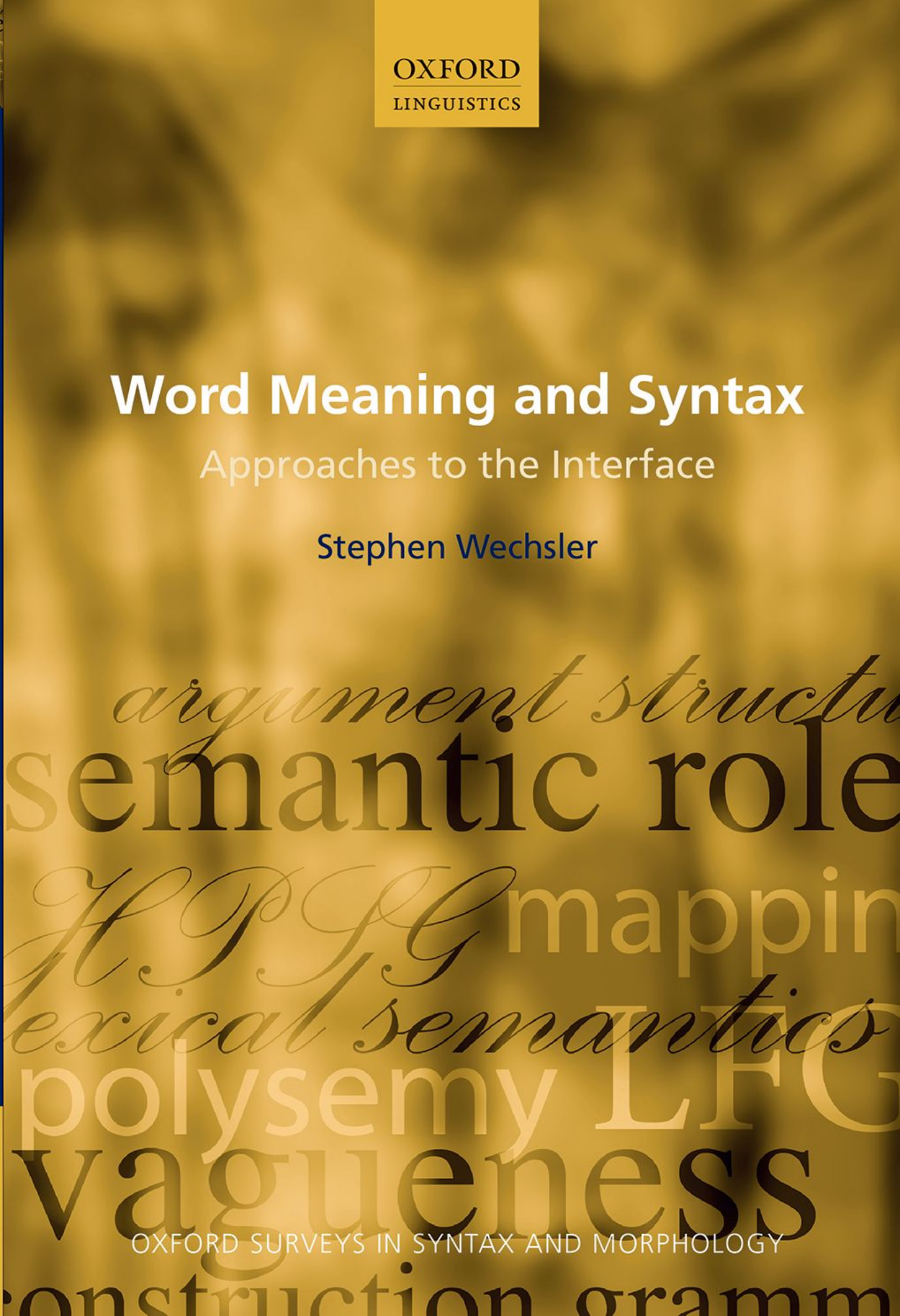
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# Word Meaning and Syntax

