

Chapter 1

Introduction

This book explores a topic in “subatomic semantics,” a term I shall shortly explain. The thesis under investigation is that semantics of simple sentences of English require logical forms that are somewhat more complex than is normally assumed in investigations of natural language semantics. In particular, the semantics of a simple sentence such as ‘Brutus stabbed Caesar’ requires a form of at least the following complexity:

For some event e ,
 e is a stabbing, and
 the agent of e is Brutus, and
 the object of e is Caesar, and
 e culminated at some time in the past.

This form, which is typical, is dominated by an existential quantification over events. Since no such quantification is explicitly indicated in the sentence ‘Brutus stabbed Caesar’, I call it an “underlying” quantification. A main theme of the theory I investigate is that such underlying quantification over events (and states) is ubiquitous in natural language. This is a theoretical hypothesis which is to be justified by its fruitfulness in explaining a wide range of semantic characteristics of natural language. My goal is to describe these characteristics and to articulate a theory that explains them.

1.1 Background

In dictionaries and grammar books we are likely to find definitions such as these:

noun: A word that stands for a person, place, or thing.

verb: A word that expresses an action or state.

That explanations of this sort are so common suggests that they contain some insight. I am interested in giving that insight a useful theoretical characterization.

The semantics of nouns, as opposed to verbs, has received a great deal of scrutiny. We now know that the way in which nouns “stand for things” is a matter of some subtlety and complexity. A proper noun, such as ‘Kim’ or ‘Samantha’, refers to its bearer, which is indeed a “thing,” but common nouns such as ‘table’ or ‘giraffe’ do not stand for things of this sort; they stand for *kinds* of things. We do use common nouns to refer to particular things but only when the nouns are coupled with definite articles or demonstratives: ‘*the* table’, ‘*that* giraffe’. In addition, and of great importance, we also use them to quantify over things in phrases such as ‘some tables’ or ‘no giraffes’. A large part of the study of modern logic is taken up with the study of complex noun phrases of this sort.

In this book I assume that much the same is true of verbs; ordinary verbs stand for *kinds* of actions or states, and it is a matter of some complexity to formulate a theory of how we use them to talk about particular actions and states.

1.1.1 History of the Idea

The account I shall explore stems originally from the work of Panini, several centuries B.C. According to his account, in a simple sentence such as ‘Kim hit the tree with a knife’ the verb stands for some particular action, the nouns in the sentence stand for people or things, and the sentence asserts that those things stand in certain relations to the action. For example, Kim is the agent of the action, the knife is the instrument of the action, and the tree is the object of the action. This is very close to the account that I shall discuss, except that my account denies that verbs stand for particular actions. Although the view that verbs, like proper nouns, stand for particular actions can be defended, it is quite awkward when taken seriously in detail.¹

The proposal that verbs should be related in some way to events and states is found scattered throughout the history of philosophy. It is found, for example, in Plato,² and it surfaces in the *Port-Royal Logic*.³ It was effectively squelched early in this century by Frege’s ignoring it, and by Russell’s insisting on its secondary importance in semantics.⁴

The version I shall investigate takes verbs to be more like common nouns than proper nouns. On this view, the verb ‘hit’ in ‘Mary hit Fred’ does not stand for a particular action (a particular hitting); it stands for a kind of action, a kind that has particular hittings as its instances. The sentence as a whole says that *some* action of that kind took place, an action of the kind that had Mary as agent and Fred as object. A simple sentence using ‘hit’ says that a hitting took place, one using ‘eat’ says that an eating took place, and so on. This idea was first articulated, so far as I know, by Frank Ramsey, who said, ‘That Caesar died’ is really an existential proposition, asserting the existence of an event of a certain sort (Ramsey 1927).

Unfortunately, this is about all that Ramsey said on the subject, and it is not certain that his idea is the same as the one explored here. Hans Reichenbach gave an account (1947) in terms of facts (which he also called events), but it is too complex to profitably duplicate here. His account was then considerably modified by Donald Davidson (1967) into a theory in which verbs explicitly stand for kinds of events, so that a sentence containing such a verb states implicitly that an event of that sort takes place.

