Introduction

I.1 ARGUMENT STRUCTURE

Verbs have meanings, and occur in meaningful contexts. What is the relation between the verb and the contexts it privileges, seen from the viewpoint of meaning? Theories of argument structure contribute to an answer, focussing on satellites of the verb that bind participant roles it implies. Constellations of the verb and such satellites are argument structures, our topic in this book.

Any clause centered on carry, for example, concerns an event of carrying – this much is a consequence of what the verb means. Any carrying involves both a carrier and what is carried, two participant roles – this much follows from what a carrying is like, no matter what we say about the verb. And now in (1), carry inhabits a transitive clause, with a subject and an object. True uses of the sentence require that, in the carrying it reports, Navin is the carrier and the chair is what he carried.

(1) Navin carried the chair.

These last facts – that carry can occur in a transitive clause, and that the clause has just this interpretation – are consequences of the grammar, nothing else. And it is facts like this that we aim to describe theoretically, in terms that allow for fertile generalizations. What exactly are the relations that the satellites bind in the meaning of the clause? What exactly are the relations that mediate this in syntax? And what exactly are the properties of the verb such that it can enter these dependencies?

A theory of argument structure answers these questions for each context a verb may occur in. In carry's case, this includes sentences like (1), and also those of the sort listed in (2).

(2) a Navin carried the chair down Beverly Drive.
b His knapsack carried a thermos.
c Those chairs don't carry so easily.
d The chair was carried by Navin.
e Constantly carrying the chair will wear Navin down.

The theory should also account for those contexts that do not allow the verb. Carry is excluded from the contexts in (3), for example.

(3) a * Navin carried.[1]
'Navin carried something.'
b * The chair carried.
'Something carried the chair.'
c * Navin carried the chair his thermos.
'Navin carried the chair and his thermos.'
d * Navin carried his elbow sore.
'Navin made his elbow sore by carrying something.'

This all paves the way for questions of greater generality. Surely the facts about carry are instances of broader patterns, both within English and cross-linguistically. Our analysis should be in a vocabulary that allows us to state these. The goal, as always, is to put the analysis in terms that help us to understand the human capacity for language, and the way we acquire a language in childhood (Chomsky 1965).

In studying argument structure, therefore, we study the relation between predicates and their arguments, generally abstracting both from details of morphology, and from non-local syntactic dependencies, areas covered by other books in the Key Topics series.

I.2 OUR APPROACH

This book is not a treatise on one theory of argument structure, or an impartial review of several. It is an analysis of the elements for any such theory, both syntactic and semantic. Textbooks on syntax or semantics can only skim our topic quickly. Monographs may drop us into the middle of a debate among specialists. There is a need, I think, for something in between, a book that engages the specialist's issues by concentrating on fundamentals, building from the ground up. This approach has two different purposes. One is to provide a foundation on which

[1] Judgments of acceptability are always relative to a given interpretation. The asterisk in (3a) indicates that Navin carried cannot be used in exactly the same way as Navin carried something. There are other interpretations, however, relative to which Navin carried is an acceptable sentence. Relative to a game of basketball it can mean that Navin dribbled the ball after allowing it to come to rest in his hands. In the argot of American gun law, it can mean that Navin carried a gun. And sometimes it can be used anaphorically, exploiting a contextually given restriction on what is carried; for example, when discussing a task known to involve two components, carrying boxes and loading boxes, one can use Navin carried to mean that Navin carried boxes. Yet none of these possibilities changes what is reported in (3a).

diverse hypotheses about argument structure can be understood and evaluated, neutralizing parochial differences. The other is to stimulate new thoughts on what the right theory might look like. Sometimes the biggest ideas come from scrutinizing what seems elementary.

In particular I will focus more than usual on the argument relation itself, taking my inspiration mainly from Dowty (1989), Parsons (1990), Schein (1993, 2002, 2012), Kratzer (1996, 2000, 2002, 2003, 2005) and Pietroski (2005a). What sorts of relations, syntactic and semantic, go under the heading of *argument*? What sorts of semantic interpretations are associated with arguments? And how do these match up with the syntax? These are my main interests, and I think they deserve a sustained but introductory treatment in contemporary terms. They also provide a basis for further issues. What semantic classes of verbs occur in which argument structures? What is the right analysis for a particular argument structure, such as unaccusative, passive, middle or resultative? And are some argument structures derived syntactically from others? I will address some aspects of these questions in later chapters. But they are already a central focus of many excellent books, including Jackendoff (1990), Goldberg (1995 and 2006), Levin and Rappaport Hovav (1995 and 2005), Hale and Keyser (2002), Borer (2005) and Ramchand (2008). Again, I would like to add something that I think is missing: a guide to the elements of argument structure.