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# Word Meaning and Syntax

## *Approaches to the Interface*

STEPHEN WECHSLER

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# General preface

*Oxford Surveys in Syntax and Morphology* provides overviews of the major approaches to subjects and questions at the center of linguistic research in morphology and syntax. The volumes are accessible, critical, and up-to-date. Individually and collectively they aim to reveal the field's intellectual history and theoretical diversity. Each book published in the series will characteristically contain: (1) a brief historical overview of relevant research in the subject; (2) a critical presentation of approaches from relevant (but usually seen as competing) theoretical perspectives to the phenomena and issues at hand, including an objective evaluation of the strengths and weaknesses of each approach to the central problems and issues; (3) a balanced account of the current issues, problems, and opportunities relating to the topic, showing the degree of consensus or otherwise in each case. The volumes will thus provide researchers and graduate students concerned with syntax, morphology, and related aspects of semantics with a vital source of information and reference.

*Word Meaning and Syntax: Approaches to the Interface* addresses some of the most important issues concerning the syntax–semantics interface in contemporary linguistic theory, namely those concerning predicate argument structure. It provides an excellent critical overview of many approaches to these topics, starting with a discussion of the nature of word meaning itself and presenting a pre-theoretical survey of the major phenomena in this domain before delving into the different theoretical analyses.

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Düsseldorf

# Preface and acknowledgments

This book examines approaches to the interface between word meaning and syntax, focusing on the issue of how the arguments of verbs and other predicators are expressed in the syntax, an area generally known as 'argument structure' or 'argument realization.' The word 'approaches' in the book's subtitle refers to the various theoretical frameworks for modeling and understanding that interface. But it also refers to the two fundamental sides from which one must approach the interface: from the word meaning side and from the syntax side. Or one might prefer to say: from the meaning side and the form side. Addressing the approach from the meaning side requires us to face an ancient question: what is the meaning of a word? The main aspects of that problem, including polysemy, vagueness, normativity, and pragmatic context, cannot be ignored when we turn to the syntax interface. So those issues are reviewed first, before we look at argument alternations, and then finally delve into specific proposals for the lexicon–syntax interface.

This book project started during a period that I spent as a visiting scholar at Stanford University in 2005, with the help of funding from a Faculty Research Assignment grant from the University of Texas. I am grateful to both institutions, and to the many people who helped out with the book, and people with whom I had conversations that helped shape my thinking. Beth Levin was especially important in the early stages of writing, providing guidance and commenting on some early chapter drafts. There are very few people with as much expertise and experience in this area as Beth has, and I am grateful to her for her help. I am fortunate to have as the series editor Robert Van Valin, who has written extensively on this area and was able to give very detailed and perceptive comments on many aspects of the book. Two anonymous reviewers gave valuable comments on the prospectus. Katrin Erk's detailed feedback on Chapter 2 improved it greatly. John Beavers commented on the section on mereologies and affectedness, and we also discussed other aspects of the book. Stefan Müller is a co-author of Chapter 6, 'The lexical–constructional debate,' which is based on a paper we wrote that appeared as a target article in *Theoretical Linguistics* (the chapter appears here with the kind permission of the

journal). Stefan also generously read and reviewed other chapters of the book, and thereby saved me from making several errors. The people acknowledged in the *Theoretical Linguistics* article were also helping me with this book, perhaps without knowing it. These include Colin Bannard, Judith Meinschäfer, Frank Richter, and Dieter Wunderlich, who commented on a draft.

I am particularly grateful to my teacher, mentor, friend, and colleague Ivan Sag, who has been a major influence on my thinking in this area throughout my career. Ivan died in 2012, before this book was quite completed, and the field of linguistics is much the poorer for the loss. Ivan never stopped asking the important questions, and his answers shaped our understanding of syntax and its relation to semantics. In fact, the collaboration with Stefan Müller grew out of an online discussion initiated by Ivan. In addition to Ivan, Stefan, and myself, that discussion included Bill Croft, Charles Fillmore, Adele Goldberg, Paul Kay, and Jean-Pierre Koenig.

