There would be real merit...in keeping track of the relation between [(33)] and [(34)], which is that the first entails the second; but Castañeda's notation does not help with

this" (1967b:117). Nor does Davidson's.[7] In any case, it is clear that the surface transitivity of the verb is encoded in Davidson's notation as a single unit, separate from the other relations. The issue of this transitive/intransitive distinction appears again in the next chapter in regard to putative optional direct objects.

3.2.2 The Neo-Davidsonian Approach

3.2.2.1 *The Separation of Agents and Patients Revisited*

In his reply to Castañeda, Davidson (1967b) gives, solely for the sake of argument, the two logical forms in (36) for the sentence in (35):

(35) The King insulted the Queen.
(36a) $(\exists x)$(Insulted(the King, x) & Insulted(x, the Queen))
(36b) $(\exists x)$(Insulted(the King, x) & Was insulted(the Queen, x))

The first, (36a), is the form Davidson claims Castañeda would give; (36b) is suggested as an improvement on (36a) in that it is "less misleading" (Davidson, 1967b:118). As stated above, Davidson rejects both types of logical form and maintains three argument slots for the transitive verb *insult.*

However, the form in (36b) is closest to the logical notation found in the work of Terence Parsons (e.g., 1980, 1995). Based on Parsons (1980), (35) would have the representation in (37):

(37) $(\exists e)$(Insulted(e) & Of(the Queen, e) & Agent(the King, e))

---

[7] What appears to play a role in the entailment relations is whether the transitive/intransitive pair is based on a causative relation. The entailment pattern as seen between (33) and (34) holds for causative/non-causative pairs such as *break , open, melt, boil, bake, fly,* etc. Other types of transitive/intransitive pairs such as *kick, swallow, eat, drink, read, sing, shave, wash,* etc. do not exhibit this entailment pattern, though addition of an adverbial as in the middle construction allows, for example, *Russian novels were read/Russian novels read easily.* A complete analysis of these is beyond the scope of the present work.

The other difference in (37) as compared to the Davidsonian notation is that the event argument itself is separated from the participants altogether; this change will be taken as irrelevant with respect to this thesis and so will not receive discussion.

In Parsons' later work (e.g., 1990, 1995), the 'Of' is replaced by 'Theme' to give (38):

(38) $(\exists e)$(Insulted(e) & Theme(e, the Queen) & Agent(e, the King))

The change in the order of the arguments of Theme and Agent will also be taken as irrelevant in relation to the aims of this thesis. More importantly, Parsons (1995:639) defines the thematic relations as in (39):

(39)

Agent	e is by x
Theme	e is of x
Source	e is from x
Goal	e is to x
Instrument	e is with x [or 'e is by means of x']
Benefactive	e is for x

Apparently, it was David Dowty who coined the phrase 'Neo-Davidsonian System' (1989:83) to name the approach in which each label for a thematic role defines the relation between an event and an entity. Dowty (1989) contrasts the Davidsonian and neo-Davidsonian approaches using (part of) Davidson's original sentence:

(40) Jones buttered the toast at midnight in the bathroom.
(41) $\exists e$[buttered(Jones, the-toast, e) & at-midnight(e) & in-the-bathroom(e)].
(42) $\exists e$[buttered(e) & Agent(Jones, e) & Theme(the-toast, e) & at-midnight(e) & in-the-bathroom(e)]

Dowty also points out (1989:84) that "some people, for example Chomsky (1981, p. 35) [*Lectures on Government and Binding*], seem to have thought

that the theory implied by [(42)], rather than that implied by [(41)], is what Davidson *did* propose. However, I find no justification for this attribution in Davidson's writings themselves, in fact Davidson argued *against* [(42)]...". As discussed above, Dowty's statement is indeed accurate. However, the form in (41) is still not quite Davidsonian since 'at-midnight' and 'in-the-bathroom' would be further decomposed, as in (43):

(43) $\exists e$[Buttered(Jones, the-toast, e) & At(midnight, e) & In(the-bathroom, e)]

In (43), 'At' and 'In' are each treated as two-place relations while this is not the case in (42). In the neo-Davidsonian system, at least as per Parsons, there are one-place relations which take only the event argument. These are the attributive modifiers such as *slowly*, precisely the type which Davidson excludes.

3.2.2.2 *Adding in Attributives*

Davidson excludes the adverb *slowly* from his analysis partly because it may be taken as modifying both the event and the action. To make his objection clear, he uses the example of a slow crossing of the Channel which is, at the same time, a fast swimming of the Channel. Parsons (1985) is not convinced by Davidson's reasoning, writing that "the truth of the matter seems to be that *evaluative* or *degree* words change extension with context. Their extension is usually determined by an implicit comparison class (*short for a basketball player, tall for a man*), and the noun or verb that is modified by the word in question usually makes a major contribution to the determination of that class" (Parsons, 1985:251). Ultimately, Parsons' position is that "for adverbials I see nothing wrong with analysing 'Agatha runs slowly' as *There is a running whose agent is Agatha and which is slow*"

(Parsons, 1985:251). Parsons maintains this view in his more recent published work. The example in (44) with the logical form ("predicate calculus") representation given in (45) is from his 1995 paper (p. 636):

(44) Brutus stabbed Caesar violently in the back with a knife in the agora.

(45) ∃e[Stabbing(e) & Agent(e, Brutus) & Theme(e, Caesar) & Violent(e) & In_{TARGET}(e, the back) & With(e, the knife) & $In_{LOCATION}$(e, the agora)].

In (45), as in any Davidsonian or neo-Davidsonian representation, the event argument appears in the scope of each and every predicate. For the manner adverb *violently,* the event argument supplies the comparison class so that the logical form explicitly indicates 'violent for a stabbing'. Likewise, if the event argument is a *crossing of the Channel* it may be 'slow for a crossing' but if the event argument is a *swimming of the Channel* it may be 'fast for a swimming'. It is immaterial if both event arguments pick out the same event. The rate adverb is referenced to the event argument in its scope and not to the event itself.

The move to extend Davidson's approach to manner adverbs addresses a general concern that "Davidson's theory is explicitly narrow in its scope...There remains, then, a need for a general semantic theory of adverbs" (Thomason and Stalnaker, 1973:196). Even if attributives are added in to the Davidsonian representation, there remains the question of how to fit in sentence modifiers such as *possibly, probably, allegedly,* and *surprisingly.* The operator approach, discussed in the next section, was motivated in part by this deficiency.

3.3 THE OPERATOR APPROACH TO THE SEMANTICS OF ADVERBIALS

3.3.1 Reaction to Davidson's Event Approach

Reaction to Davidson's treatment of adverbials as predicates of underlying events appears to have prompted Clark, Parsons, and Montague to independently propose strikingly similar alternative approaches to the semantics of adverbials (Clark, 1970; Parsons, 1970; Montague, 1970). In the next three sub-sections, the reactions and proposals of each are outlined with particular attention given to the logical entailment relations which motivated the Davidsonian approach.

3.3.1.1 *Clark (1970)*

Clark (1970) is mainly opposed to the event argument, the need to invoke an 'abstractive singular term'. His alternative is that the sentence in (46) "is an instance of a predicate schema of [the form in (47)]" (p. 321):

(46) Jones buttered the toast, slowly, with a knife, at midnight in the bathroom.

(47) $[In^1[At^1[With^1[Slowly^0[Buttered^2(x,y)]](z)](w)](v)]$

In (47), 'In', 'At', 'With', 'Slowly', and 'Buttered' are all predicate operators. The superscript following each identifies the "degree" of the predicate, i.e., the number of "positions suitable for singular terms" (p. 320). In (47), the terms are denoted by v, w, x, y, and z. Regarding the predicate operators, Clark writes (p. 321):

> We shall think of these operators as all extensional,[8] creating predicates within which replacement of references to identicals at their associated singular term positions is unrestricted. Stacked extensional operators,

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8 The intension/extension distinction corresponds to Frege's sense/reference distinction. The sense or intension of an expression is its meaning—a thought or proposition in the case of a sentence, a property in the case of a one-place predicate, and a concept in the case of a noun phrase. The reference or extension of an expression is its denotation—a truth value for a sentence, a set of individuals for a one-place predicate, and an individual for a noun phrase.

> with their associated singular term places, may be permuted without restriction.

The last point is stipulated as the "permutation principle for operators" (p. 322) in order that (48) logically entails (49) and vice versa:

(48) Jones buttered the toast in the bathroom at midnight.
(49) Jones buttered the toast at midnight in the bathroom.

Clark also stipulates the "detachment principle for predicates" (pp. 321-322) such that "Jones buttered the toast" follows from (48) and from (49). "Throughout...'buttered' remains a predicate of degree two" (p. 322). There is no event argument, in which case the predicate would be of degree three, nor are agents and patients separated as in the neo-Davidsonian approach.

Because Clark treats all of the operators as extensional, his approach is not much less restricted than Davidson's. Specifically, neither approach as is will handle the 'non-standard modifiers' (this term apparently due to Parsons (1970:323)) such as *possibly* and *allegedly*. Clark knows this and adds a "Repairs" section to his 1970 paper. In it, he focuses mainly on adjectives and lays out six different kinds (pp. 329, 331-332), given in (50):

(50)	i)	Standard modifiers	*vicious* unicorn, John walked *rapidly*.
	ii)	Negators	*fake* diamond, John is *nearly* done.
	iii)	Fictionalizers	*mythical* beast
	iv)	Defictionalizers	*simulated/mock/artificial* griffin
	v)	Enlargers	*possible* addict
	vi)	Neutralizers	*alleged* thief

Clark suggests that the six kinds of modifiers have distinct inferential properties assigned to them. Clark sketches out the program as follows (pp. 329-330):

> Thus the principle of Predicate Detachment...applies, of course, to *standard* predicates but not to *negators*. In accord with that principle,

> we infer that John walked from the fact that he walked rapidly. 'walked rapidly' is clearly a standard predicate which implies any initial segment of itself. We do not, in accord with that principle, infer that John is done from the fact that he is nearly done, for 'nearly' is not a standard pred-mod [predicate modifier], but a negator. The principle governing negators clearly is that one infers the negation of the predicate immediately in the scope of a negator. Enlargers have yet other inferential powers, apparently parasitic upon those of standard sentential modal operators.

3.3.1.2 *Parsons (1970)*

Parsons also points out the problem with non-standard modifiers: "there are *toy guns* which aren't *guns*; *apparent heirs* which aren't *heirs*; and it can be true of someone that he *supposedly stole* the gems without his having *stolen* the gems" (1970:323). Unlike Clark, Parsons makes a single split between standard and non-standard modifiers. Standard modifiers obey the laws in (51) and (52), non-standard modifiers—such as *toy*, *apparent*, and *supposedly* as used above—do not.

(51) '*x* is an *A N*' logically implies '*x* is an *N*'
(52) '*x V*'s *A*ly logically implies '*x V*'s'.

Parsons' proposal is to "represent adverbs as operators added to an ordinary *first*-order predicate calculus" (p. 325). Unlike Clark's proposal, these operators are non-extensional: "semantically they can be construed as functions (I'll call them 'operations') which map the properties expressed by the formulas they modify onto new properties" (Parsons, 1970:325). For example, (53) would be represented as (54):

(53) *x* drives slowly.
(54) Slowly(Drives *x*)

The operator 'Slowly' maps the property of driving onto the property of driving slowly. This new property, driving slowly, is then mapped onto

individuals (to fill in the value for *x*) and a truth value is returned—true if that individual drives slowly, false if that individual does not drive slowly.

The gain of the operator approach is that the problem with non-standard modifiers disappears. Parsons uses the example of the non-standard adjective *fake*: "'*x* is a fake gun' becomes '*F*(*Gx*)'" (p. 326). The operator *F* maps the property of being a gun onto the property of being a fake gun. The operator does not sanction the logical inference that if '*x* is a fake gun' then '*x* is a gun'.

The loss, however, is as noted by Richmond Thomason (1971): "The difficulty is that in judging an inference valid we must also judge any inference of the same form valid. Thus, [(55)] is invalid if it has the same form as [(56)]" (Thomason, 1971:715):

(55a) Otto stole compulsively
(55b) Therefore Otto stole

(56a) Otto stole allegedly
(56b) Therefore Otto stole

Though (55b) seems to be a logically valid inference following from (55a), it has the same form as in (56); yet (56b) does not follow as a valid inference from (56a). A possible way out of this problem is provided in Michael Bennett's dissertation (1974), based on observations in Montague (1970), and is included in the next sub-section.