Davidson’s proposal has had less influence in philosophical semantics than it deserves, for three reasons. First, some saw the proposal as a mere detail in Davidson’s attempt to show how to formulate a Tarski truth-definition for English. This particular detail worked fairly well for that purpose, so the controversy quickly shifted elsewhere. Second, others saw the proposal not so much as an account of the semantics of natural language but as a clause in Davidson’s metaphysics of events and actions. It was judged therefore by its conformity or lack of conformity with preexisting opinions about actions and events—especially about their “identity conditions.” Thus the fruitfulness of the theory in accounting for a broad array of data concerning natural language was missed. Third, the theory failed to impress many workers in the semantics of natural language (including me) because we saw its only virtue as yielding an account of the semantics and logic of adverbial modifiers. And here, the theory fails to provide a *general* account; it works well for ‘in the bedroom’ but fails for ‘in a dream’, works well for ‘happily’ but not for ‘necessarily’, works well for ‘immediately’ but seems to fail for ‘slowly’—or at least this is what Davidson himself suggested, and most others have taken it for granted. The loss of interest in the theory is understandable but mistaken. No

theory of substance will work for all grammatical modifiers, for these modifiers occur in different categories, and they behave differently from one another. And the claim that the account fails for degree adverbs such as 'slowly' is, when carefully examined, far from obvious. Further, plenty of linguistic constructions in addition to adverbial modification can be well accounted for by positing underlying quantification over events. That is the view I articulate in this book.

1.1.2 The Theory

The theory to be investigated begins by combining Panini's and Davidson's.⁵ The basic assumption is that a sentence such as

Caesar died

says something like the following:

For some event e ,

e is a dying, *and*

the object of e is Caesar, *and*

e culminates before now.

In the symbolism of symbolic logic this becomes

$(\exists e)$ [Dying(e) & Object(e , Caesar) & Culminate(e , before now)]

↑ ↑ ↑ ↑
DEFAULT VERB SUBJECT TENSE

The three things blatantly present in the English sentence—subject, verb, and tense—become separate conjuncts constraining the event of Caesar's dying. The verb indicates that the event in question is an event of dying. The subject indicates that Caesar is the object of that event. (The notion of 'object' is discussed in detail in chapter 5 under the rubric 'theme'.) The tense indicates that the event in question culminated before the time of utterance of the sentence. ('Culmination' is discussed in chapter 3.) Throughout most of the preliminary discussion in these first few chapters I shall ignore tenses; I discuss them first in chapter 3 and more fully in chapters 11 and 12.

In the absence of other sources of event quantification, the event variable in question is existentially bound, with scope as narrow as possible. Other options are discussed in chapter 11.

This analysis of 'Caesar died' is considerably more complex than the symbolization normally taught in logic books, which (ignoring tense) is simply

$D(c)$,

where the 'D' represents 'died' and the 'c' represents 'Caesar'. The two proposals are not incompatible, however, for the former can be seen as a more refined version of the latter. If we view the traditional formula 'D(x)' as a crude form that fails to display all the logical structure in question, then a more refined analysis of the logic text formula 'D(x)' is

$(\exists e)[\text{Dying}(e) \ \& \ \text{Object}(e,x)]$.

Assigning this refined structure to the logic textbook account yields the proposal stated above.⁶

The proposed form is, however, considerably more complicated than the traditional symbolization. The topic of this book is whether, and why, the additional complication is necessary. The answer I propose is that the additional structure provides a nice account of various phenomena concerning language, including

- The logic of modifiers: logical relations among sentences such as 'Brutus stabbed Caesar in the back' and 'Brutus stabbed Caesar' (e.g., that the former entails the latter).
- The semantics of perception statements, including the relation between 'Agatha saw Brutus stab Caesar' and 'Agatha saw the stabbing of Caesar by Brutus'.
- The semantics of causatives and inchoatives: Why, if Mary will open the door, the door will open, and why this in turn entails that the door will be open. (In traditional logic these three uses of 'open' are symbolized as three completely independent predicates.)
- Relations between the explicit ways in which we talk about events and our sentences that do not appear to involve explicit reference to events at all. E.g., between 'A flight over the pole by a Norwegian took place in May 1926' and 'A Norwegian flew over the pole in May 1926'. Or between the NP 'every violent destruction of a city' and the VP 'violently destroyed a city'.⁷ Included in this topic is the relation between the semantics of adjectives ('slow') and their corresponding -ly adverbs ('slowly'), and between verbs ('sing') and gerunds used as common nouns ('the singing').
- The relation between "causative" sentences with events as subjects (such as 'Mary's singing broke the window') and the same sentences with agents of events as subjects ('Mary broke the window'). Why, e.g., does the former entail the latter?