Students in my Fall 2010 seminar on Word Meaning (namely Telma Can Pixabaj, Luis Chacartegui, Zach Childers, Ashwini Ganeshan, Maggie Gemmell, Juwon Lee, Sandra Markarian, Charles Mignot, Michael Speriosu, I Nyoman Udayana, and Ahmed Zaheed) were subjected to drafts of Chapters 1 and 2. I have discussed various issues in this book with a number of other scholars, including Heidi Harley and Richard Larson.

The world's leading expert on the complex interactions between the writing of this book and my overall mood is my wife, Marie Carmel. I am grateful to Marie for her support, without which I might have given up a long time ago.

# List of abbreviations

| | |
|---|---|
| ABS | absolutive case |
| ACC | accusative case |
| ACT | Actor (in RRG) |
| AGT | agent |
| ANTIP | antipassive |
| APPL | applicative |
| ARG-ST | argument structure (in HPSG) |
| ASC | argument structure construction |
| ASP | aspect |
| AUX | auxiliary |
| AV | Actor voice (in Austronesian languages) |
| AVM | attribute-value matrix |
| C | complementizer |
| CAT | category |
| CAUS | causative |
| CG | Categorial Grammar |
| COMPL | completive aspect |
| COMPS | complement list (HPSG feature) |
| DAT | dative case |
| DEC | declarative |
| DEF | definite |
| DIR | directional |
| DN | derived nominal |
| DO | double object |
| DS | different subject |
| DTRS | daughters (HPSG feature) |
| ECM | exceptional case marking |
| ERG | ergative case |
| EXPL | expletive |
| F | feminine |

| | |
|---|---|
| FOC | focus |
| FUT | future |
| FV | final vowel |
| GEN | genitive case |
| GN | gerundive nominal |
| GPSG | Generalized Phrase Structure Grammar |
| HPSG | Head-Driven Phrase Structure Grammar |
| I.C. | Intrinsic Classification (in LMT) |
| iff | if and only if |
| IND | indicative |
| INF | infinitive |
| INGR | ingressive |
| INS | instrumental role or case |
| INTR | intransitive |
| IPFV | imperfective |
| LDG | Lexical Decomposition Grammar |
| LFG | Lexical-Functional Grammar |
| LMT | Lexical Mapping Theory |
| LOC | locative case |
| M | masculine |
| MaxEndpt | Maximal endpoint closed-scale adjective |
| MID | middle voice |
| MinEndpt | Minimal endpoint closed-scale adjective |
| MSE | Mapping to subevents |
| MSO | Mapping to subobjects |
| NFUT | non-future |
| NOM | nominative case |
| NPAST | non-past |
| OBJ | object |
| OBJ2 | secondary object |
| OBL | oblique |
| OM | object marker |
| OV | Objective voice (in Austronesian languages) |
| PASS | passive |
| PAT | patient role |

| | |
|---|---|
| PFV | perfective aspect |
| PHON | phonology |
| PL | plural |
| PO | prepositional object |
| POSS | possessor |
| PRED | predicate (LFG feature) |
| PRS | present |
| PST | past |
| PTCP | participle |
| REFL | reflexive |
| RN | relational noun |
| RRG | Role and Reference Grammar |
| SBCG | Sign-Based Construction Grammar |
| SC | small clause |
| SEML | semelfactive |
| SG | singular |
| SM | subject marker |
| SOA | State of affairs |
| SPR | specifier |
| SUBCAT | subcategorization list (HPSG feature) |
| SUBJ | subject |
| TAG | Tree-Adjoining Grammar |
| TOP | topic |
| TR | transitive |
| UND | Undergoer (in RRG) |

# 1

# The role of word meaning in syntax

## 1.1 The syntax–lexicon interface

Syntax, the system of rules for combining words into sentences, is greatly influenced by the meanings of those words. But the exact nature of this interface between word meaning and syntax remains one of the most controversial and elusive issues in contemporary linguistics. To understand the relationship between word meaning and syntax we first devise appropriate ways of modeling each of these two relata, and then proceed to explore the relation between those two models. Each side of the interface, word meaning and syntax, presents its own challenges. Syntax is probably more amenable to definitive statements of empirical fact. It is easy to show, based on an examination of written or spoken corpora, that in English a verb precedes its object while in Japanese a verb follows its object. Although there are various alternative ways to model syntax, there is little disagreement that these are important facts about the syntax of the respective languages. But unlike syntax, where we can consult the acoustic signal or the order of written words on a page, word meaning has no physical manifestation and is accessible mainly through the introspective judgments of speakers. When it comes to word meaning, there is often disagreement about the facts. Even before bringing syntax into the picture, word meaning is already a complex relation between language and the world it represents.