Two aspects of my perspective are best flagged at the outset, to prevent disorientation: it is both less lexical and more semantic than one might expect, given the topic. Argument structure is sometimes presented in isolation from phrasal syntax and semantics, as a part of the theory of the lexical items. But this can be misleading. What the theory aims to describe are relations between verbs (or other predicates) and satellites elsewhere in the clause. These are phrasal, clause-level dependencies. To describe such dependencies, we must of course fix the properties of the words they involve. But this is an intrinsic part of phrasal grammar, and not something separate. It goes hand in hand with designing the rules of syntactic and semantic composition: the two tasks are complementary. Certainly it may turn out in the end that the properties we assign to the words are complex and demand further analysis, lest generalizations be missed; and this will indeed put us in the province of Lexicon, a level of analysis whose domain is the primitives of Syntax. But this is just one possible outcome of the theory of argument structure, and not a necessity. It should not be mistaken for a definition of the topic. The topic is relations within phrases between predicates and semantically related satellites.

This attitude will express itself in many ways, and I will note two here. First, I deal openly and regularly with the compositional

semantics. Without this, it is simply not possible to understand what an argument structure is, or might be. As my medium, I use the predicate calculus, supplemented with lambda abstraction (as in Dowty 1979) and Davidsonian event variables (as in Parsons 1990). This notation is familiar, highly expressive and also perfectly clear, with a settled, textbook interpretation. This enforces an important standard of explicitness, not shared by all notations, but essential for stating and evaluating hypotheses. I present a brief primer in chapter 2; richer background can be found in Chierchia and McConnell-Ginet (1990), Gamut (1991) or Heim and Kratzer (1998).

Second, I do not simply presuppose that argument structures 'project' from the verb, rather than from other items in whose company the verb occurs. Instead I take this to be one of our major questions: is a given argument relation 'introduced' by the verb, or by a structure that the verb occupies? The first approach is expressed in many landmark works since the mid 1970s, including Dowty (1979), Chomsky (1981), Stowell (1981), Jackendoff (1990b), Grimshaw (1990), Hale and Keyser (1993) and Levin and Rappaport Hovav (1995). But the second is brought to the fore in Carlson (1984), Dowty (1989), Schein (1993), Borer (1994 and 2003), Goldberg (1995), Kratzer (1996), Marantz (1997) and Pylkkänen (2002), often echoing the earlier perspectives of Lakoff (1965, 1971) and McCawley (1971), which went briefly into abeyance after Dowty 1979 and Chomsky 1981. I feel the issue is not as well understood as it might be, and discuss it periodically throughout the book. It is the exclusive topic of Chapter 9.

I.3 CHAPTER SYNOPSIS

This book has four parts. Chapters 1–2 provide a background in syntax and semantics. Chapters 3–5 characterize the notion of argumenthood. Chapters 6–11 concern the semantic and syntactic analysis of argument relations. The book finishes with two case studies in Chapters 12 and 13. Let me now describe this in more detail.

I begin in Chapter 1 with the very general perspective I take in talking about syntax. I view grammar as the derivation of a 'big' expression from 'smaller' ones. Besides any features that serve to restrict the phonetic or semantic values of its tokens, any expression has a syntactic category, comprising features to which the rules of syntax may refer, generally having to do with distribution. I observe that theories of syntax most often share two properties that shape the theory of argument structure: they presume that the rules of syntax do not refer to very specific categories, such as 'transitive verb,' and that every primitive of

syntax is phonetically interpreted, if only as silence. But neither property is necessary, and their absence characterizes what are sometimes called construction-based theories.