3.3.1.3 *Montague (1970)*

Montague's approach to adverbials appears in his 1970 paper 'English as a Formal Language' and is based on work of Parsons (published in 1970) and Montague's student Hans Kamp (work published in 1975). Montague's paper is much less of a reaction to the Davidsonian approach than the reaction in

Clark (1970) and Parsons (1970), though it does seek to address the problems of certain types of adverbs noted by Davidson (Montague, 1970:189 Fn.5). The paper is much more of a reaction to transformational grammar (cf. Newmeyer, 1986:193-194). Montague writes (p. 188):

> I regard the construction of a theory of truth—or rather, of the more general notion of truth under an arbitrary interpretation—as the basic goal of serious syntax and semantics; and the developments emanating from the Massachusetts Institute of Technology offer little promise towards that end.
>
> In the present paper I shall accordingly present a precise treatment, culminating in a theory of truth, of a formal language that I believe may be reasonably regarded as a fragment of ordinary English.

With respect to adverbs, Montague distinguishes 'adformula phrases' (e.g., *not, necessarily*) from 'adverb phrases' (e.g., *rapidly, with x*). Montague further distinguishes between 'ad-one-verb phrases' which modify intransitive verbs and 'ad-two-verb phrases' which modify transitive verbs (p. 191). The last two syntactic categories are, however, coextensive—*rapidly*, for example, can modify both the intransitive *walk* and the transitive *walk a dog*.

The syntax and semantics of adverb phrases (hereafter referring to adformula phrases and both types of adverb phrases) are handled by pairs of syntactic/semantic rules of a type known as 'rules of functional application'. "A syntactic rule of functional application is any rule with input categories whose names have the form A/B and B (for some A and B), and whose output category is A" (Dowty *et al.*, 1981:192). This may be represented as in (57):

(57) $A/B + B \rightarrow A$

For adverb phrases, *A* and *B* are identical categories. Specifically, for adformula phrases, *A* and *B* are members of the set of formulas (e.g., *it rains, John walks*); for ad-one-verb phrases, *A* and B are members of the set of one-place verb phrases (e.g., *walks*); for ad-two-verb phrases, *A* and *B* are member of the set of two-place verb phrases (e.g., *walks, loves, cuts*). The generalizations are that (i) adverb phrases are functors (where a functor is defined as anything of the form *A/B* as used in (57)) and (ii) adverb phrases take an expression of a syntactic category (formula, one-place verb phrase, two-place verb phrase) and return a more complex expression of the same syntactic category.

The semantic part of a rule of functional application, known in Montague grammar as a 'translation rule', is more complex because it makes reference to objects used in intensional logic. "It is an instruction to take the translation α' of the *A/B*-expression and combine it with the intension of the translation β' of the *B*-expression to give $\alpha'(\hat{}\beta')$" (Dowty *et al.*, 1981:192).[9] For the purposes here, the key point is that (simplifying somewhat) the meaning of the adverb phrase is mapped onto the meaning of the expression with which it combines. This unified treatment of adverbials leads Montague to make this statement: "Notice, for instance, that 'Jones kills Smith in a dream' does not logically imply 'Jones kills Smith'; hence neither does 'Jones kills Smith with a knife'" (Montague, 1970:213).

Such a statement follows quite naturally in light of Montague's observations on adjective phrases and his view that "adverbial phrases are interpreted in very much the same way as adjective phrases" (p. 213). His

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9 For completeness, the notational conventions are these: α' is the translation of an expression α from the natural language to the formal language; $\hat{}$ is the intension operator such that $\hat{}\alpha$ is the intension of α with respect to some model *M* and value assignment *g*. (Dowty *et al.*, 1981).

observations on adjective phrases imply that there are at least three basic kinds. First, "the standard denotations of many adjectives—for instance, 'green' and 'married'—may be taken as *intersection functions...*" (p. 211). A married man would be in the intersection of individuals which possess the property of being a man and individuals which possess the property of being married, with respect to some possible world.

Montague goes on to observe (1970:211) the following, in connection with the adjectives which are interpreted by intersection functions:

> It would be a mistake, however, to suppose that all adjectives could be so interpreted. Compare the common noun phrases 'big flea' and 'big entity'....not all big fleas (indeed, probably no big fleas) are big entities. (A big flea is, roughly, a flea bigger than most fleas, and a big entity an entity bigger than most entities.)

Thus, the second kind of adjective implied in Montague's remarks is one requiring comparison strictly within the set denoted by the noun phrase.

Montague's examples of the third kind of adjective are found in 'possible president', 'false friend', 'reputed millionaire', 'ostensible ally', and 'alleged intruder'. The problem is that if "the denotation of an adjective is a function that always assigns to a property one of its *subproperties*" (p. 211), then there would be the requirement to have within the set of presidents, for example, a subset of possible presidents; within the set of friends, a subset of false friends; and likewise for the others. This problem is avoided by simply maintaining that the form in (58) is not logically true (p. 212):

(58) every $\delta\,\zeta$ is a ζ
where δ is an adjective and ζ is a common noun phrase

The consequence of this is that none of the statements in (59) is logically true:

(59a) Every married man is a man.
(59b) Every green book is a book.
(59c) Every big flea is a flea.
(59d) Every false friend is a friend.
(59e) Every alleged intruder is an intruder.

That (59a-c) are not logically true is not particularly satisfying. Montague suggests the use of certain postulates for the "two special classes of adjective phrases" (p. 212): (i) the intersective adjectives and (ii) the comparative type adjectives. Bennett (1974) follows up on these observations.

First, Bennett (1974:43-47) provides useful labels for the different kinds of adjectives and adverbs discussed by Montague: (i) phrases such as *mortal, green,* and *in the park* are 'intersective'; (ii) phrases such as *big, famous, quickly, slowly* are 'subsective'; and (iii) phrases such as *former, alleged, allegedly,* and *in a dream* are 'nonsubsective'. To these three, Bennett adds a fourth kind: 'antisubsective' adverbs such as *almost* are those which have the effect of negation. Thus (60) entails (61):

(60) John almost walks.
(61) John does not walk.

Next, to make (59c) a logically true statement and to make (62) entail (63), Bennett gives the meaning postulate in (64) (Bennett, 1974:27; Dowty *et al.*, 1981:234):

(62) x drives slowly
(63) x drives

(64) $\forall x \forall P \Box[\gamma(P)(x) \rightarrow P(x)]$, where γ is a subsective modifier.

(64) may be informally read as follows: for all individuals, x, and for all properties of individuals, P, it is necessarily the case that if the modified

property of the individual is true then the unmodified property of the individual is also true.

Bennett (1974:26) gives a second meaning postulate to guarantee the intersective property:

(65) $\forall x \forall P \Box[\gamma(P)(x) \leftrightarrow [P(x) \,\&\, \gamma([\hat{}\text{entity}'])(x)]]$, where γ is an intersective modifier.

Although (65) appears to be more complex than (64), it simply guarantees that each intersective modifier licenses the mutual entailment patterns of the type demonstrated by example in (66) and (67) (examples from Bennett, 1974:43,45):

(66a) John is a mortal man.
(66b) John is a man and John is a mortal entity.

(67a) John walks in the park.
(67b) John walks and John is in the park.

In (66), (a) entails (b) and (b) entails (a). Bennett claims (p. 45) the same mutual entailment exists in (67), although this requires the interpretation of *walks* as an activity in which John in engaged rather than *walks* as an ability which John has. Finally, there is a meaning postulate for the antisubsective adverb *almost* to guarantee the entailment of negation.

Two observations on the meaning postulates in (64) and (65) are in order. The first is that these postulates are reminiscent of Clark's suggestion that the class of modifier dictates the principles which hold for it. Recall from section 3.3.1.1 that the principle of predicate detachment applies only to standard modifiers and that some principle of predicate negation governs negators such as *nearly* (or *almost*). While Bennett formalizes these principles as postulates, they are no less stipulative and seem to miss an important generalization which holds for most, if not all, predicate modifiers.

The second observation is that, in the case of adverb phrases, the postulate for intersective modifiers given in (65) licenses an inference which maps the meaning of an adverbial onto an entity. Thus, *John walks in the park* entails *John is in the park,* as shown above in (67). This may have undesirable consequences. Consider (68) and the entailments, as per the meaning postulate for intersective modifiers, in (69):

(68) Jones buttered the toast with a knife.
(69) Jones buttered the toast and Jones is with a knife.

Because the second conjunct in (69) fails, *with a knife* does not appear to be an intersective modifier. Classifying it as a subsective is intuitively unappealing because it means that *with a knife,* like comparatives such as *quickly,* can only be interpreted with reference to the set of entities it modifies. The meaning postulate in (65) greatly restricts the set of intersective adverbials, possibly to just locations and times.[10] Furthermore, it fails to license inferences such as in (70) and (71):

(70a) John walks in the park.
(70b) John walks and the walking is in the park.

(71a) Jones buttered the toast with a knife.
(71b) Jones buttered the toast and the buttering is with a knife.

Of course, these are precisely the logical entailments which the Davidsonian approach was designed to meet. In section 3.4, further arguments are given for the alignment of predicate modifiers with the Davidsonian approach, a

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10 Bennett (1974:47) notes that "*in the chest* [in (i)] functions as a subsective, but nonintersective, manner adverbial phrase which indicates where the stabbing takes place". It is nonintersective because (ii) is not entailed by (i).

(i) John stabs the emperor in the chest.
(ii) John is in the chest.

move which obviates the need for stipulative meaning postulates in the operator approach. Before doing so, an attempt by Parsons (1980) to combine the Davidsonian and the operator approaches is summarized. What will become obvious is that, even in a combined approach, an inherent distinction between standard modifiers, such as *slowly* and *with a knife*, and non-standard modifiers, such as *nearly* and *allegedly*, is required.

3.3.2 Combining the Event Approach and the Operator Approach

In Part I of his paper 'Modifiers and Quantifiers in Natural Language', Parsons (1980) proposed the following (p. 40):

> The 'operator' approach and the 'event' approach in fact are not incompatible at all; they can be combined in a single theory. The basic idea is to symbolize all modifiers as operators, and to have available principles that effectively 'reduce' the operator symbolization to the event symbolization for those modifiers for which this is appropriate.

Although the approach to adverbials is unified in that they are all operators, there is a still a fundamental split between sentence modifiers and predicate modifiers. Sentence modifiers are symbolized as simple operators, of the form in (72):

(72) Adv

Predicate modifiers such as *slowly, in the park, towards Fred, with the knife* are complex operators, of the form in (73):

(73) $\lambda P \lambda e(P(e) \,\&\, Adv(e))$
where e is the event argument of a predicate P
and λ is the lambda operator

The lambda operator, introduced into mathematical logic by Alonzo Church (1941), performs a function called 'lambda conversion' which Parsons describes as "the principle that takes you from a formula of the form $\lambda x \phi(a)$ to

whatever you get by replacing free occurrences of x in ϕ by a" (Parsons, 1980:42 Fn.8). This may be formalized as in (74) (based on Chierchia and McConnell-Ginet, 1990:319):

(74) $\lambda x[\phi](a) \leftrightarrow \phi[a/x]$
where a is any term (an individual variable or constant) and $\phi[a/x]$ is the result of substituting a for all occurrences of x in ϕ

The lambda abstract, $\lambda x[\phi]$, is a one-place predicate which combines with a term a to give a well-formed formula, $\lambda x[\phi](a)$. Lambda reduction is the left-to-right part of the equivalence in (74); lambda abstraction is the right-to-left part of (74).

Thus, the complex operator in (73) is a lambda abstract. Parsons treats predicates and event arguments as terms, assuming they can substitute for a in the formalism in (74). Consider his example for the manner adverb *slowly*. As an operator, it has the form of a lambda abstract as in (75):

(75) $\lambda P \lambda e(P(e)\ \&\ Slowly(e))$

Applying this operator (or one-place predicate) to *drives* gives the formula in (76):

(76) $\lambda P \lambda e(P(e)\ \&\ Slowly(e))(Drives)$

By lambda conversion, (76) reduces to (77):

(77) $\lambda e(Drives(e)\ \&\ Slowly(e))$

Parsons (1980) does not make clear how the lambda conversion is carried out to give (78):

(78) $\exists e(Drives(e)\ \&\ Slowly(e))$

Presumably the lambda abstract in (77) combines with some term relating to the occurrence or existence of the driving event. This may require incorporating the agent into the logical form, as Parsons (1980:42) seems to suggest, but this has been suppressed in (78) for the sake of clarity.