Syntax may be defined as the grammatical system for combining words into utterances, so syntax in this broad sense includes phrase structure, morphosyntax, and compositional semantics. While the study of word meaning has always been an important part of linguistics, it is the combinatorial system of syntax that began to receive a new level of attention and analysis with the advent of generative grammar. Chomsky's (1957) monograph *Syntactic Structures* demonstrated that

mathematical models could be applied to the study of this combinatorial system, allowing the formulation of precise, testable hypotheses. The central idea, dubbed "the autonomy of syntax," was that words belong to categories corresponding to traditional parts of speech such as Noun, Verb, Adjective, and Preposition, and that a language can be formally defined as a set of well-formedness conditions on structured combinations of such category symbols, thereby abstracting away from the meanings of the particular words themselves. A single word has rich, complex shades of meaning that interface with the extralinguistic world, while syntax, or at least an important aspect of it, is a hermetic, closed system that can be studied in isolation from the messy world outside. It was natural that the new science of linguistics would have placed its primary emphasis on combinatorics rather than words themselves. Similarly, an important part of the study of formal semantics allows for word meanings to be effectively reduced to constants like **drink'** for the word *drink,* that retain only a logical type, such as type ⟨e, ⟨e,t⟩⟩ for a transitive verb.

While the difficulty of modeling word meaning and the complexity of its relation to syntax pose a challenge, a look at cross-linguistic patterns reveals clear tendencies governing its relation to syntax. We know that in language after language, agentive sorts of semantic roles, such as the drinker role of the verb *drink*, are realized as subjects rather than objects—even if we cannot always say exactly what counts as an "agentive sort of semantic role." We can see that something is at work, even if we cannot say with certainty what that something is.

## 1.2 Predicate argument structure and its discontents

Speakers of English can be fairly confident that the object of the active verb *eat* represents the food or other thing that gets eaten, while the subject of *eat* represents the eater. This type of regularity, which is important for efficient communication, is immediately explained by the hypothesis that the lexical representation of the verb includes a "predicate argument structure": a lexical representation specifying the allowable associations between participant roles and dependent phrases for a verb or other predicator. Call this the "lexical hypothesis." The predicate argument structure for the verb *eat* indicates that its subject fills the eater role (the *agent*) and its object the role of the thing eaten (the *patient*):

(1) *eat* ⟨ agent patient ⟩

| |

SUBJ OBJ

This lexical representation is then handed to the system of English syntax, which specifies how subjects and objects are encoded, roughly speaking as NPs respectively preceding and following the verb. Most but not all theories assume that grammar includes lexical predicate argument structures in some form, varying however in the details.

But is this mapping between semantic roles and the phrases expressing them really built into the lexical representation of the verb? Or does it come about some other way? The evidence seems to cut in two directions. On the one hand there are strong generalizations obtaining across the lexicon. Many verbs with similar meaning have a parallel subject–object mapping: *consume*, *drink*, *devour*, and so on. More generally, as mentioned in the previous section, agents of active sentences tend to be expressed by subjects rather than objects. This suggests (to some researchers) that the mapping is dictated not by the lexical item *per se* but rather by constraints holding directly between the syntax and semantic interpretation. On that extra-lexical hypothesis, the fact that the "eater" role of *eat* is the verb's subject does not follow from the grammatical representation of the verb. Instead, the rules governing the relation between subjecthood and the denotations of clauses would require that in descriptions of eating type situations, the eater must be the subject. Such rules deal in notions like 'agent' and 'subject' (or 'external argument'), but bypass any direct mention of the verb *eat*.

On the other hand, there is also considerable lexical idiosyncracy in the expression of arguments, as in these contrasts:

(2) a. She ate it. / *She ate on it. / She ate.
b. *She dined it. / She dined on it. / She dined.
c. She nibbled it. / She nibbled on it. / She nibbled.
d. She devoured it. / *She devoured on it. / *She devoured.