Chapter 2 is a primer on relevant aspects of semantics. Getting clear here is essential. We talk about 'meaning' in many different ways, and the differences often matter to theories of argument structure in particular – far more than to theories of movement, for example. I distinguish between objectivist and mentalist theories; between meaning, value and semantic representation; between derived and underived structure; between semantic consequence and analyticity; and between various forms of indeterminacy, such as ambiguity and polysemy. At the end of the chapter, I establish my notation, namely the predicate calculus with lambdas and event variables, and review common rules of semantic composition.

With this background in place, the next three chapters explore three uses of the term *argument*: syntactic arguments, semantic arguments and implicit arguments. First up in Chapter 3 is syntax. Here arguments are dependents in a phrase that are 'selected' in relation to its head, as distinct from adjuncts. The most common implementation of this idea treats the 'selection' relation as projecting from the head, giving a lexicalist encoding of the argument relation. But nonlexicalist encodings are also possible, and I will review this alternative. Then I quickly discuss optionality and the internal–external distinction, as well as "Θ-roles," which are syntactic indices of semantic argumenthood. I finish with a review of how the argument–adjunct distinction might (and might not) be expressed observationally.

Chapter 4 concerns argumenthood in the domain of semantics. Here usage is detrimentally diverse, and distinctions need to be made. A dependent is a **functional argument** of a predicate when the predicate expresses a function that has the meaning of the dependent as an argument. A **content argument** of a predicate instantiates a relation that the predicate introduces into the derivation. A **participant argument** merely names a participant in the event that the predicate denotes.

Then in Chapter 5 we come to understand some of what goes under the heading of **implicit arguments**. Any clause entails many relations that correspond to no obvious part of its syntax. This alone warrants no grammatical recognition. So when is an entailed relation furthermore an implicit argument? This is a rich question that is often passed over, especially in introductory literature. In addressing it, I explore the important distinction between *existential* and *definite* implicit arguments, assembling and developing insights from Fillmore (1986), Partee (1989) and Condoravdi and Gawron (1996), among others. I then discuss the two major diagnostics of bona fide implicit argumenthood. First,

the availability of covarying readings in the scope of a quantifier, as in (4). Much of the data here is not widely known.

(4) a Nobody who put chips on a prime number won.
'No person$_k$ who put chips on a prime number won the bet he$_k$ placed in doing so.'
b * No ship purchased by a gangster was sunk less than three days later.
'No ship purchased by a gangster$_k$ was sunk by him$_k$ less than three days later.'

Second, the possibility of controlling infinitival adjuncts, as in (5). I foreshadow the claim I develop in Chapter 12 that the well-known argument on this basis is unsound: sentences like (5) do not necessitate a syntactic or semantic argument for the demoted subject of the passive.

(5) The ship was sunk to collect the insurance. (Roeper 1987)
'The ship was sunk so that its sinker might collect the insurance.'

Chapters 6–11 concern semantic analysis and how it matches up with syntax. The most common type of analysis is in terms of **thematic relations**. In Chapter 6 I say what these are, and why one might or might not want to use them. The chapter ends with a quick review of some popular inventories of relations. Chapter 7 follows on with a longer discussion of the most popular relations, Agent and Patient, the former as seen through the lens of instrumental subjects, as in This knife sliced the salami.

Chapters 8 and 9 consider how thematic relations align with the syntax. In Chapter 8, I ask why **role iteration**, as in (6), is impossible. Except perhaps in some special cases, the same semantic relation is never associated with two distinct dependents.

(6) * Nik smacked the table the chair.
'Nik smacked the table and the chair.'

Standard accounts follow Fillmore 1968 and Chomsky 1981 in excluding this via a grammatical constraint against assigning the same relation twice, such as Chomsky's "Theta Criterion." I argue against this, and instead defend the (partly) semantic account from Carlson (1984), Dowty (1989) and Schein (1993), according to which each dependent is interpreted as *exhausting* its semantic role, naming all of its satisfiers. On this view, (6) is unacceptable for the same reason that (7a) does not entail (7b).

(7) a Tony and Geezer lifted the amp and the piano.
b Tony lifted the amp.

In Chapter 9 I consider the choice between **projection** and **separation** of thematic relations: are they are introduced by the verb, or separately, by other items in whose context the verb occurs? I take

the position of a partisan, and review several arguments in favor of separation (Carlson 1984, Schein 1993, Goldberg 1995, Kratzer 1996, Borer 2003). But I do this critically, as in my view the most familiar arguments for separation are often among the weakest, while the strongest are the least-known. I try to give separation a fair hearing by criticizing the weak arguments and clarifying the strong.