The key point for the purposes here is that "the modifier 'allegedly' will not correspond to a lambda abstract, and so a stage will be reached at which lambda conversion will not apply."(p. 43). Parsons' example is in (79):

(79) Mary allegedly turned towards Fred

As for *slowly*, the predicate modifier *towards Fred* is a lambda abstract as in (80):

(80) $\lambda P \lambda e(P(e)$ & $Towards(e,$ Fred$))$

By lambda conversion, *turned towards Fred* has the representation in (81):

(81) $\lambda e(Turned(e)$ & $Towards(e,$ Fred$))$

Because *allegedly* is a simple operator and not a lambda abstract, *allegedly turned towards Fred* is symbolized as in (82):

(82) $Allegedly(\lambda e(Turned(e)$ & $Towards(e,$ Fred$)))$

The representation for the whole sentence in (79) is given in (83) (from Parsons, 1980:43):

(83) $(\exists e)(Allegedly(\lambda e(Turned(e)$ & $Towards(e,$ Fred$)))(e)$
& $Agent$ (Mary, e))

The expression may be read as 'There is an event which allegedly is a turning towards Fred, of which Mary is the agent'. Note in (83) that there is an unreduced formula containing the lambda operator. According to Parsons

(1980:44), this prevents all of the sentences in (84) from being logically entailed by (79):

(84a) Mary turned towards Fred
(84b) Mary allegedly turned
(84c) Mary turned

The 'combined' approach, then, relies on the distinction between event modifiers (as lambda abstracts) and intensional adverbials (as simple operators). Lambda conversion serves to reduce the lambda abstract to an event modifier of the type in the (neo-)Davidsonian approach. This formal machinery indirectly gives the same result which is directly achieved by the Davidsonian approach to event modifiers. In the next section, the case for aligning predicate modifiers directly with Davidson's treatment is made.

3.4 PREDICATE MODIFIERS AS DAVIDSONIAN ADJUNCTS

It should be clear from section 3.3 that one of the tenets shared by the advocates of the operator approach was that adverbials should be treated uniformly. This was achieved at the cost of Davidson's structural entailments in the logical form, which were regained by stipulation, adverb by adverb. This is clearly not a problem for those with the same opinion as Max Cresswell, who writes (1974:469) in regards to the entailment of *John runs* by *John runs quickly*:

> But there is no syntactic property of the object-language sentence which shews (sic) the entailment. I am not worried by this because in my view the entailment arises simply because of the meaning of the word ***quickly***. There is no more reason why the entailment of ***John runs*** by ***John runs quickly*** should be made explicit in the λ-deep structure than should the entailment of ***John moves*** by ***John runs***.

However, there is at least another consideration which does not appear to be in Clark (1970), Parsons (1970, 1980), or Montague (1970). Cresswell (1979) mentions the issue in passing (p. 178):

> Since ***quickly*** is in category ⟨⟨0,1⟩,⟨0,1⟩⟩ then where ⟨D,V⟩ is an interpretation for a λ-categorial language containing ***quickly***, V(***quickly***), the semantic value of ***quickly*** under ⟨D,V⟩, will be a function from $D_{\langle 0,1\rangle}$ into $D_{\langle 0,1\rangle}$. Not all members of $D_{\langle 0,1\rangle}$ will be fit arguments for V(***quickly***), only those which involve motion. Sentences involving other predicates will be semantically undefined when modified by ***quickly***. I shall not try to specify exactly what counts as a predicate of motion, and for this reason the domain of V(***quickly***) will be left a little vague. (I shall sometimes speak of 'appropriate' arguments for various functions,...). Nevertheless, it is possible to give illustrations of the kind of predicates which ***quickly*** typically modifies.

Setting aside the notation, which simply amounts to treating *quickly* as an operator, the point Cresswell makes relates to semantic anomaly and selectional restrictions. These are discussed in section 3.4.2 following a prerequisite discussion on operators and functors in section 3.4.1.

3.4.1 Operators and Functors

In an early work on natural language and mathematical logic, Curry (1961)[11] defines functors as follows: "Every functor combines one or more phrases, called its *arguments*, to form a new phrase called its *value* ... A functor is by definition a means of combining phrases to form other phrases" (p. 61). It seems to be safe to say that, in the operator approach, adverb phrases are taken to be functors. Cresswell (1974:456) points out that the variable-binding abstraction operator λ (cf. §3.3.2 above) is not a functor. This may lead one to assume that functors constitute a proper subset of the set of

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[11] Curry states in his footnote 1 that the paper is based on work from 1948. Though it is unlikely that it is the original statement on functors, it nevertheless serves as a useful starting point for the present discussion.

operators, an assumption which has little bearing on the present discussion but which will nevertheless be accepted.

A much more crucial assumption for the present discussion is that functors are semantically independent of their arguments. This follows from the view that functors perform functions on arguments. Though functors specify the category of the arguments they 'take' and 'make' (e.g., 'sentence', 'name'), they do not specify the semantic content of these arguments. This appears to be the view which Cresswell (1974) takes. He defines functors this way (p. 455):

> We begin with the notion of a *syntactic category*. 0 is the category of *sentence* and 1 is the category of *name*. Given τ and $\sigma_1,\ldots,\sigma_n$ as categories then $\langle\tau, \sigma_1,\ldots,\sigma_n\rangle$ is the category of a *functor* which makes an expression of category τ out of a sequence of expressions of categories $\sigma_1,\ldots,\sigma_n$ respectively. Thus if ***not*** is a one-place propositional connective it is of category $\langle 0, 0\rangle$. A two-place predicate is of category $\langle 0, 1, 1\rangle$ and so on.

In Cresswell (1974), all adverbs are uniform modifiers of the category $\langle\sigma, \sigma\rangle$. "Some adverbs are of category $\langle 0, 0\rangle$, others are of category $\langle\langle 0, 1\rangle, \langle 0, 1\rangle\rangle$, still others may be of category $\langle\langle 0, 1, 1\rangle, \langle 0, 1, 1\rangle\rangle$ and so on" (Cresswell, 1974:465). Cresswell places *necessarily* and *nearly* with *not* in the category $\langle 0, 0\rangle$ and calls them 'propositional modifiers', a category which corresponds to the sentence modifiers of chapter two. The adverbs *willingly* and *quickly* are in category $\langle\langle 0, 1\rangle, \langle 0, 1\rangle\rangle$; these correspond to modifiers of one-place predicates. A modifier of two-place predicates would be in the category $\langle\langle 0, 1, 1\rangle, \langle 0, 1, 1\rangle\rangle$. However, these last two categories would be coextensive. For example, as discussed in section 3.3.1.3 in regard to Montague's ad-one-verbs and ad-two-verbs, the verb *walk* can be a one-place predicate (it takes a name and makes a sentence, as in *John walks*) or it can be a two-place predicate (it takes two names and makes a sentence, as in *John walks a dog*). Any adverb which

can modify the one-place *walk* can also modify the two-place *walk* and so is in both category ⟨⟨0, 1⟩, ⟨0, 1⟩⟩ and category ⟨⟨0, 1, 1⟩, ⟨0, 1, 1⟩⟩.

The expression for the functor specifies the syntactic category of the argument or arguments taken and also the syntactic category of the result of the function. There is, however, no stipulation on the semantics of these expressions. This lack of restriction poses no problem for modifiers in the category ⟨0, 0⟩. There are problems, however, for modifiers in the category ⟨⟨0, 1⟩, ⟨0, 1⟩⟩ (and ⟨⟨0, 1, 1⟩, ⟨0, 1, 1⟩⟩, etc.).

3.4.2 Selectional Restrictions and Semantic Anomaly

Consider the functor *not*. As a member of the category ⟨0, 0⟩, it takes sentences and returns more complex sentences. There do not appear to be any other restrictions. All of the sentences in (85), which are based on different types of verbs, can be freely operated on by the functor *not*.

(85a) Ali knows (the answer).
(85b) Brooke has green eyes.
(85c) Corey drives a Mazda Miata.
(85d) Drew solved the puzzle.
(85e) Jaime reached the summit.
(85f) Kim lost her marbles.

Consider now a wider range of sentence modifiers. In the last chapter, the adverbs and prepositional phrases representing modal, evaluative, and pragmatic adverbials were classified as sentence modifiers according to the criteria discussed in that chapter. Applying these modifiers to the sentences in (85) creates no severe anomalies, as demonstrated by the sentences in (86):

(86a) Ali probably/fortunately knows (the answer).
(86b) To my surprise/In my opinion Brooke has green eyes.
(86c) Allegedly/Honestly, Corey drives a Mazda Miata.
(86d) Drew evidently/luckily solved the puzzle.
(86e) Surprisingly/Surely Jaime reached the summit.
(86f) Frankly/Oddly, Kim lost her marbles.

How do these compare to predicate modifiers? McConnell-Ginet (1982:166) gives the examples in (87):

(87a) *Annie weighs 120 pounds {heavily, beautifully, quickly, elegantly}.
(87b) *Annie weighs 120 pounds {for her mother, with a fork, in an hour, toward Detroit}.

Though it is not too difficult to construe contexts in which certain of these modifiers could occur with the sentence (i.e., *Annie weighs 120 pounds beautifully/elegantly* are fine in the sense of 'wears her weight well' and *Annie weighs 120 pounds for her mother* is acceptable in the sense of 'controls her weight for her mother's benefit'), most of the sentences are outright semantically unacceptable.

Adding to the list is a simple task, as demonstrated in (88):

(88a) *Ali knows (the answer) in the bathroom/at noon/with a knife.
(88b) *Brooke slowly/gently has green eyes.
(88c) *Corey drives a Mazda Miata by car.
(88d) *Drew solved the puzzle to the Morning Star/for 4 hours.
(88e) *Jaime reached the summit for 4 hours/in the bathroom.
(88f) *Kim lost her marbles by car/with a knife.

In fact, restrictions on the appearance of certain adverbs and prepositional phrase adverbials in sentences are used as tests to sort verbs into various classes—states, activities, accomplishments, and achievements (cf. Dowty, 1979).

The operator approach is too powerful for predicate modifiers in that there is no principled means to prevent them from operating on arguments of a type which lead to semantically anomalous results. Davidson (1967a,b) did not discuss the licensing mechanism by which adverbials get into action sentences. Rather, his goal was to represent the logical form of a given sentence in such a way as to capture the entailments derived solely from the

structure. A possible licensing mechanism is discussed in section 4.2.3 in the next chapter. This mechanism, which is based on licensing by constraints on event types (Larson, 1988), is completely compatible with Davidson's program. If, on the other hand, predicate modifiers are operators or functors, there would need to be some other mechanism to restrict the sorts of arguments on which they operate. For example, an instrument adverbial such as *with a knife* would not operate on a stative predicate such as *has green eyes*, and a time duration adverbial such as *until noon* would not operate on an achievement predicate such as *reached the summit*. Such restrictions would not apply to sentence modifiers[12] and so, in a unified approach to adverbials, a generalization is lost.

3.4.3 Constancy of Semantic Contribution

Another consequence of the operator account for predicate modifiers bears on one of the tests for identifying adjuncts, the constancy of semantic contribution test: "In general, a given adjunct can co-occur with a relatively broad range of heads while seeming to make a more-or-less uniform contribution to semantic content across that range" (Pollard and Sag, 1987:136). Dowty suggests an explanation for this test (1991:577 Fn.19):[13]

> If by NP ADJUNCT we mean a phrase whose referent's relationship to an event is the semantically compositional result of applying that phrase's meaning to the meaning of any verb or VP (categorially, a 'VP

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12 Domain adverbs do show a type of restriction in that the sentences in (i) to (iii) are semantically anomalous:

(i) *Horticulturally, Robin drives a Mazda Miata.
(ii) *Weatherwise, 2 + 2 = 4.
(iii) *Architecturally, Kim has green eyes.

The viewpoint specified by a domain adverb restricts the sorts of sentences with which it occurs. How this bears on their treatment as operators is left as an open question.

13 My thanks to Leslie Saxon for pointing out this footnote to me in the early stages of developing this thesis.

> functor'), rather than an NP referent whose relationship to the event is defined by the verb's meaning itself (Dowty 1982), then any adjunct, like the instrumental *with a knife*, must have a constant meaning across every VP it occurs in. Thus there can be many kinds of meanings for 'Patient', but only one for English instrumental *with*.