(3) a. Susan trusts Mary. / *Susan trusts on Mary.
b. *Susan relies Mary. / Susan relies on Mary.

Indeed, it has been obvious from the start of the generative program that part-of-speech categories like Noun and Verb are insufficient to determine the distribution of words, since words vary in their transitivity

and, more generally, in their complement selection properties. Beyond the specification of major category, words belong to subcategories according to the morphosyntactic features of the complements they select. The pattern in (3) can be captured with the subcategorization frames posited below for the verbs *trust* and *rely*:

(4) a. *trust*, V. [ ___ NP]
b. *rely*, V. [ ___ $PP_{on}$]

The mapping to semantic arguments is made explicit here:

(5) a. *trust* ⟨ agent patient ⟩
| |
SUBJ OBJ

b. *rely* ⟨ agent patient ⟩
| |
SUBJ $OBL_{on}$

Here $OBL_{on}$ stands for a prepositional phrase headed by the word *on*. So subcategorization can be rather idiosyncratic, varying from word to word. In some languages this idiosyncracy is observed in subcategorization for subjects as well as complements, as in Icelandic lexically determined ('quirky') subject case (Zaenen et al. 1985).

These lexical entries represent the predicate argument structure as if it were an idiosyncratic property of each word, but this is only a useful first approximation. As noted, there are rather strong correlations, some cross-linguistic (e.g. agents tend not to be objects) and some language-specific (e.g. a particular English preposition such as *on* marks a certain range of semantic role types). This tension between idiosyncracy (in this case, lexical idiosyncracy) and rule-governed behavior leaves us on very familiar ground, as it is observed in nearly all areas of grammar, including phonology, morphology, syntax, semantics, and pragmatics. This property of the lexicon has been captured with formal devices such as default inheritance hierarchies and lexical rules with exception features.

Such lexical idiosyncracy suggests that the predicate argument structure is associated with a *word* after all. On that view, the argument–complement mapping specified in lexical structures could itself be governed by principles and language-specific rules, which would

explain the cross-lexical generalizations. Those principles and rules crucially involve *the meaning of the word* (here, the word *eat*), as opposed to the denotation of a particular utterance. (Recall that by contrast the *extralexical* hypothesis above bypassed any mention of the word.) The lexical and extralexical hypotheses imply different answers to the question of what sort of thing the meaning of a word is (see Chapter 2). Ultimately it is likely that both lexical and extralexical factors are at play in the grammars of natural language, and that many problems of language can be understood in terms of an interaction between the two.

## 1.3 Organization of the book

This book approaches the interface between word meaning and syntax from both sides of this relation. Chapter 2 comes at the problem from the lexicosemantic side, looking at word meaning in all its richness. Chapter 3 introduces the syntactic side, surveying verb classes according to patterns of complementation and especially complement alternations, and then reviewing findings on how these aspects of syntax relate to meaning. Chapter 4 reviews models of word meaning involving sublexical structure that is visible to the rules of syntax. Chapter 5 discuss various approaches to modeling the mapping between word meaning and syntax. The controversy between lexicalism and constructional approaches is discussed in Chapter 6, followed by some specific empirical domains for testing and comparing different theoretical approaches in Chapter 7.

# 2

# Word meaning

## 2.1 Introduction

To address the relationship between word meanings and argument realization, we must know what word meanings are, and how those word meanings figure into the theory of argument realization. This chapter primarily focuses on the problem of word meaning and some of the approaches to that problem. In later chapters we consider more directly the role played by word meaning in the theory of argument realization.

Word forms are typically polysemous, carrying a range of related senses. Decisions about where to draw the borders between senses can have crucial consequences for the study of the lexicon–syntax interface. Consider an analysis of the mapping between complement patterns and word meaning. When we associate a complement pattern with an aspect of the verb's meaning, must that aspect be observed in all uses of the verb? Or do we restrict attention just to certain 'prototypical' senses? Or just the sense relevant to the immediate context? (See Section 4.6 for examples.) Vagueness also poses an important problem. Rules for mapping from a word meaning to syntax must take account of the fact that speakers are typically uncertain about the boundaries of the word's denotation.