These topics, and a host of others, can be addressed by a theory of underlying events and states. There is a wealth of data in our native

tongue just waiting to be explained; the hypothesis of underlying events and states explains a great deal of it, provided that that hypothesis is suitably developed. There is also a wealth of data about language in old-fashioned grammar books, couched in terms of 'event' (or 'action') and 'state'.⁸ Many observations about language couched in this terminology have been ignored as a consequence of recent advances in the study of syntax that assume syntax to be autonomous from semantics. This may be appropriate for those who work in syntax, since the observations I have gathered are mostly semantical or pragmatic in nature. But since this book is in semantics, they often prove fruitful for my task.

1.2 Subatomic Semantics

In formal logic, formulas are divided into two sorts: *atomic* formulas, from which all the rest are generated, and *nonatomic* formulas that are generated from the atomic ones, usually by means of quantification (universal or existential quantifiers: '(x)', '(∃x)'), or by combination with connectives ('&', '∨', '¬', '→'), or by the addition of operators (e.g., modal operators representing 'necessarily' and 'possibly'). This idea has generally been carried over to the study of natural language, and there are now fairly firm customs about what things count as atomic formulas of English, so far as their semantics is concerned. These "atomic formulas of English" are phrases like 'x is tall' or 'x stabbed y'. The literature in philosophical logic is full of discussions about how to combine these atomic formulas with other things so as to produce sentences. The "other things" include the English version of quantification with NPs ('Every boy'), modification with sentence operators ('Necessarily', 'Allegedly'), amalgamation with connectives ('and', 'or', 'not'), and embeddings into that-clauses. The topic of this book lies primarily elsewhere. I want to investigate certain aspects of the *subatomic* structure of the atomic formulas of English that these other studies take as their inputs. I do not dispute that 'x stabbed y' is an atomic formula of English, nor do I dispute that it contains two variables and a constant part. I merely want to investigate the structure of the constant part in more detail. This enterprise leaves traditional theories of language mostly untouched and unchallenged. Indeed, I presuppose traditional accounts of quantification, connectives, sentence modification, and so on, as means of getting from the atomic structures I investigate to a more complete theory of English. I do not

doubt, for example, that 'Allegedly, every boy dated a girl' has a semantic structure something like

$$\begin{array}{ccccccc} \text{Allegedly} & (x)(B(x) \rightarrow (\exists y)(G(y) \ \& \ x \text{ dated } y)), \\ \uparrow & \uparrow & \uparrow & \uparrow \\ \text{Allegedly} & \text{every-boy} & \text{some-girl} & \text{dated} \end{array}$$

(where 'Allegedly' is a sentence operator; I ignore tense for the moment). I am interested instead in whether there is some additional structure for 'x dated y', something like

$$x \text{ dates } y = (\exists e)(e \text{ is a dating} \ \& \ x \text{ is the agent of } e \ \& \ y \text{ is the object of } e).$$

I believe there is. What this additional structure consists in forms my primary subject matter.

I *will* take issue with one part of the established tradition. The remarkable interest and success in handling portions of the semantics of language in terms of sentential operators, such as in modal logic, have lured people into applying the technique of operators too extensively.⁹ In particular, scope-bearing operators have been used to analyze many things that should be handled differently, including verb modifiers, causatives, and the special characteristics of the progressive and perfect aspects. These matters will be addressed in later chapters.

1.3 Methodology

My methodology regarding events differs from that of the main philosophical tradition. Philosophers typically begin with general hypotheses about events, gleaned from intuition and first principles. The principles include views about, for instance, the identity conditions for events. These general principles are then brought to bear on a theory such as the one I investigate to test its adequacy. This usually results in a conflict between the principles and the theory, and in consequence the theory is rejected.

I have reservations about this type of approach. I usually lack the intuitions that others begin with, and I note that the writers in question rarely agree among themselves as to the truth about events. This gives me the courage to ignore their criticisms, at least temporarily, and to pursue a theory having implications for events that would be rejected by many of the main traditions. (Of course the literature contains a host of interesting examples that the theory will have to explain, and

so I cannot ignore the discussions, even if I am unmoved by the methodology.)