The constancy of semantic contribution of adjuncts is derivative of their functor status. Note, however, that Dowty needs to specify "instrumental *with*" since *with* is also used to introduce comitative adjuncts, Subject-oriented modifiers, themes, and accompaniments, as shown in (89):[14]

(89a)	Jones buttered the toast with a knife.	Instrumental
(89b)	The dish ran away with the spoon.	Comitative
(89c)	Jones buttered the toast with reluctance.	Subject-oriented
(89d)	Jones buttered the toast with cheap margarine.	Theme
(89e)	The tank filled with a gurgling sound.	Accompaniment

The first assumption that is required to accept Dowty's statement above is that each homophonous form of *with* is inherently specified as instrumental, comitative, manner (specifically Subject-oriented), etc. Consider, for example, the contrasts in (90) and (91):

(90a) The dish ran away with the spoon.
(90b) I eat my peas with a spoon.

(91a) I eat my peas with honey.
(91b) You catch more bees with honey.

Taking the definite/indefinite difference in the *with*-phrases in (90) as not bearing on the issue under discussion here, there needs to be a way of distinguishing the semantic contribution of the *with* in the (a) examples from the *with* in the (b) examples. If the semantic contribution of these adjuncts is independent of the verb (phrase), then each *with* must be underlyingly specified.

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[14] The example in (89e) and the label for the *with*-phrase are from Jackendoff, 1990b:162.

Even if it is the case that the *with* homophones are independently semantically distinct, there is still a second assumption required for the semantic constancy test to work. Consider the instrumental adjuncts in (92):

(92a) Jones buttered the toast with a knife.
(92b) Jones cut the chicken with a knife.
(92c) The butler stabbed Jones with a knife.

For each sentence in (92), the interpretation of the instrument adjunct *with a knife* is different from the others in both the type of knife used and in how it was used. According to Dowty's statement above, these semantic differences are to be neglected. In other words, constancy of semantic contribution holds for these instrument phrases when the interpretation is reduced to 'a knife was used'. Of course, the interpretation in each case is much richer than that which suggests that the adjunct depends on the verb to a much greater extent than the diagnostic is supposed to show.

A similar observation has been made for rate adverbs such as *quickly* and *slowly*. McConnell-Ginet (1982) notes a similarity in the behaviour of rate adverbs and 'vague' quantifiers such as *many* and *few*. She argues that the sentences in (93) show that the interpretation of *many* depends on the verb:

(93a) Karen has read many books.
(93b) Karen has written many books.

"Six might suffice to make [93b] true; but even for a second-grader, at least double digits are necessary for the truth of [93a]" (McConnell-Ginet, 1982:167). It is clear that the same type of dependence on the verb exists for the rate adverbs, as demonstrated by the sentences in (94) and (95):

(94a) Sean read his thesis quickly.
(94b) Sean wrote his thesis quickly.

(95a) The old man walked slowly down the street.
(95b) The old man cycled slowly down the street.

It is easy to imagine (94a) taking a number of hours and (94b) a number of weeks but not vice versa. Similarly, (95b) allows for a greater distance to be travelled than (95a) in the same amount of time. These are not expected results if rate adverbs, clearly adjuncts in their uses in (94) and (95), contribute a constant meaning across a range of verbs.

It is not quite as simple as all this, however, for there is an alternative view of functors in the linguistics literature. Keenan and Faltz (1985) argue that there are examples from both mathematics and natural language that show that functors depend on their arguments for their semantic interpretation. They write (p. 28):

> Note that there is an intuitive sense in which the 'meaning' of a function expression may depend on that of its argument; namely, what the function 'does' to the argument may vary with properties of the argument. Standard examples from mathematics are, say, the absolute value function, where the value of the function varies systematically according as the argument is positive or negative. Similarly, rounding off functions are of this sort...
>
> Similarly, in natural language we find that the expressions we have interpreted by functions exhibit this sort of variation with respect to their arguments. For example,...*run* implies both internal movement and external movement...when the argument expression denotes animate things. So, if a horse runs we understand...that both his parts move and that he changes location relative to other things....But if the argument expression is a mechanical object, the sense of external movement is absent: watches or cars may run without changing location.

McGlashan (1993) summarizes this view of functors in this way: "one interpretation of Keenan's position is that semantic variation is a characteristic of functor categories but not argument categories: that is, the semantic interpretation of functor categories varies with that of argument

categories, but not vice versa" (McGlashan, 1993:214). On this view, *cut* is a functor because it depends on its direct object for its semantic interpretation (examples in (96) from McGlashan, 1993:214):

(96a) cut finger ('to make an incision on the surface of')
(96b) cut cake ('to cut all the way through'; 'to divide into portions for the purpose of serving')
(96c) cut lawn ('trim')
(96d) cut heroin ('diminish the potency of by adding a physically comparable substance')

The semantic dependence of adverbs on their verbs (and adjectives on their nouns) awards them functor status as well, which is in line with the operator approach. However, there are three important points which need to be made. First, McGlashan notes that "variation in semantic interpretation is not simply unidirectional, for just as the argument can affect the interpretation of the functor, so the functor can affect the interpretation of the argument" (p. 218). This is equivalent to Dowty's statement that "there can be many kinds of meanings for 'Patient'" (1991:577 Fn.19).

The second point is related to the first in that the examples of arguments semantically depending on their functors often involve category shift. Consider the example in (97), from McGlashan (1993:219):

(97a) Pianos can be pleasing to listen to.
(97b) Pianos can be difficult to move.

"In [(97a)] the sound, but not the weight, of the piano is relevant, whereas in [(97b)] the opposite is true" (McGlashan, 1993:219). Another way of looking at this, in very approximate terms, is that in (97a) the piano is in the category of musical instrument and in (97b) it is in the category of furniture. Consider the direct objects in (98):

(98a) I fried the chicken.
(98b) I freed the chicken.

There is clearly a sharp contrast, especially for the chicken. In (98a), it is in the category of food while in (98b) it is necessarily animate for a felicitous reading of the sentence. The point is that Dowty's "many kinds of meanings for 'Patient'", where 'Patient' is often the grammatical direct object, may well be the result of the category shift brought on by the verb. The question, then, is whether the semantic variation of *cut* in (96) is also the result of category shift, this time brought on by the argument. This issue will not be resolved here, primarily because of a third point in regards to functors and arguments, due to Zwicky (1985).

In an important paper on the notion of 'head' in grammatical theory, Zwicky (1985:4 Fn.3) cautions:

> The mechanisms of a system of logic rich enough to provide the basis for a description of natural language semantics will not themselves force a decision as to what is functor and what is argument. With a certain amount of formal ingenuity, a Montague-style semantics that treats Det as a functor on the argument N can be redone as a system treating N as a functor on the argument Det. The intuitively correct assignment of certain items as arguments and others as functors can be guaranteed only if substantive assumptions about the relationship of semantics and syntax are made...

It is relatively uncontroversial that auxiliary verbs (e.g., *will, must*) are semantic functors which take VPs as arguments, and that, by recursion, verbs in VPs (e.g., *move, fry*) are semantic functors which take NPs as arguments (cf. Zwicky, 1985:4). Recall that under the operator approach, adverbials are functors which take VPs or sentences as their arguments. This need not be the case since there is a certain amount of arbitrariness in assigning functor

status. Semantic variation seems to be bidirectional (McGlashan, 1993) and a little formal ingenuity allows for either assignment.

These three points weaken the argument that predicate modifiers are not functors since they are dependent for their semantic contribution on the verbs with which they occur. Note, however, that these same three points also weaken the constancy of semantic contribution test for the argument/adjunct distinction, the test outlined at the start of this section.The next chapter discusses two other tests for the argument/adjunct distinction, the optionality and iterability tests. Such tests have been used to support one of the most venerable claims in linguistic theory—that there is a distinction between arguments of verbs and adjuncts or modifiers of verbs. One of the consequences of adopting the Davidsonian approach for predicate modifiers is that it makes a prediction which runs counter to this claim—adverbials have the same status in the logical form regardless of whether the tests indicate them to be arguments or adjuncts.

CHAPTER FOUR

4.1 DAVIDSON'S LOGICAL FORM AND THE ARGUMENT/ADJUNCT DISTINCTION

As pointed out in the last chapter, Kratzer (1993) interprets Davidson's representation of action sentences as clearly distinguishing arguments from adjuncts (p. 103). Recall that Davidson proposed that a two-place predicate such as *kicked* in *Shem kicked Shaun* be analyzed as a three-place predicate and be represented as in (1) (Davidson, 1967a:92). Two of the places are for the two participants of the action denoted by the transitive verb and the third place is for the event argument x.

(1) $(\exists x)(\text{Kicked}(\text{Shem}, \text{Shaun}, x))$

In Davidson's analysis, adding a locative adverbial such as *in the park* in (2a) would not yield a four-place predicate but instead would give the form in (2b):

(2a) Shem kicked Shaun in the park.
(2b) $(\exists x)(\text{Kicked}(\text{Shem}, \text{Shaun}, x) \ \& \ \text{In}(\text{the park}, x))$

Castañeda (1967), commenting on Davidson's analysis, illuminates the key distinction made in Davidson's representation: the distinction between a "structural core of an action" (p. 105) and added structure. Castañeda writes:

> The basic structural core of an action is (i) a relation between an agent, and an event, if the action is intransitive, and (ii) a relation among an agent, a patient or accusative of the action, and an event, if the action is transitive, i.e., has an object...The expressions that formulate an increase in the polyadicity of an action statement are at bottom conjunctive sentential functions attributing properties to the event which is the action in question (p. 105).

Castañeda went on to suggest the following modification to Davidson's structural core:

> The basic structural core of an action is a dyadic relation from a set or sum of agents to the event which is the action. If the action is transitive then there is another core conjunct consisting of the same dyadic relation as before holding from the event in question to a set or sum of accusatives (p. 107).

So, for Castañeda, a sentence such as *Shem kicked Shaun* would be represented as in (3):

(3) $(\exists x)$(Kicked(Shem,x) & Kicked(x, Shaun))

4.1.1 Davidson's Structural Core

Davidson (1967b) strongly opposed this suggestion to separate agents and patients, stating that in his program "simple sentences containing transitive verbs do not, as a matter of logical form, entail sentences with intransitive verbs" (p. 117). In effect, the Davidsonian approach maintains a transitive/intransitive distinction in the structural core of the logical form of an action sentence. A transitive/intransitive pair such as causative and non-causative *sink* would be distinguished in the single structural cores for each, as shown in (4) and (5):

(4a) I sank the Bismarck.
(4b) $(\exists x)$(Sank(I, the Bismarck,x)

(5a) I sank.
(5b) $(\exists x)$(Sank(I, x)

In the Davidsonian system, the maximum number of arguments in the structural core is three including the event argument. It is also part of the system that the logical form in (4b) does not entail the logical form in (5b). Castañeda's motivation to separate agent from patient was apparently in an effort to capture just such an entailment, as demonstrated by his example, repeated here in (6) and (7) (Castañeda, 1967:104, 106):

(6a) I flew my spaceship.
(6b) $(\exists x)$(Flew(I, x) & Flew(x, my spaceship))

(7a) I flew.
(7b) $(\exists x)$(Flew(I, x))

Davidson's reply makes it abundantly clear what his notion of entailment is. He writes (1967b:117):

> It is not part of my program to make all entailments matters of logical form..."x is a grandfather" entails "x is a father," but not as a matter of form..."I flew my spaceship" may entail "I flew," but if it does, it is not, I think, because of the logical form of the sentences. My reason for saying this is that I find no reason to believe the logical form of "I flew my spaceship" differs from that of "I sank the Bismarck," which does not entail "I sank"...A comparison of these examples ought to go a long way to persuade us that simple sentences containing transitive verbs do not, as a matter of logical form, entail sentences with intranstive verbs.

Davidson's statement—in particular, that "x is a grandfather" does not entail "x is a father" as a matter of logical form—illuminates the restricted sense of entailment he is using. It follows from this: if x is a member of the set P, there can be no conclusion drawn as to whether x is also a member of set Q. Likewise, if x *verbs* y, there is no logical entailment that x *verbs*, where *verbs* names some relation in a world. Identifying set P, set Q, and the relation *verbs* allows for 'entailment' statements where the sense of entailment is the broader, more prevalent sense of entailment as illustrated in this passage from Kempson (1975:48):

> Entailment I defined... as a relation between sentences such that the truth of the second necessarily follows from the truth of the first. Thus any statement S_1 will entail a statement S_2 if when S_2 is true, S_2 must also be true. It is therefore not possible to assert the truth of S_1 and deny the truth of S_2....For example, the statement made by uttering *That person is a bachelor* (S_1) entails the statement made by uttering *That person is a man* (S_2)..