This chapter reviews various approaches to the problems of polysemy (Sections 2.2 and 2.3) and vagueness (Section 2.4). Then we consider theories of word meaning that place a heavy emphasis on the role of world knowledge (Section 2.5), before concluding (Section 2.6).

## 2.2 Words and senses

### *2.2.1 Homonymy, polysemy, and generality*

Cruse (1986: 50ff.) observed: 'One of the basic problems of lexical semantics is the multiplicity of semantic uses of a single word form

(without grammatical difference).' Words are said to be 'polysemous': each word form has a range of meanings that are related, whether closely or distantly. With the proviso 'without grammatical difference', Cruse is limiting his attention to variation exhibited by a single part-of-speech category, putting aside cognates such as the noun *chair* versus the verb *to chair*, as in *to chair a committee*. Polysemy is ubiquitous, 'the rule rather than the exception' (Cruse 1986: 50).

Traditionally a distinction is drawn between 'homonymy' and 'polysemy'.[1] Two words are homonyms if they accidentally take the same phonological shape but are unrelated in meaning, such as *light* in weight versus *light* in color, or *bank* 'financial institution' versus *bank* 'side of a river'. However, the line between homonymy and polysemy is not always easy to draw. For example, while the latter example of *bank* has become a standard example of clear homonymy, we will see below that even for this example the situation is not entirely clear-cut.

In contrast to homonymy, polysemy involves meaning variation, such as *bank* as 'financial institution' (1a) versus *bank* as 'physical building housing a financial institution' (1b) (Pustejovsky 1995):

(1) a. The bank raised its interest rates.
b. John walked into the bank.

This example of polysemy differs from homonymy in two respects. First, the financial institution and the building housing it are clearly related, while in contrast there is no apparent relation between financial institutions and riversides (but see Section 2.2.1). Second, the polysemy relation connecting the two uses of *bank* in (1) is systematic. A parallel polysemy can be found across virtually all English words and phrases refering to buildings that house institutions, including even proper names such as *Austin City Hall*, *The University of Texas*, *The Performing Arts Center*, and so on:

(2) a. The University of Texas raised its tuition rates.
b. The University of Texas is located several blocks north of the state capitol building.

[1] Regarding 'homophony' versus 'homonymy': Homophones have the same sound (*break* ~ *brake*); homographs have the same spelling (*bow* of a ship ~ *bow* and arrow); and homonyms have the same sound and spelling (the dogs *bark* ~ the *bark* of the tree). As long as we are concerned with spoken language, the terms homophony and homonymy are interchangeable. But some reading studies are described below.

This alternation (*institution X ~ building that houses X*) is an instance of 'systematic polysemy', since the relation is regular within the language (see Section 2.3.1).

Not all polysemy is similarly regular or systematic. Individual words are often extended to new uses that bear some semantic relation to the old ones. If these extensions catch on for a single word but fail to generalize to semantically related words of the language, they remain as isolated instances of 'idiosyncratic polysemy'. For example, Cruse (1986: 49–50) contrasts the different uses of the adjective *topless* in *a topless dress*, *a topless dancer*, and *a topless bar*. But writing in 1986 Cruse did not foresee the March 2008 coinage of *topless meeting* to refer to a business meeting where laptops, palmtops, and other portable electronic devices are forbidden.[2] The 2008 coinage is a play on *laptop* and presumably a deliberate *double entendre* based on the sort of uses Cruse referred to. For speakers using that coinage this is an example of lexically idiosyncratic polysemy. Such idiosyncratic polysemy is extremely common.