My approach is different. I begin with a mass of linguistic data to be explained and with the bare outlines of a theory for explaining it. I try to develop the theory in the best way possible to explain the data. Only at the end of the enterprise am I in possession of generalities about events. Conflicts between the resulting theory and views from the philosophical literature are discussed in chapter 8.

What are the linguistic data on which this theory rests? We are examining a semantic theory that tells us that certain sentences are true (or false) in certain circumstances. As native speakers of the language, we are authorities on whether these sentences really are true or false as the theory says, at least for ordinary sentences, such as 'There is beer in the refrigerator', as opposed to sentences such as 'Two events are identical if and only if they have exactly the same causes and the same effects'. I regard judgments about the former type of sentence as data, but not judgments about the latter. Existing theories of natural language tell us that if 'Agatha has a clever boyfriend' is true, then so is 'Agatha has a boyfriend'. A theory that makes many correct predictions of this sort has a claim to being taken seriously as a potentially correct theory of language. The theory I shall be considering makes predictions such as this: If 'Mary runs slowly' is true then so is 'Mary runs'. More ambitiously, if 'Mary fells a tree into the truck' is true then so are 'A tree falls', 'A tree falls into the truck', 'A tree will be in the truck'. (The theory does not say that Mary falls, or that Mary ends up in the truck, though the latter *will* follow from 'Mary climbs into the truck'.) A theory of language needs to explain these data. They should be seen as clear consequences of the theory, and then these consequences, as well as all others not envisioned in the formulation of the theory, need to be tested against further data. If the predictions are widespread and correct, then the theory deserves to be taken seriously. This, in a nutshell, is my method.

Unfortunately, things do not work out so neatly, primarily because most sentences are ambiguous. This fact has two consequences for my enterprise. First, since we, as native speakers, can see the ambiguity in a sentence, we thereby have additional data on which to base our theories. But the "data" also become much less datalike. If a sentence is ambiguous, then it makes no sense to call it "true" or "false" without qualification, but only "true on such and such a read-

ing."¹⁰ We are indeed capable of assessing theories on the basis of their consequences for "truth on a reading," and I rely on this technique. But it is considerably more difficult to articulate the methodology being employed when ambiguity is introduced into the data.

1.4 Logical Form

I seek a theory that describes the semantics of sentences of English, that is, the relations between words of our language and things in the world.¹¹ One convenient way of accomplishing this is to find a way to associate "logical forms" with English sentences. These "forms" will be sentences of a formal language that has already received a clear semantical treatment. The semantics of the English sentences in question will then be that of their associated logical forms. This intermediate route from the English to its semantics—via logical forms—is for the sake of convenience only. The semantics of the formal language I use (mostly the ordinary predicate calculus) is already widely known, and so I can presuppose a great deal of familiar work in formal semantics. It also allows me to finesse the problem of ambiguity. The semantics of an ambiguous language such as English is cumbersome to state directly; it is easier to assign unambiguous logical forms to sentences of English based on their various modes of generation.¹² For these two reasons alone I employ logical forms. If you prefer to avoid their use, you need only translate the logical forms into stilted English in the usual fashion. You will then be directly (rather than mediately) stating the semantics of the English sentences under study, suitably disambiguated.¹³

When I attribute a logical form to a sentence, part of the significance is that the sentence and the corresponding logical form are true in the same circumstances (ignoring ambiguity, and assuming identical interpretations of the parts of the sentence and corresponding parts of the form). Thus the whole theory might be reinterpreted in entirely different terms. Instead of thinking of L as the logical form of a sentence S, one could think of L as a sentence in a theory of events. The claim made in associating S with L is, as before, that they are true together. The result of the global association of sentences with forms then can be seen as a detailed articulation of a theory of events; the formulation within logical notation makes precise the logical structure of this theory, and its correlation with English sentences makes the consequences of this theory clearly identifiable in our own native tongue.

Other reinterpretations of the logical forms are possible as well. If I am successful in my enterprise, it should be possible to take the results of this work and convert them into several quite different frameworks.

With regard to many of the issues I address, we are still at the stage of needing *some* theory to account for the data. Once we have one, then we can consider formulating others and arguing about which is better. I do little theory comparison here, since we do not yet have the theories to compare.¹⁴ Thus I shall frustrate many readers for not having shown why my approach is the only correct one. Others will have to address this issue when more competing theories are available.