This use of 'entailment' is fundamentally different from Davidson's. To maintain the integrity of Davidson's structural core, a line must be drawn between structural entailment ('entailment of form') and entailment derived from the language-user's knowledge of the world. To press this point, consider the invented verb as used in the 'sentence' in (8):

(8) Jones shrabed the bananas.

Without knowing what it means to *shrabe*, it is not possible to assert that (8) entails (9):

(9) Jones shrabed.

In the case where *shrabe* means PEEL, this lack of entailment is a welcome result. However, if *shrabe* means EAT, this lack of entailment may come as a surprise. In Davidson's system, the lack of entailment between (10) and (11) is a matter of difference in the structural core:

(10a) Jones ate the bananas.
(10b) $(\exists x)$(Ate(Jones, the bananas, x)

(11a) Jones ate.
(11b) $(\exists x)$(Ate(Jones, x)

Under Kempson's use of the term 'entailment', (10a) does entail (11a).

These two uses of entailment hearken back to Charles Morris' original division between semantics and pragmatics (Morris, 1938). In *Foundations of the Theory of Signs*, Morris defined semantics and pragmatics this way:

> Semantics deals with the relation of signs to their designata and so to the objects which they may or do denote. (Morris, 1938:21)
>
> By 'pragmatics' is designated the science of the relation of signs to their interpreters....Since most, if not all, signs have as their interpreters living organisms, it is a sufficiently accurate characterization of pragmatics to say that it deals with the biotic aspects of semiosis, that is,

> with all the psychological, biological, and sociological phenomena which occur in the functioning of signs. (Morris, 1938:30)

Kamp (1979:266) notes that "Morris's original distinction...still leaves considerable room for manoeuvre to the theorist who wants to convert this characterization into a formally precise definition." Stalnaker (1972:380-1) notes that the vagueness of the term *designata* blurs the boundary between semantics and pragmatics. Morris defined it this way (p. 5): "A designatum is not a thing, but a kind of object or a class of objects—and a class may have many members, or one member, or no members."

That Davidson is drawing the line between logical entailments and entailments derived from knowledge of word meanings is clearly demonstrated in the following passage (Davidson, 1967a:82):

> To give another illustration of the distinction I have in mind: we need not view the difference between "Joe believes that there is life on Mars" and "Joe knows that there is life on Mars" as a difference in logical form. That the second, but not the first, entails "There is life on Mars" is plausibly a logical truth; but it is a truth that emerges only when we consider the meaning analysis of "believes" and "knows." Admittedly there is something arbitrary in how much of logic to pin on logical form. But limits are set if our interest is in giving a coherent and constructive account of meaning: we must uncover enough structure to make it possible to state, for an arbitrary sentence, how its meaning depends on that structure, and we must not attribute more structure than such a theory of meaning can accommodate.

This line between structural entailment and knowledge-based entailment will play a crucial role in the discussion of putative optional direct objects in section 4.2.2.1.

4.1.2 The Question of Subcategorized Prepositional Phrases

Davidson's distinction between a structural core and added structure poses an interesting question for the argument/adjunct distinction when the

to-phrase of a verb such as *give* or the locative phrase of a verb such as *put* is considered. Dowty notes (1991:548 Fn. 2) that Davidson's proposal treated only the subject and object as arguments of the verb and that the rest of the relations he dealt with were adjuncts. Taking this assessment as accurate, Davidson would give the form in (13) for the sentence in (12):

(12) Robin gave the letter to Stacy.
(13) $(\exists x)$(Gave(Robin, the letter, x) & To(Stacy, x))

Based on what Davidson writes (1967a:92; 1967b:118), the form in (13) might be read as "There is an event x such that x is a giving of the letter by Robin and the giving is toward and terminating at Stacy".

The form in (13) supplants the alternative form shown in (14) in which the ditransitive *give* is taken to be a four-place predicate.

(14) $(\exists x)$(Gave(Robin, the letter, (to) Stacy, x))

Recall that Davidson gives the representation in (15) for the sentence in (16):

(15) I flew my spaceship to the Morning Star.
(16) $(\exists x)$(Flew(I, my spaceship, x) & To(the Morning Star, x))

In regard to this representation, he writes (1967a:93):

> It is not necessary, in representing this argument, to separate off the To-relation; instead we could have taken "Flew" as a four-place predicate. But that would have obscured another inference, namely that from [(16)] to
>
> [(17)] $(\exists x)$(Flew(I, my spaceship, x)).
>
> In general, we conceal logical structure when we treat prepositions as integral parts of verbs; it is a merit of the present proposal that it suggests a way of treating prepositions as contributing structure.

The preposition contributes the meaning "motion-toward-and-terminating at" (Davidson, 1967b:118). This captures at least part of the meaning of the *to*-phrase in (12): the motion of the letter is toward and terminating at Stacy.

The logical entailment in (18) is made clear when the *to*-relation is separate from the rest.

(18) $(\exists x)$(Gave(Robin, the letter, x))

Though (18) gives a string which is generally held to be ungrammatical when uttered in isolation (**Robin gave the letter*), it is nevertheless a logical entailment of (13). No further structural decomposition is carried out in Davidsonian system, though there would be for the neo-Davidsonian, and so the transitivity of the verb remains intact in the logical form.

Another logical entailment is given in (19); that is, (13) entails (in Davidson's sense) (19):

(19) $(\exists x)$(To(Stacy, x))

This might be read as 'there is an event x which is to Stacy'. Whether the event is one of *flying, giving, walking,* or *throwing* is not relevant to this part of the representation.

This feature of Davidson's logical form has not always been fully appreciated. For example, McCawley (1979:76) claims that Davidson proposed the logical structure in (20) for the sentence in (21):

(20) Amundsen flew to the North Pole in May 1926.
(21) $(\exists x)$(Fly(Amundsen, the North Pole, x) & In(x, 1926)

McCawley further states that "'Fly' is conceived of as a three-place predicate, with the third place being the action" (p. 76). McCawley seems to have confused Reichenbach's proposal with Davidson's; Davidson (1967a:90-92) argues against the representation in (21) before making his proposal, one in which the *fly* of (20) would be a two-place predicate and the *to*-phrase would be conjoined as a separate predicate.

The move to separate all prepositional phrases from the structural core—be they subcategorized for by the verb or omissible modifiers—has the consequence of providing a uniform treatment of them. However, there are important implications of this for the argument/adjunct distinction, a distinction which has been called "[one] of the most longstanding and robust hypotheses of syntactic theory" (Jackendoff, 1990a:453).[1]

In this chapter, the implications of Davidson's logical form with respect to two criteria used to distinguish arguments from adjuncts are examined. The two criteria are optionality and iterability. Kratzer's (1993) claim that Davidson's program makes a clear argument/adjunct distinction can be reconciled only if the term 'argument' applies exclusively to the one or two central participants in the event denoted by an intransitive or transitive verb. The term 'adjunct', then, applies to any adverbial which contributes structure by conjunction to the core structure but which does not increase the intrinsic valency of the verb (cf. Kenny's problem discussed in section 3.2.1.1). This view runs counter to the traditional view of 'argument' and 'adjunct', and specifically as they are identified by the two tests discussed in sections 4.2 and 4.3.

4.2 THE OPTIONALITY TEST

4.2.1 The Problem of Overlap

The optionality test is conceptually simple but empirically confounded. The simplicity lies in the idea that adjuncts are always omissible, leaving grammatically well-formed sentences. The confoundedness lies in the fact that arguments are sometimes omissible. Consider the following data as

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1 More precisely, Jackendoff is referring to the hypothesis "that there is a structural distinction between arguments and modifiers" (1990a:453). Under the controversial assumption that syntax and semantics are non-autonomous, a structural distinction will have semantic consequences.

demonstrations of the obligatoriness and optionality of certain phrases. The grammaticality judgments are for the sentences in isolation, with no attempts to construe a context to improve their acceptability.

(22a) Jaime sang (sweetly).
(22b) Kelly devoured his lunch (from 11:30 to 11:33).
(22c) Lindsay waxed her car (in the garage).
(22d) Jones buttered the toast (with a knife) (at midnight).
(22e) Sandy drives (recklessly).

(23a) Jaime sang (a show tune).
(23b) Kelly ate (his lunch).
(23c) Laurie drinks (beer).
(23d) Mickie read (*The Hobbit*).
(23e) Sandy drives (a Mazda Miata).

(24a) Jackie kissed *(a frog).
(24b) Kelly devoured *(his lunch).
(24c) Laurie guzzled *(his beer).
(24d) Brett destroyed *(the painting).
(24e) Sam mowed *(the lawn).

(25a) The Dean presented an award (to Kim).
(25b) Ashley installed the lights (in the living room).
(25c) Beau moved the toaster (from the shelf) (to the counter).
(25d) Corey planted potatoes (in the field).

(26a) Ashley gave $100 *(to the church).
(26b) Fred handed a toy *(to the baby).
(26c) Corey put the toaster *(on the counter).

Although the adverbials in (22) are generally taken to be adjuncts, this does not follow from the test—the phrases in parentheses could be optional arguments. The direct objects in (23) are generally taken to be optional arguments, but again this is not an outcome of the optionality test. In (24), the direct objects in parentheses are obligatory for grammaticality and so, according to the test, they are arguments of the verb. In (25), the prepositional phrases are judged here as optional and so are either arguments or adjuncts. The prepositional phrases in the sentences in (26), which have semantically

related verbs to those in (25), are obligatory and so pass the test for argument status.

Because of this overlap in behaviour between adjuncts and optional arguments with respect to the test, non-omissibility is insufficient for determining argument status. Dowty (1982) proposes two criteria for distinguishing arguments from adjuncts—the subcategorization test and the entailment test—which are both relevant to the optionality test in that they may be taken to be more fine-grained versions of it.

It needs to be said from the outset, however, that Dowty has reservations about the criteria he proposes, as indicated by this footnote: "Though I have here given specific criteria for the argument/modifier distinction, primarily for the sake of concreteness at this point in the paper, I definitely believe that further consideration and perhaps revision of these is in order" (Dowty, 1982:90 Fn. 5). Later in his paper, he discusses "the elusive boundary between arguments and modifiers" (p. 116), pointing out suspicious cases of overlap such as between passive agents and instruments and between indirect objects and benefactives. In the next section, Dowty's two criteria are considered in relation to these two questions which pertain to Davidson's logical form:

(i) If a simple sentence headed by a transitive verb does not entail a counterpart with the intransitive form of the verb, what is the status of optional direct objects?

(ii) If the locative phrases of the verbs *give, hand,* and *put* have the same status as those of *fly, present,* and *plant,* why are they omissible for the latter set but not for the former set?

4.2.2 The Subcategorization and Entailment Criteria

The rationale for the subcategorization[2] test is simply that "one cannot add a direct object or an indirect object to just any verb, but only to one that is subcategorized for an object. One cannot say **John caught a fish to Mary*, or **An hour elapsed John*, because *catch* and *elapse* are not that sort of verb" (Dowty, 1982:90). In contrast, an adjunct such as the benefactive *for Mary* can be added to almost any verb phrase without rendering the string ungrammatical.

The first thing to notice, as duly noted by McConnell-Ginet (1982:165-6), is that there are verbs which subcategorize for adverbials. The examples in (27), (28), and (29) illustrate this for manner, locative, and durative adverbials respectively:

(27a) Kim treated Sandy with disdain.
(27b) Robin behaved badly.
(27c) The job paid us handsomely.
(27d) We worded our response carefully.
(27e) He phrased his reply with malice.
(27f) She handled the glass figurine with care.

(28a) Tony resides in Kalamazoo.
(28b) Terry put the car into the garage.

(29) The performance lasted for three hours.