With idiosyncratic polysemy, one of the two criteria distinguishing polysemy from homonymy has been lost: idiosyncratic polysemy is not regular. The connection between senses may still be 'motivated', in that one can explain it after the fact (as in the case of *topless meetings*), while not being 'predictable', in the sense that a general rule applies (on this distinction see Lakoff 1987). This leaves only the criterion of semantic similarity. But if the connection between uses becomes opaque over time, due either to semantic drift or to changes in the extralinguistic world, then such cases of polysemy can grade off into homonymy. In fact, it is interesting to note that the two meanings of *bank* frequently cited to illustrate homonymy, 'riverside' and 'financial institution', are believed to have a common historical origin in a form denoting a 'shelf, natural or artificial, of earth, rock, sand, or wood' (*Oxford English Dictionary*, *OED*).[3] The bank of a river is such a shelf. Regarding the 'financial institution' sense, the *OED* notes that 'The original meaning "shelf, bench"... was extended in Italian to that of "tradesman's stall, counter, money-changer's table",... whence "money-shop, bank", a use

[2] 'Frustrated by distracted workers so plugged in that they tune out in the middle of business meetings, a growing number of companies are going "topless," as in no laptops allowed. Also banned from some conference rooms: BlackBerrys, iPhones and other personal devices on which so many have come to depend...' (from 'When it's hard to stay focused, try going 'topless' to meetings': *San Jose Mercury News*, March 25, 2008).

[3] Thanks to Katrin Erk for pointing out this example to me.

of the word which passed, with the trade of banking, from Italy into other countries. This connection between the two senses of *bank* is probably unknown to the vast majority of contemporary speakers of English, so for them this is a case of homonymy, not polysemy. But since polysemy can gradually evolve into homonymy, the line between the two categories is fuzzy.

To take another example, the noun *dial* originally referred to a sundial (from Latin *dies* 'day'), from which it was generalized to other clocks, then to instruments resembling clocks ('An external plate or face on which revolutions, pressure, etc. are indicated by an index-finger or otherwise'—*OED*). The verb *dial* refers to various actions involving dials, including the manipulation of a telephone dial to initiate a connection. With dial telephones now virtually obsolete, the verb *dial* is currently used for any action that initiates a telephone connection, including the caller pushing buttons or even a computer establishing a connection. New generations of speakers need not know that throughout most of the 20th century, telephone connections were established by turning dials, so the connection between *dial* 'initiate telephone connection' and *dial* 'turn a dial' may be expected to disappear from the mental representation of the language.

While polysemy is ubiquitous, the number of senses of a word is sometimes overestimated due to the effects of context. In a classic critique of *Webster's Third* dictionary, Weinreich (1964) argued that the dictionary's criteria for distinct senses are inconsistent and that many of the putative senses are merely differences of interpretation determined by different linguistic contexts for the word. For example, of the many senses of the verb *turn*, *Webster's* listed 'to reverse or upset the order or disposition of', which was illustrated with the example '[They] found everything turned *topsy-turvy*'. Weinreich (1964: 407) argued that this 'reversal' meaning comes from *topsy-turvy* and not from *turn*, noting that it evaporates if the adjective is omitted, while omission of the verb leaves the meaning intact: '[They] found everything *topsy-turvy*'. Similarly, the verb *have* is sometimes assumed to have different senses (or 'readings') for various so-called 'inalienable possessions' such as medical conditions (*have a headache*), mental states (*have a good idea*), or kinship relations (*have a sister*). But it may be that the relations are supplied by the noun, while the verb *have* is, as Weinreich said about *turn*, 'a semantically depleted connector' that does not vary in meaning across these different contexts (Partee 2008; Tham 2005; Wechsler 2008a; Beavers et al. 2008).

The grammatical connection between senses of a polysemous word form can sometimes be seen in irregular inflectional morphology. For example, the many verb–particle constructions using *take*, such as *take off* 'become airborne', *take off NP* 'remove (clothing)', *take on* 'adopt', while varying in meaning in apparently unpredictable ways, are clearly related, since irregular past tense forms are parallel: *take/took off*, *take/took on*. Similarly, *shoot up* has the same past tense form across very different senses in *The stock price shot up* and *The heroin addict shot up* (Koenig 1999: 122–3). Forms with such widely differing meaning that we may consider them to be a case of homonymy rather than polysemy, according to our definition, can nonetheless have identical morphological paradigms, as a consequence of a common etymology. For example, consider: *She draws/drew pictures.* ~ *She draws/drew her hand across his face.* What is shared between senses in this case is a tense paradigm (*draw/drew*), which is somewhat more abstract than a phonological form.