In Chapter 10, I return to semantic analysis, with a discussion of **event structures**. An event structure is a decomposition of a predicate meaning into a relation between several distinct events. I review general arguments for and against such structure in the semantics, as well as the question of whether it is derived in syntax, reprising the issue of projection versus separation. Throughout, I focus on transitive clauses expressing changes, such as Floyd melted the glass. These are very often analyzed as meaning that one event caused another. But I give reasons to reject this analysis, following Pietroski 2005a.

Chapter 11 covers two topics. First, how do semantic relations instantiated by a dependent, such as Agent or Patient, align with grammatical relations, such as Subject or Object? This is the issue of **linking** or *alignment*. I review the common theories of linking, which agree in relating an ordering of semantic relations to an ordering of grammatical relations. They disagree in whether the semantic ordering is over traditional thematic relations (Gruber 1965, Fillmore 1968, Jackendoff 1972, Baker 1997), "aspectual" relations (Tenny 1987, Grimshaw 1990, Ramchand 1998, Borer 2005) or causal and mereological relations between events (Van Valin and LaPolla 1997, Rappaport Hovav and Levin 1998, Croft 2012). They also disagree in whether the mapping between orderings is "relative" or "absolute" (Baker 1997). A relative mapping relates a *set* of thematic relations to a pairing of these with grammatical relations, while an absolute mapping, as proposed in Baker's (1988) "Uniformity of Theta Assignment Hypothesis," relates each thematic relation to a single grammatical relation.

The second topic of Chapter 11 is **framing**. What are the argument structures in which a particular verb can occur, and how does this relate to its meaning? For instance, as Fillmore (1970) asked, why is hit acceptable in both (8) and (9), but not break?

(8) a John hit the fence with a stick.
b John broke the fence with a stick.

(9) a John hit a stick against the fence.
b * John broke a stick against the fence.
'John broke the fence with a stick.'

Here there are important cross-linguistic patterns. For example, we do not find a verb like the hypothetical scarry in (10), that means 'carry' but occurs in these sorts of contexts.

(10) a * The chair scarried Navin (down Beverly Drive).
'Navin carried the chair (down Beverly Drive).'
b * Navin scarried (down Beverly Drive).
'Navin carried something (down Beverly Drive).'
c * There scarried (down Beverly Drive).
'People carried things (down Beverly Drive).'

These generalizations in turn suggest hypotheses about language acquisition. Might the cross-linguistic patterns reflect learning biases in young children?

Chapters 12 and 13 conclude the book with case studies on passives and resultatives, giving us a chance to exercise what we have learned. In the chapter on passives, Chapter 12, my focus is on the status of the 'demoted subject,' the implied role corresponding to the subject of the active. Commonly, sentences such as (5) are taken to show that this role has (in some way) the status of ordinary argument, just one that is not realized with the form it has in actives. I develop a case against this conclusion, generally in agreement with Landau (2000). It leaves many facts unexplained, such as the implicit control of the infinitival clause in (11), and what does explain those facts also explains those which initially motivate the implicit argument theory.

(11) The ship was sunk. People were horrified. The only goal was to collect the insurance.

The chapter on resultatives, Chapter 13, focusses on their event structure, and the relation between arguments of the main verb and arguments of the complex predicate it inhabits. Resultatives like (12) suggest that there is a distinction, since the direct object of the clause is not an argument of sing, the main verb.

(12) Ozzy sang his throat hoarse.

Given this, we must say what an 'argument of the complex predicate' is, and how it relates to the main verb in cases like (13), where the cutlet seems also to be an argument vis-à-vis pound.

(13) Al pounded the cutlet flat.

As we will see, this modest question bears directly and consequentially on many issues discussed in earlier chapters: the syntactic distinction between lexical and structural arguments (Chapter 3); the semantic distinction between between participant arguments and content arguments (Chapter 4); the utility of highly general thematic predicates (Chapters 6 and 7); projection versus separation of thematic relations (Chapter 9); the event structure of change (Chapter 10); and the realization of thematic relations in syntax (Chapter 11).

Part I
Background