Zwicky (1993) suggests that examples such as those in (27) to (29) be taken care of by stipulations which override the defaults: "We then say that English has a construction in which a Verb Head (like *word*) is licensed with three Arguments: a Subject, a Direct Object and an Adverbial (of a specific

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[2] The term 'subcategorization' has a variety of uses. Though it has the meaning along the lines of the classification of lexical heads on the basis of the complements (non-subject arguments) which they take (e.g., intransitive verb, transitive verb, ditransitive verb, *put*-type verb), it is often used to refer to the number and kind of phrases which a verb requires to be complete. It differs from polyadicity in that it is a construct of syntactic theory; polyadicity refers to the semantic arguments of a predicate (cf. §3.2.1.1).

type). Adverbials are by default Modifiers, but here we have Adverbials stipulated to be Arguments" (p. 302). Even with this stipulation, there would still be the mystery pointed out by McConnell-Ginet (1982): the locative prepositional phrases in (30a) and (31a) have argument status while the same phrases in (30b) and (31b) have adjunct status:

(30a) Tony resides in Kalamazoo.
(30b) Tony teaches in Kalamazoo.

(31a) Terry put the car into the garage.
(31b) Terry drove the car into the garage.

Despite this problem, the subcategorization test improves on the optionality test in as much as the optional direct objects in (23) are shown to be arguments; they cannot be added to just any verb, as illustrated in (32):

(32a) Jaime gossiped (*a show tune).
(32b) Kelly dined (*his lunch).
(32c) Laurie slept (**The Hobbit*).

In contrast, the optional phrases in (22) can be added relatively freely to a range of verb phrases, as shown in (33), indicating that they are modifiers:

(33a) Jaime sang a show tune in the garage at midnight.
(33b) Kelly ate his lunch recklessly.
(33c) Laurie read *The Hobbit* from 11:30 to 11:33.

4.2.2.1 *Optional Direct Objects*

The assumption being made in the subcategorization test with respect to direct objects is that although they are optional, they are still subcategorized for by the verb. In other words, certain intransitive verbs—such as *eat, sing, read, cook, sew*—are taken to subcategorize for direct objects, regardless of whether or not they surface. This is at odds with Davidson's analysis whereby an intransitive verb has two arguments, the event argument and the single

participant, usually labelled as the agent in the case of action sentences. Taking this literally means that for a simple sentence containing an intransitive verb, there *is* no direct object, even if the subcategorization test allows for one. Thus, on Davidson's view, the status of optional direct objects is that they do not exist. This prediction has an even more striking effect on the entailment test.

The entailment test is based on the idea that syntactically optional direct and indirect objects are often not semantically optional but rather are implied by virtue of the verb's meaning. So, for example, *Chris ate* entails that *Chris ate something*, but *Jo baked a cake* does not entail that *Jo baked a cake for someone*. In other words, "the meaning of an IV [=verb phrase] can be complete without a benefactive (or instrumental or locative)... By contrast, the second and/or third arguments of an inherently two or three-place verb are always implicit in the meaning of the verb, even if they are unmentioned in the sentence..." (Dowty, 1982:90).

As has been pointed out in the literature (e.g., Davidson, 1967b; Parsons, 1985; Carlson, 1984; McConnell-Ginet, 1982), direct objects are often syntactically optional without their being semantically entailed, as shown by the following examples.

(34a) I sank the Bismarck. (Davidson, 1967b:117)
(34b) I sank.

(35a) I flew my kite over city hall. (Parsons, 1985:256)
(35b) I flew over city hall.

(36a) The mule kicked someone/something. (Carlson, 1984:264)
(36b) The mule kicked.

(37a) Leslie played something. (McConnell-Ginet, 1982:166)
(37b) Leslie played.

This is shown perhaps most productively by the causative/non-causative alternations of verbs such as *sink, fly, break, boil, melt,* and *open.* In regard to (36), Dowty (1989) claims that "transitive/intransitive verbs that are semantically like *kick* are extremely rare" (p. 94) (another example is *swallow*). The example in (37) and others like it (e.g., *eat, read, cook, bake, sew*) show a rather fine distinction between the transitive and (active) intransitive uses. This is exactly the point where the difference between logical entailment and knowledge-based entailment, as discussed in section 4.1.1, comes into play.

Using the meaning of 'entail' as in logical entailment, (38a) does not entail (38b). The corresponding Davidsonian representations in (39) show this:

(38a) Terry ate the fish.
(38b) Terry ate.

(39a) $(\exists x)(\text{Ate}(\text{Terry}, \text{the fish}, x))$
(39b) $(\exists x)(\text{Ate}(\text{Terry}, x))$

The sentence in (38a) denotes a relation between two entities—Terry and the fish—while the sentence in (38b) denotes a set, one to which Terry belongs. In other words, *eat* is a two-place verb in (38a) and a one-place verb in (38b). Though it may not be his intention to do so, Dowty (1989:93) gives a clear explanation as to why it seems counterintuitive to say that (38a) does not entail (38b):

> Because of our knowledge about the nature of events of eating, i.e. our knowledge that [(40)] holds for all events of eating,
>
> [(40)] $\forall e[\text{eating}(e) \rightarrow \exists x\text{Agent}(x, e) \ \& \ \exists y\text{Patient}(y, e)]$
>
> we know that there nevertheless exists something that [Terry] ate [in (38b)]

The statement in (40)—which may be informally read as 'For all events, if the event is an eating then there is an eater and an eaten'—is simply a formalism of a fact which holds for this world. Dowty offers another example of a formal meaning postulate to describe a fact, repeated here in (41) (from Dowty, 1989:85):

(41) $\forall e \forall x \Box[\,[\text{singing}(e) \,\&\, \text{Agent}(x, e)] \rightarrow \text{moving-vocal-cords}(x)]$.[3]

This is reminiscent of Cresswell's remark (1974:469) that *running* entails *moving* just as *running quickly* entails *running*. For Cresswell, neither of these entailments follows from the logical form (his 'λ-deep structure'). For the neo-Davidsonian, *running quickly* does entail *running* as a result of the logical form. However, it was not the aim of Davidson's program to capture the entailment of *moving* by *running*, nor to capture the entailments described by (40) and (41).

There are at least two empirical advantages of limiting logical entailments to the logical form, specifically with respect to maintaining a two-place/one-place distinction for all transitive/intransitive alternations. The first advantage relates to the sentence in (42), a sentence which has been discussed in Bresnan (1978), Fodor and Fodor (1980), Mittwoch (1982), and Carlson (1984):

(42) Everyone ate.

The interest in this seemingly innocuous sentence is that it is generally taken to be unambiguous in a way that (43) is not:

(43) Everyone ate something.

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[3] Dowty's postulate in (41) contains the necessity operator □ which has the meaning 'in all worlds and at all times'. This may make the postulate too strong a statement since it makes claims about singing in other worlds.

The sentence in (43) represents the classic example of scopal ambiguity. In (44a), the existential quantifier in *something* has wider scope, giving the many-to-one reading; in (44b), the universal quantifier has wider scope and the one-to-one reading obtains:

(44a) There is some x such that for every y, y ate x. (Many-to-one)
(44b) For every y, there is some x such that y ate x. (One-to-one)

Bresnan (1978) proposed that since "*John ate* implies that John ate something; the verb *eat* has a logical object even when it lacks a grammatical object" (p. 15). Her "lexical argument structure for the intransitive verb *eat*" (p. 16) is as in (45):

(45) $(\exists y)\ x$ EAT y

Fodor and Fodor (1980) pointed out that intransitive *eat* in (43) lacks the reading in (44a) and so the representation in (45) requires a stipulation that the existential quantifier have narrow scope in the intransitive use. This stipulation appears in Bresnan (1982) for the sentence in (46):

(46) Everyone was reading.

Bresnan writes (1982:170):

> The lexical quantification of predicate arguments has narrow scope with respect ot the syntactic quantification of sentences....[(46)] is unambiguous: the lexically introduced quantification of *read*'s second argument can have only narrow scope with respect to the syntactically introduced quantifier *everyone*, and so the sentence has only the meaning 'For every person, there was something such that that person was reading it'.

Fodor and Fodor (1980:761) and Carlson (1984:263) make use of meaning postulates, along the lines of (40), to gain the entailment of (43) by (42), and without the scopal ambiguity. Such meaning postulates are completely

compatible with Davidson's approach, as long as they are not viewed as part of the logical component of interpretation but are rather grounded in knowledge of the world.

The second empirical advantage of treating *x eats* as logically distinct from *x eats something* (i.e., neither entails the other) relates to the difference between activities and accomplishments. Both Dowty (1979) and Mittwoch (1982) give tests for distinguishing activities from accomplishments. One of the tests is the *almost* test (Dowty, 1979:58). The sentence in (47a) has one reading, namely that John did not run though he nearly did. In contrast, the sentence in (47b) has two—one in which John started building a house but didn't finish it and one in which John did not start building a house.

(47a) John almost ran.
(47b) John almost built a house.

The same contrast appears in (48). The (a) sentence has one reading in which John did not eat. The (b) sentence has both this reading and a second reading in which John started to eat the pie but failed to eat the whole thing.

(48a) John almost ate.
(48b) John almost ate a pie.

If (48a) logically entails *John almost ate something* then two readings are expected. Without a context to elicit the second interpretation, it is not present for the intransitive, activity-type *eat*.

This distinction between activities and accomplishments is also compatible with Davidson's encoding of the transitive/intransitive distinction in the logical structure of the verb. In addition, it gives the advantage of a unified explanation for the apparent optionality of direct objects for some verbs and their obligatoriness for other verbs. The reason

that (49b) is fine, and (50b) is not, arises from the existence of an intransitive verb *eat* but a gap for an intransitive *devour*.

(49a) Gerry ate the whole cake.
(49b) Gerry ate.

(50a) Gerry devoured the whole cake.
(50b) *Gerry devoured.

It may well be that the transitive and intransitive forms of *eat* are separate lexical entries; or it may be that the intransitive form is derived from the transitive form by some sort of detransitivization process. That issue is taken as well beyond the scope of this thesis. The point being made here is that the direct object in (49b) is not missing; rather, there is no argument slot for a direct object in the structural core of intransitive *eat*.

The generalization which follows from this last point is that there are no syntactically optional direct objects. The phenomenon of implicit direct objects is the result of inferring a direct object based on real world knowledge, as in the meaning postulates discussed above. Fillmore (1986) gives three examples, as support for a different point than the one being made here, that demonstrate the specialized inferences required to interpret intransitive *eat*, *drink*, and *bake*:

(51) We've already eaten.
(52) I've tried to stop drinking.
(53) I spent the afternoon baking.

Fillmore (1986) writes "EAT is used to mean something like 'eat a meal' – not merely 'eat something' and DRINK is used to mean 'drink alcoholic beverages'... [in (53] the missing object is taken to include breads or pastries, but not potatoes or hams" (p. 97). The interpretations require specialized knowledge about intransitive *eat*, *drink*, and *bake*, information that

existential quantification over a null direct object slot will not provide. This provides further support for maintaining a syntactic and semantic transitive/intransitive distinction rather than subscribing to the practise of marking verbs as optionally transitive and/or direct object positions as optionally null.

4.2.2.2 *Omissible and Obligatory Adverbials*

The other part of Dowty's entailment test is that modifiers are not necessarily inherent in the meaning of the verb in the way arguments are. For example, the sentence in (54) does not entail an instrument, Dowty's (1982) example in (55) does not entail a benefactive, and the sentence in (56) does not entail a locative (presumably in the sense of an intended target).

(54) Brett fixed the fridge.
(55) Corey baked a cake.
(56) Dell threw the ball.

McConnell-Ginet (1982) makes the obvious argument against this entailment test in that "anyone can construct countless sentences that entail 'in some place or other'" (p. 166). This line of argumentation extends easily to time and manner adverbials if it is true that the proposition in (57) entails each of those in (58):

(57) Chris ate.

(58a) Chris ate in some place or other (real or imagined).
(58b) Chris ate at some time or other (real or imagined).
(58c) Chris ate in some manner or other.

This of course leads to the result that (59) is entailed by (57):

(59) Chris ate something.

In section 4.2.2.1, the distinction between structural entailment and knowledge-based entailment was used to argue for a transitive/intransitive distinction. Following from this, as discussed above, (57) does not formally entail (59); nor does (59) formally entail (57). Treating the sentences in (58) the same way, none of them are formally entailed by (57). Instead, their appearance is somehow sanctioned or licensed by knowledge-based inference. This makes the entailment test a 'slippery' one: judgment of entailment necessarily requires inferences based on understanding of the world. For example, by the entailment test, the prepositional phrase *to the church* in (60a) would be judged as a modifier since (60b) is a possible scenario, in which case (60c) is fine:

(60a) Jan walked to the church.
(60b) Jan walked aimlessly.
(60c) Jan walked.