Chapter 2

The Evidence in Favor of Underlying Events

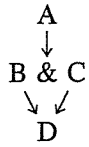
In this chapter I review various kinds of evidence in favor of the underlying event analysis, concentrating on its applications to event sentences, and leaving the issue of state sentences to a later chapter. I begin with no particular preconceptions about the nature of events. My methodology is rather to proceed in a scientific frame of mind: there are data to be explained, and we have in rough outline a theory that might be used to explain it. The final form of the theory will be tailored by the ways in which it meets the test of accounting for the data.

2.1 The First Kind of Evidence: The Logic of Modifiers

The first kind of evidence in favor of the underlying event analysis has to do with the logic of modifiers. Sentences containing grammatical modifiers bear certain logical relations to one another because of these modifiers. The evidence that the underlying event analysis accounts for these relations can be illustrated by the logical relations among these sentences:¹

- A Brutus stabbed Caesar in the back with a knife.
- B Brutus stabbed Caesar in the back.
- C Brutus stabbed Caesar with a knife.
- D Brutus stabbed Caesar.

The evidence that needs accounting for is that sentence (A) entails the conjunction of (B) and (C), but *not* vice versa, and that either of (B) or (C) alone entails (D). In diagrammatic form, the higher sentences in the following graph entail the lower ones, and not vice versa:



These connections (and lack of connections) are exactly the ones predicted by assigning to the sentences in question the forms described earlier:

- A' $(\exists e)[\text{Stabbing}(e) \ \& \ \text{Subj}(e,B) \ \& \ \text{Obj}(e,C) \ \& \ \text{In}(e,b) \ \& \ \text{With}(e,k)]$
 B' $(\exists e)[\text{Stabbing}(e) \ \& \ \text{Subj}(e,B) \ \& \ \text{Obj}(e,C) \ \& \ \text{In}(e,b)]$
 C' $(\exists e)[\text{Stabbing}(e) \ \& \ \text{Subj}(e,B) \ \& \ \text{Obj}(e,C) \ \& \ \text{With}(e,k)]$
 D' $(\exists e)[\text{Stabbing}(e) \ \& \ \text{Subj}(e,B) \ \& \ \text{Obj}(e,C)]$

Notice that it is important that (A) ('Brutus stabbed Caesar in the back with a knife') not follow from the conjunction of (B) and (C) ('Brutus stabbed Caesar in the back & Brutus stabbed Caesar with a knife'). Suppose that Brutus stabbed Caesar in the back with an icepick, and in the thigh with a knife. Then both (B) and (C) are true, but (A) may be false. (This is so even if the stabbings are simultaneous.) The logical forms get this right, and for the right reason: the conjunction of (B') and (C') does not require that the two stabbings (the one in the back and the one with the knife) be the same.

The account, of course, needs to be tested against a wide range of data, for it is not obvious that all verb modifiers follow this neat pattern. I cannot survey all the potential problem cases here, but two that are prominent in the literature deserve mention.

First, in many potential counterexamples the modifier in question is actually a sentence modifier. One illustrative example is 'nearly', as in 'Mary nearly hit John'. It is easy to see that if 'nearly' were treated as a predicate of events in this example, then the form would be wrong; it would tell us that if Mary nearly hit John, then there was a hitting of John by Mary that was "near," and this would entail that Mary actually hit John. The solution to this problem is to note that 'nearly' functions here as a sentence modifier, and so the theory under examination does not apply to it. (The distinction between verb-modifiers and sentence-modifiers is discussed in chapter 3.)

Second, the word 'partway' is a classic counterexample in the literature. (See, for example, Stalnaker & Thomason 1973.) If Mary closed the door partway, then it does not follow that she closed the

door, as it would if 'partway' were functioning as a predicate of events in the theory under investigation. Yet 'partway' does not appear to be a sentence modifier either. The solution is to see that 'partway' is actually a modifier of other modifiers, not of verbs. This is evidenced by its occurrence in sentences such as 'Mary pushed the door partway closed', in which 'partway' obviously modifies the adjective 'closed'. But a sentence such as 'Mary closed the door' is of a rather well-studied, complex sort; it is a classic "causative-inchoative" sentence, whose meaning is something like

Mary did something that caused the door to become closed.

It then seems plausible to suppose that 'partway' behaves in its usual way in 'Mary closed the door partway', and that the meaning of the whole sentence is something like

Mary did something that caused the door to become partway closed.

If this account is on the right track, 'partway' is not a verb modifier at all, and so it does not provide a counterexample to the theory. (Causative-inchoative constructions and their modifiers are discussed in chapter 6.)

The logic of modifiers affords a rich and complex pattern of inferences that needs explanation. The theory of underlying events does well for verb modifiers, whereas most other theories do not. I take this as some evidence in favor of the view. The evidence is not conclusive—far from it—but it is evidence nonetheless, and it is supportive. Discussion of the logic of modifiers, including critiques of alternative views, occupies most of chapter 4.

2.2 A Second Kind of Evidence: The Logic of Perceptual Idioms

A certain class of idioms has only recently received attention in the philosophical literature. An idiom of this sort is a sentence whose main verb is a perceptual verb that is followed by a clause having the structure of a simple sentence that is missing its tense. Examples are

A Mary saw *Brutus stab Caesar*.

B Sam heard *Mary shoot Bill*.

C Agatha felt *the boat rock*.

Each of the italicized phrases is just like a simple sentence except that the tense is missing.

The semantics of such sentences must be quite different from popular accounts of the semantics of “perceiving-that” constructions. Sentence (A), for example, differs radically from

D Mary saw *that Brutus stabbed Caesar*.

Not only are (A) and (D) logically independent of one another but their logical behaviors differ. For example, the contents of the that-clause in (D) are in an opaque context, whereas the contents of the italicized phrase in (A) are not. If Caesar is the emperor, then (A) entails that Mary saw Brutus stab the emperor, but (D) does not entail that Mary saw that Brutus stabbed the emperor.

It is fruitless to try to account for such idioms in terms of perception of the *participants* of the events that are perceived. That would be like trying to analyze perception of a melody in terms of perception of the notes constituting it. For example, although it might be plausible to analyze

John saw Mary run

as

John saw Mary & Mary was running (at that time),

the plausibility depends on the fact that ‘see’ is the perceptual verb and running is the activity.² Certainly it is implausible to try to analyze

John felt Mary shuffle her feet

as

John felt Mary & Mary shuffled her feet (then).

This gives neither necessary nor sufficient conditions. On the one hand, one might feel Mary shuffling her feet (for example, in a canoe) without feeling Mary. On the other hand, one might feel Mary (by placing one’s hand on her forehead) while she is shuffling her feet without feeling her shuffle her feet. (The proposed analysis incorrectly entails that if John felt Mary shuffle her feet, then he felt her do X, where X is anything at all that she did at that time.)

The underlying event analysis can easily be extended to account for these sentences by construing them as telling us that the subject perceives a certain *event*, an event of the sort picked out by the embedded clause. Thus (A) would have a form that says

There is a seeing whose subject is Mary and whose object is a stabbing of Caesar by Brutus,

or, spelled out in detail

$(\exists e)[\text{Seeing}(e) \ \& \ \text{Subj}(e, \text{Mary}) \ \& \ (\exists e')[\text{Stabbing}(e') \ \& \ \text{Subj}(e', \text{Brutus}) \ \& \ \text{Obj}(e', \text{Caesar}) \ \& \ \text{Obj}(e, e')]]$.

This is a version of an analysis discussed in some detail by James Higginbotham (1983) and Frank Vlach (1983) in independent papers; each argues that it is superior to accounts based on situation semantics. They both point out that the analysis passes a variety of tests proposed in Barwise (1981) for any adequate analysis of perceptual idioms.³

2.3 Implicit and Explicit Talk about Events

A third kind of evidence in favor of the underlying event analysis lies in the resources it gives us to explain the relationship between certain sentences that contain explicit reference to events and those that do not. For example, sentence (A) contains a phrase that explicitly refers to an event of singing, the phrase ‘the singing of the *Marseillaise*’, whereas there is no explicit reference to any event at all in (B):

└ explicit reference to an event

A After the singing of the *Marseillaise* they saluted the flag

B After the *Marseillaise* was sung they saluted the flag.

Yet these sentences convey almost the same information; the main difference being that a presupposition in (A) seems to be missing in (B): that there was only one singing of the *Marseillaise*.