However, the same phrase in (61a) would be an argument if (61b) is not a possible scenario:

(61a) Jan gave $100 to the church.
(61b) ?Jan gave $100, but he gave it to no one.
(61c) *Jan gave $100.

Returning to (60b), the salient point is that the lack of entailment of a goal, as expressed by *aimlessly*, primarily attributes something to *Jan*, the sentence subject. The sentence in (60c) still implicitly entails movement from point *a* to point *b*, whether *Jan*, the walker, intended point *b* as a goal or not. In order to truly express the lack of a goal, something like (60d) is required, which can be used to mean (60e):

(60d) Jan walked nowhere.
(60e) Jan didn't walk anywhere.

The string of words in (61b) may not be an acceptable sentence in isolation. There are, nevertheless, contexts in which it would be fine: for example, if Jan gave $100 to his own bank account and considered it a generous act of giving, another individual might report this by (61b). The *to*-phrase in the sentence in (61d) has the same Subject-oriented attribution as *aimlessly* in (60b). True lack of a goal has the same effect as for *walk*, as shown in (61e) and (61f):

(61d) Jan gave $100, but he gave it to no one in particular.
(61e) Jan gave $100 to no one.
(61f) Jan didn't give $100 to anyone.

There are two points to all of this. The first is that judging what is entailed and what is not entailed in Dowty's entailment test is highly subjective, to the point of being arbitrary. The second point is that while *walk* and *give* show similarities, there remain the following data which deserve an explanation:

(62a) Jan walked.
(62b) *Jan gave.
(62c) *Jan gave $100.

In sections 4.2.3 and 4.2.4 below, one solution to the problem of the data in (62) is provided. This solution has two parts. The first part (§4.2.3) is based on Larson (1988), 'Implicit Arguments in Situation Semantics', and proposes that omissible adverbials remain implicit by virtue of the event type. The second part of the solution (§4.2.4) proposes that the obligatoriness of certain adverbials is pragmatically controlled, drawing on work by Fillmore (1986) and Groefsema (1995).

4.2.3 'Implicit Arguments in Situation Semantics' – Larson (1988)

In his 1988 paper 'Implicit Arguments in Situation Semantics', Richard Larson offers a solution to the problem of the overlap of optional arguments and adjuncts. He specifically considers phrases of source, goal, path, instrument, and agent, as in the examples in (63):

(63a) Andy ran (from the house).
(63b) Beau walked (to the store).
(63c) Corey jogged (along the highway).
(63d) Dana sliced the bagels (with a knife).
(63e) Francis was attacked (by a German shepherd).

The phrases in parentheses in (63) show a property of adjuncts in that they are freely omissible and a property of arguments in that they are not iterable (the iterability test is discussed in section 4.3). Larson's solution is that implicit arguments such as these "are phrases licensed by a form of extragrammatical 'inference' involving knowledge about events and the relationships holding among them" (Larson, 1988:169). Essentially, Larson transports ideas on thematic relations from Gruber (1965) and Jackendoff (e.g., 1972, 1976) into the framework of Situation Semantics (Barwise and Perry, 1983). Gruber and Jackendoff pointed out that the verb *give* is like a verb of motion such as *fly* in that both involve an object moving from somewhere to somewhere. Larson uses the notion of the 'event type' from Situation Semantics and writes (p. 175):

> I want to suggest that (utterances of) sentences involving "motion" verbs (*travel, go, fly, give, donate, change, mutate,* etc.) describe situations which are all linked to a common event type of "motion", E_{GO}, in which something x goes from y to z... Implicit argument phrases of goal, source, and path occurring in such [sentences] are licensed by the semantic contribution they make to E_{GO}; they saturate arguments of GO (Larson, 1988:175).

According to Larson, the link between a verb such as *travel* and one such as *give* lies in the event type E_{GO}, a situation type in which an entity is in one state at one point in time and in another state at a later point in time. For the verb *travel*, the beginning and final states are locations while for the verb *give*, the beginning and final states are possessors.

What this event-type analysis gives is an explanation for Dowty's subcategorization and entailment criteria. Instead of saying that the sequence of words in (64) is ungrammatical because *catch* does not subcategorize for an indirect object, one could follow Larson and say that *catch* does not denote an event of the type E_{GO}.

(64) *John caught a fish to Mary.

One advantage of making this move is that the prepositional phrase *to the church* in (65) and (66) is treated identically rather than as a modifier (locative) in (65) and as an argument (indirect object) in (66).

(65) Jan walked to the church.
(66) Jan donated $100 to the church.

The prepositional phrases in both (65) and (66) are 'licensed', or allowed to be there, because of the commonality between walking and donating events. The additional and exceptional stipulation that the verb in (66) subcategorizes for the prepositional phrase is unnecessary.

However, there still remains the puzzle of obligatory prepositional phrases which, when dropped, render sentences ungrammatical. In other words, there still needs to be an explanatory account of the contrasts in (67) and (68):

(67a) Laurie gave his address to Kim.
(67b) *Laurie gave his address.

(68a) Francis put the book on the shelf.
(68b) *Francis put the book.

Larson (1988) sidesteps these data by still maintaining syntactic subcategorization in the form of argument status for obligatory elements. He assumes that *give* is a three place verb so that if the indirect object, for example, is missing, "the sentence will then fail to designate a statement just as would any sentence with "missing argument". Hence the argument-like status of *to*-phrases in dative constructions is not sacrificed under this analysis" (Larson, 1988:183). In the pursuit of maintaining Davidson's treatment of all (predicate-modifying) PP adverbials as outside the structural core of the verb, an explanation for the non-omissibility of the prepositional phrases in (67) and (68) is provided, as promised, in the next section.

4.2.4 Pragmatically-Dependent Obligatoriness and Omissibility

Fillmore (1986) discusses a range of verbs which allow their arguments to be omitted in certain contexts. It is useful to have the goal of his discussion in mind since it is not obvious from the title of his paper, 'Pragmatically Controlled Zero Anaphora'. He concludes (p. 106):

> From the reality that omissibility phenomena of the sort discussed in this paper are tightly connected with specific senses of specific words, it seems unavoidable that (at least in these cases) closely related word sense must be listed separately in lexical entries.

The separate lexical entries would include information as to which of their arguments are omissible. In addition, the type of omissible argument would be lexically encoded—either as indefinite omissible, in which case the implicit argument would be disjoint in reference with anything in the discourse, or as

definite omissible, in which case the argument would be retrievable from the discourse context. Consider the examples in (69):

(69a) Fido ate.
(69b) What happened to my sandwich? Fido ate.

The context in (69b), for which Fillmore credits Adrian Akmajian, demonstrates that the implicit argument of *eat* must be "obligatorily disjoint in reference with anything saliently present in the pragmatic context" (p. 97). Thus, (69b) is not a well-formed exchange, according to Fillmore, and *eat* is lexically-marked as having an indefinite omissible direct object.

Fillmore (1986) goes on to discuss the special use of *give* in which it means CONTRIBUTE. This use of *give* and also *contribute* allow both their direct and indirect objects to be omitted "within an ongoing discourse in which the missing information can be immediately retrieved from the context" (Fillmore, 1986:97). Consider Fillmore's examples in (70) and (71):

(70a) I gave five dollars.
(70b) I gave to the United Fund.
(70c) I gave at the office.

(71a) I contributed five dollars.
(71b) I contributed to the movement.
(71c) I've already contributed.

The (a) sentences "can only be spoken in the middle of an ongoing interaction to someone for whom the identity of...the missing complement can be understood as something like 'to the movement that we've just been thinking about'"(Fillmore, 1986:98). The (b) sentences require the missing direct object to be unspecified. The (c) sentences accumulate the effects of (a) and (b) and so require an unspecified direct object (i.e., indefinite omissible argument) and an understood indirect object (definite omissible argument).

Groefsema (1995) takes issue with Fillmore's proposal, supplying the data in (72) and (73) as counterevidence:

(72) John brought the sandwiches and Ann ate.
(73) I always give books on birthdays.

Groefsema argues (p. 142) that (72) lacks the interpretation in (74) and that (74) is the expected interpretation if *eat* is lexically-marked for an indefinite omissible object:

(74) John brought the sandwiches and Ann ate something other than the sandwiches.

In (73), *give* allows for omission of its indirect object and it does not have the CONTRIBUTE meaning as in (70). This shows, contra Fillmore, that the GIVING PRESENTS meaning also allows for an omissible argument in context. Moreover, the implicit indirect object is indefinite, though is pragmatically interpreted as the individual who is having a birthday. The sentence in (75) has neither the CONTRIBUTE nor the GIVING PRESENTS meaning and might well be uttered with just the context that the speaker and hearer know who Jackie is.

(75) Jackie gives and gives and gets nothing in return.

Groefsema stirs in these additional examples containing the verb *put*:

(76a) Ann: I don't know how to finish this letter.
(76b) Sue: Why don't you put 'yours sincerely'?

(77) John, Bruce and Mary were playing a game which involved putting something on the table. John put his book, Bruce put his pipe, and Mary (put) her glasses.

What these examples show is that it is crucial to the obligatoriness test that the grammaticality judgment be made for the sentence in isolation. The

fact that it is possible to construe a context in which an ungrammatical sentence might be uttered is irrelevant to the test. Thus, most of the examples above would be ungrammatical because they are missing obligatory arguments. However, the question may be posed differently: "What exactly does non-omissibility of phrases for a sentence devoid of context show?"

An answer to this question is this: the phenomena that prepositional phrases of verbs such as *give* and *put* are obligatory are artifacts of the data and are the result of isolating sentences from their contexts. The obligatoriness reflects the minimal required information to make an utterance of any use. For *give*, this requires the goal of the giving event, and for *put*, this requires the locative. In context, the optionality of adverbials is dictated by at least two factors: (i) the relevance of the adverbial in relation to both the verb type and the context of its use, and (ii) the recoverability of the adverbial from the context. Bringing in these pragmatic factors severely weakens the optionality test. The iterability test is challenged next.

4.3 THE ITERABILITY TEST

Larson (1988:171-172) provides a concise explanation for the iterability test:

> Under a view standard since Frege, arguments have been taken to supply coordinates of properties or relations....Once such a value is provided, the relevant coordinate in the relation is "saturated"; hence the non-iterability of arguments....In contrast, adjuncts are standardly analyzed as functions on predicates or clauses...They supply no values to the relational structure of predicates, and so are optional. Furthermore, the combination of an adjunct with a predicate yields a predicate of the same type (e.g., a VP modified by a locative adverb remains a VP). This permits a modified phrase to be itself subject to modification; hence the iterability of adjuncts."

To demonstrate the iterability test, Larson and Segal (1995) use the example from Bresnan (1982:164), repeated here in (78):

(78) Fred *deftly* [Manner] handed a toy to the baby *by reaching behind his back* [Manner] *over lunch* [Temp] *at noon* [Temp] *in a restaurant* [Loc] *last Sunday* [Temp] *in Back Bay* [Loc] *without interrupting the discussion* [Manner].

This unusually long sentence contains three manner adverbials, three temporal adverbials, and two locatives, all arguably modifying the verb *handed* or the verb phrase *handed a toy to the baby.*

Compare this with Larson and Segal's (1995:469) examples of the restriction against multiple arguments:

(79a) *Jill admires Chris the student.
(79b) *Phil gave Fido this dog to Kumiko.
(79c) *Fred handed Barney this toy to the baby Alice.

The footnote to these examples is crucial: "In evaluating the examples..., care must be taken not to read the doubled phrases as parentheticals ("Chris, the student") or as modifiers ("baby Alice"). The latter have a very different semantics than arguments" (Larson and Segal, 1995:469 Fn. 2). What exactly these "different semantics" are is left unanswered. In any case, this section is concerned with the myriad of examples in the linguistics literature which demonstrate the existence of non-iterable adjuncts and iterable arguments. In other words, counterexamples to the iterability test abound. The examples indicate that the phenomenon of iterability depends not on argument versus adjunct status but on the type of semantic role which the phrasal element plays in relation to the verb (i.e., its thematic role).

4.3.1 Non-Iterable Adjuncts

It can be seen in the examples in (80) and (81) (from Bresnan, 1982:164) that only one agentive *by*-phrase is permitted while multiple locative *by*-phrases are possible:

(80) *She was admired by him by the President.
(81) She was sitting by him by the President.