This example also raises the related question of the relationship between a nominal gerund, such as ‘singing’, used semantically as a noun to designate an event, and the verb ‘sing’ from which it is derived. The underlying event analysis provides the means for a neat solution by proposing that nominal gerunds contribute the *very same* predicates to logical form as the verbs on which they are based.⁴ (In giving English versions of the logical forms of ordinary sentences, I have already been using such gerunds.) With this assumption, the definite description in sentence (A) can be symbolized in the ordinary fashion, assuming as before that the ‘of’ in ‘the singing of the *Marseillaise*’ indicates that the *Marseillaise* is the object of the singing in question. The logical forms are

A' $(\exists e)[\text{Saluting}(e) \ \& \ \text{Subj}(e, \text{them}) \ \& \ \text{Obj}(e, \text{the flag}) \ \&$

After(e, SM)],

where ‘SM’ is ‘(the e’)(Singing(e’) & Obj(e’, the M))’.

[“After the event that was a singing of the *Marseillaise*, there was a saluting of the flag (by them).”]

B' $(\exists e)[\text{Saluting}(e) \ \& \ \text{Subj}(e, \text{them}) \ \& \ \text{Obj}(e, \text{the flag}) \ \& \ (\exists e')(\text{Singing}(e') \ \& \ \text{Obj}(e', \text{the } M) \ \& \ \text{After}(e, e'))]$.

["After an event that was a singing of the *Marseillaise* there was a saluting of the flag (by them)."]

On any ordinary account of the logic of definite descriptions, (A') thereby entails (B'), and (B') will entail (A') if supplemented by the claim that there was at most one singing of the *Marseillaise* (by them).

This analysis also accounts for the relationship between certain adverbs ending in 'ly' and the adjectives from which they derive, such as the relationship between 'quietly' and 'quiet' in

C They sang the *Marseillaise* quietly

and:

D The quiet singing of the *Marseillaise* (soothed her ears).

Here again, the proposal that the adverb and related adjective contribute exactly the same predicate to logical form seems to give exactly the right results.⁵

These relationships in form between verbs and the nominal gerunds derived from them, and between adjectives and the 'ly' adverbs derived from them, cannot be seen as some gigantic coincidence; a principled theory is needed to account for them. The underlying event theory does so in a natural manner. In chapter 7 I discuss further this additional evidence in favor of the theory.

2.4 Explicit Quantification Over Events

It is a commonplace in philosophical logic that where there is reference there also is quantification. This suggests that we might fruitfully test for implicit quantification over events (in underlying logical form) by looking for inferences linking it with explicit quantification over events at the surface. Here is an example

A In every burning, oxygen is consumed.

B Agatha burned the wood.

C Oxygen was consumed.

Intuitively, sentence (C) follows from (A) and (B); the problem is to account for why this should be so. On ordinary textbook accounts, there is no quantification in (B) or (C), and no reference to events by any phrase in either of them. Yet somehow the quantification over burnings in (A) is logically related to (B) and (C). The mystery dis-

solves in the underlying event approach. Following the recipes given above, the forms associated with (A) through (C) are

A' $(e)[\text{Burning}(e) \rightarrow (\exists e')[\text{Consuming}(e') \ \& \ \text{Obj}(e', O_2) \ \& \ \text{In}(e, e')]]$

B' $(\exists e)[\text{Burning}(e) \ \& \ \text{Subj}(e, \text{Agatha}) \ \& \ \text{Obj}(e, \text{wood})]$

C' $(\exists e')[\text{Consuming}(e') \ \& \ \text{Obj}(e', O_2)]$

And (C') follows from (A') and (B') in the predicate calculus.

2.5 Robustness

On the basis of the above analyses, it is fair to say that the underlying event account explains many different kinds of semantically important phenomena. I take this to be evidence in its favor.

Each kind of evidence is supportive in its own right, but *the ways in which these phenomena interact with each other are even more important*. Part of the pattern of robustness is that the theory accounts for data in several different epistemically independent domains. The different domains are then seen to interact in fruitful ways. For example, the domains include the logic of modifiers, the semantics of perceptual idioms, and relations between explicit and implicit talk about events. These three applications then interact to explain, for example, how 'Mary saw Brutus stab Caesar violently' entails 'Mary saw something violent'. That is the theory's robustness at work.