(80) is ungrammatical on the reading where both *by*-phrases are intended as the passive agents (or experiencers) of the admiring. (81) is grammatical on the reading where the second *by*-phrase further specifies the location. The status of passive agents as adjuncts is certainly equivocal. Though they are always optional in English passive sentences and have even been said to be "optional in every language" (Grimshaw, 1990:145), this does not establish them as adjuncts due to the overlap with optional arguments in the test. Grimshaw (1990) designates passive *by*-phrases as 'argument-adjuncts', having an intermediate status. Without going into her reasoning, which makes use of the argument structure of nominals derived from verbs (e.g., *repression* from *repress; imprisonment* from *imprison*), suffice it to say that if they are argument-adjuncts, then the iterability test needs to be extended to include argument-adjuncts as non-iterable.

However, Bresnan points out the fact that "No more than one instrumental phrase can occur with a single verb" (1982:165) and contrasts (83) with (82):

(82) John escaped from prison with dynamite [= John used dynamite to escape from prison] (Bresnan, 1982:165)
(83) *John escaped from prison with dynamite with a machine gun.

Instrumental adverbials are typically taken to be adjuncts. They are always optional without rendering the sentence ungrammatical.[4] and they are not entailed by virtue of the meaning of the verb (Dowty, 1982:90; Bresnan, 1982:167). Instead of expanding the domain of 'argument' for which the non-iterability criterion is met, a reasonable tack is to identify the semantic roles of the elements which are non-iterable. So far, passive agents and instruments are the types of non-argument phrases which are not iterable. Now consider locatives and temporals.

One fact which often does not receive its due emphasis is that locatives and temporals are only iterable if they are compatible. Grimshaw (1990:148) points this out with the example in (84):

(84) *Pete destroyed the city on Tuesday on Wednesday.

Grimshaw comments that "multiple adjuncts [as in (84)] are ruled out, apparently because they occupy the same interpretive niche" (p. 148). The same holds for locatives as in (85), where Victoria and Vancouver are both names of cities:

(85a) *I saw Brett in Victoria in Vancouver.

Returning to the example in (78), repeated here in (86), it is clear that the multiple locative and temporal adverbials are completely compatible:

(86) Fred deftly handed a toy to the baby by reaching behind his back over lunch at noon in a restaurant last Sunday in Back Bay without interrupting the discussion.

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4 If they are omitted in contexts in which they are required (e.g., in response to a question "What did *x* use to *verb* (*y*)?") this reflects infelicity and not ungrammaticality.

4.3.2 Iterable Locatives and Temporals

Considering first the iterable locatives in (86), the fact that the first locative phrase is more specific than the second locative phrase, as shown more clearly in (87), might suggest that (87) is an elliptical form of (88), whereby the second locative modifies the first:

(87) Fred handed a toy to the baby in a restaurant in Back Bay.
(88) Fred handed a toy to the baby in a restaurant which is in Back Bay.

However, the specific to general order is not a constraint on multiple locatives, as shown in (89) and also by the example from Pollard and Sag (1987:136) in (90):

(89) Fred handed a toy to the baby in Back Bay in a restaurant.
(90) Kim and Sandy met in Baltimore in the lobby of the Hyatt in July.

The relative clause approach, in which the second locative in linear order modifies the first, fails for the sentences in (89) and (90).

That the order of locatives and temporals is free is noted by Pollard and Sag (1987) who write (p. 138):

> (spatio-temporal) locative adjuncts, for example, seem to be freely permutable without semantic effect....we might assume that locative adjuncts describe locations (spatio-temporal regions), with multiple locative adjuncts corresponding to the intersection of a set of locations (which would presumably be a location itself).

If this approach to iterable locatives holds for all locatives and not just locative adjuncts, then multiple, permutable locatives should be possible with *put*-type verbs. The sentences in (91), (92), and (93) seem to bear out this prediction:

(91a) Robin put the book on the dresser in the bedroom.
(91b) Robin put the book in the bedroom on the dresser.

(92a) Shannon installed a dishwasher in the basement in his home.
(92b) Shannon installed a dishwasher in his home in the basement.

(93a) Sam places flowers on Jo's grave in Ross Bay Cemetery every Friday.
(93b) Sam places flowers in Ross Bay Cemetery on Jo's grave every Friday.

Temporal adverbials of the sort which pick out a point or region of time, as opposed to duratives such as *for three hours* or *a long time*, show the same iterability and permutability, as demonstrated in (94) and (95):

(94a) Beau arrives at noon on Friday.
(94b) Beau arrives on Friday at noon.

(95a) Jaime heard the news after work on her way home last Friday.
(95b) Jaime heard the news after work last Friday on her way home.
(95c) Jaime heard the news last Friday on her way home after work.
(95d) Jaime heard the news last Friday after work on her way home.
(95e) Jaime heard the news on her way home last Friday after work.
(95f) Jaime heard the news on her way home after work last Friday.

Parsons (1990) observes: "It is a marvel of the modularity of time-constraining adverbials and frame adverbials [e.g., *during the war*] that permuting them in English sentences can have so little effect" (p. 220). He then illustrates this point with no less than twenty-seven permutations of sentences containing four temporal phrases; all of the sentences seem to be semantically equivalent.

4.3.3 Iterable Manner Adverbials?

Bresnan's sentence, repeated here in (96), has also been used as an instance of multiple manner adverbials modifying a single verb or verb phrase (Bresnan, 1982:164; Larson, 1988:171; Larson and Segal, 1995:468):

(96) Fred *deftly* handed a toy to the baby *by reaching behind his back* over lunch at noon in a restaurant last Sunday in Back Bay *without interrupting the discussion.*

It is important to note that the second and third italicized phrases in (96) are not necessarily manner adverbials. The *by*-phrase has the hallmarks of a means adverbial. Jackendoff (1990b:95) identifies *by* as the "most standard marker" for means expressions. In (96), *by* has a subordinating function (cf. Jackendoff, 1990b:96) in that the sentence *Fred reached behind his back* is embedded into the main clause. So, this phrase may well be a means adverbial and distinct from the manner adverbials.

Jackendoff (1990b:97-98) analyzes both *with* and *without* phrases as adjuncts of accompaniment. Like *by*, *with* and *without* have a subordinating function. In (96) the last phrase adds the meaning 'that interruption of the discussion did not accompany the event denoted by the main clause'. On this view of the sentence in (96), *deftly* is a manner adverb, *by reaching behind his back* is a means adverbial, and *without interrupting the discussion* is an accompaniment adverbial. The sentence, then, does not demonstrate iterability of manner adverbials.

This is consistent with Parsons' observation that "in English it is usually not grammatical to iterate adverbs of manner (*'She ran quickly smoothly'), so in these cases if we wish to indicate that one running was both quick and smooth the only option is to use surface conjunction" (Parsons, 1990:50 Fn.7). Parsons also withdraws his earlier example of a sentence with two manner adverbs, given here in (97) (from Parsons, 1970:324), on the grounds that *painstakingly* is a Subject-oriented modifier (such as *deliberately* and *willingly*) and not a manner adverb:

(97) John painstakingly wrote illegibly.

The sentence in (97) only has the reading that John was taking pains to write illegibly. In order to get the reading where John took pains to write and John wrote illegibly, conjunction of the manner adverbs is required:

(98a) John wrote painstakingly and illegibly.
(98b) John painstakingly and illegibly wrote.

One final point is that for verbs which take manner adverbs as arguments such as *treat* and *word*, iterability is not possible. The examples in (99) and (100) demonstrate this:

(99a) Brett treated Laurie *(shabbily).
(99b) *Brett treated Laurie shabbily poorly.
(99c) Brett treated Laurie shabbily and poorly.

(100a) Lindsay worded the letter *(carefully).
(100b) *Lindsay worded the letter carefully tactfully.
(100c) Lindsay worded the letter carefully and tactfully.

In light of the data discussed in this section, assessment of the iterability test indicates that passive agents, instrumentals, and manner adverbials are not iterable. On the other hand, locatives and temporals are iterable. This cuts across the argument/adjunct distinction, an ironic finding since the iterability test is meant to probe the distinction.

4.4 SUMMARY

In section 4.1.2, Davidson's comments were interpreted as arguing that the obligatory *to*-phrase of a verb such as *give* would be treated no differently than the optional *to*-phrase of a verb such as *fly*. Following Larson's (1988) suggestion, both *to*-phrases are licensed by virtue of the event type E_{GO}. In Davidson's logical form, the *to*-relation is separate from the core predicate for both *give* and *fly* and, as a result, there is an entailment of the *giving* or *flying* event without naming the goal. In other words, a truth value may be

assigned to events of *flying* and, more importantly, to events of *giving* without requiring that the goal be specified. In certain contexts, *give*-sentences which have an unspecified goal (though it is implicit by virtue of E_{GO}) are interpretable.

As a summary, the situation for the *to*-phrase of *give* will be extrapolated to the obligatory locative adverbial of *put*. A Davidsonian representation of the sentence in (101) is given in (102), making use of Parsons' 'target' predicate (cf. Parsons, 1995:636):

(101) Francis put the book on the shelf.
(102) $(\exists x)$(Put(Francis, the book, x) & $\text{On}_{\text{TARGET}}$(the shelf, x))

An event type for *put*—which might be, for example, one of causing a result (or a resultative)—would license a result phrase, which for *put* is often a locative (target) phrase. One of the structural entailments of (102) is given informally in (103), which amounts to the ungrammatical (104):

(103) There is an event x which is a putting of the book by Francis.
(104) *Francis put the book.

For events of the type which cause a result, if the result of the action is not specified then there is insufficient information in the 'sentence' and it is judged unacceptable. In discourse, the result of the action would need to be immediately recoverable from the discourse in order to be omitted from the sentence. It is difficult both to find and to create contexts in which this is the case. On the account here, though, this is due to events of *putting* being events of a resultative type.[5] It is not due to an underlying argument status of the locative of *put*. As has been argued in this chapter, the argument/adjunct distinction is not a robust one, at least for two of the better known, theory-neutral tests.

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5 Or whatever event type turns out to be the suitable primitive in Situation Semantics (Barwise and Perry, 1983).

CHAPTER FIVE

5.0 CONCLUSIONS

The overall picture which hopefully has emerged from the discussion in the last four chapters is one in which there is a sharp line between adverbials which operate on sentences and adverbials which contribute to the meaning of a verb or verb phrase by placing restrictions or further specifications on the verb (phrase). The empirical consequence of this line is that there is a cluster of properties associated with sentence modifiers and different properties associated with predicate modifiers. Whether each cluster of properties is derived from a single property (e.g., quantificational scope, ability to create possible worlds) remains to be seen.

A theoretical consequence of this line between sentence modification and predicate modification is found in recent work of Robert Kasper (1995), specifically for the lexicalist framework known as Head-driven Phrase Structure Grammar (HPSG) (Pollard and Sag, 1987; 1994). Kasper proposes modification rules of two types: operator adverbial/adnominal rules for modifiers such as *apparently* and *former*, as in (1), and intersective adverbial/adnominal rules for modifiers such as *unintentionally* and *simple*, as in (2):

(1a) Bob apparently solved the problem.
(1b) a former senator

(2a) Bob unintentionally solved the problem.
(2b) a simple example

The difference between operator modifiers and intersective modifiers is captured by two different rule types.

Another way to capture the distinction between Kasper's operator modifiers and intersective modifiers exists in the discussion in chapter 3. By

aligning sentence modifiers with the operator approach to the semantics of adverbials and predicate modifiers with the Davidsonian approach, the differences in the two types follow naturally. Sentence modifiers are intensional in that they create possible worlds and so the power of the operator approach is required. Adverbials of this type are functions which map possible worlds onto truth values. Predicate modifiers are extensional in that they further specify, and thereby restrict, the occurrence of an event, be it real or imagined. The operator approach is not only unnecessary for predicate modifiers but it is too powerful, producing results which are semantically anomalous.

Unlike the line between sentence and predicate modifiers, the line between arguments and adjuncts is an elusive one. Chapter four showed that two tests for the argument/adjunct distinction, optionality and iterability, depend on a range of other factors such that an underlying argument versus adjunct status on adverbials is, at best, a misleading theoretical construct. Abandoning it allowed the Davidsonian approach to adverbials to be extended in a uniform way to adverbials traditionally thought of as arguments.

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On the Syntax and Semantics of English Adverbials

Author 

David Alexander McKercher
July 15, 1996