### 2.2.2 Linguistic tests for distinguishing senses

Distinct from both polysemy and homonymy is 'generality', where a word is simply general in its application. The word *sweater* can apply equally to red and black sweaters, for example, but 'red sweater' and 'black sweater' are not two different senses of the word *sweater* (Zwicky and Sadock 1975). Instead of 'generality' the term 'vagueness' is sometimes used, but I will reserve the latter term for the problem of boundary cases discussed in Section 2.4. This section looks at tests for distinguishing generality (a single sense) from polysemy/homonymy (multiple senses).

There is a long tradition of applying linguistic tests to distinguish between senses (Cruse 1986; 1995; Pustejovsky 1995; Zwicky and Sadock 1975). We have identified three different cases: homonymy (multiple unrelated senses); polysemy (multiple related senses); and generality (one sense). Linguistic tests for distinguishing senses usually involve test sentences in which the word in question appears only once but is applied to more than one referent. Among the ways that it gets applied to multiple referents are through ellipsis, *one*-anaphora, coordination, and relative clause constructions.

We begin with 'identity tests'. It is assumed that one word token referring to two different entities cannot have with a different sense for each respective referent. Taking our earlier examples, we can attempt to mix the 'riverbank' and 'financial institution' senses of *bank*:

(3) a. Mary is looking at a bank. John is (looking at one) too.
b. Mary and John each visited a bank this morning.

(4) a. Mary was wearing a sweater. John was (wearing one) too.
b. John and Mary were each wearing a sweater.
c. One of my teachers is pregnant and the other is a bachelor.

The examples in (3) are governed by a constraint that the two senses of *bank* must be identical. That is, it does not seem possible to give these sentences a 'crossed reading' in which Mary is looking at or visiting a riverbank while John looks at or visits a financial institution. This suggests that they are clearly distinct senses. In contrast, if we ask whether *sweater* is ambiguous or merely general with respect to color, (4a,b) shows that it is general, since there is no suggestion whatsoever that Mary's and John's sweaters match in color. The word sweater is just general, and not ambiguous, between 'black sweater', 'red sweater', and so on. Similarly, (4c) shows that *teacher* is general and not ambiguous between 'male teacher' and 'female teacher'.

Closely related to identity tests are zeugma tests. Zeugma is a metalinguistic trope that intentionally exploits polysemy, often for humorous effect, as in these examples (5a and b from Cruse 1986:13):

(5) a. [z] Arthur and his driving licence expired last Thursday.
b. [z] He was wearing a scarf, a pair of boots, and a look of considerable embarrassment.
c. [z] I heard a Californian student in Heidelberg say, in one of his calmest moods, that he would rather decline two drinks than one German adjective. (from Mark Twain, 'The Awful German Language')
d. [z] The Mad Hatter's riddle: 'Why is a raven like a writing desk?' Answer: 'Because Poe wrote on both.' (From Martin Gardner, *The Annotated Alice*, an answer attributed to Sam Loyd)

The symbol [z] indicates an introspective judgment that the sentence is 'zeugmatic'. The traditional term for this figure of speech is 'zeugma' or, more accurately, 'syllepsis'. 'Zeugma' originally referred more generally to cases in which a word is shared between clauses, regardless of whether it has different senses in each context, while 'syllepsis' specifically refers to those cases of zeugma in which the word appears in construction with two clauses 'while properly applying to or agreeing

with only one of them . . . *or applying to them in different senses* (e.g. literal and metaphorical)' (*OED* entry for *syllepsis*, emphasis added) The term 'zeugma' is now often used in this narrower sense, as equivalent to syllepsis, and more specifically, for the application of one word in different senses; that is how the term will be used here.

Clearly, for our tests to work our native speaker informants must be able to reliably distinguish zeugmatic from non-zeugmatic locutions (or, to use the older terminology, to distinguish syllepsis from mere zeugma); and indeed it seems plausible that speakers have such intuitions. Cruse (1986: 12), for example, includes zeugma among the 'principal varieties of semantic anomaly which can be easily recognised by direct intuition.' (Whether speakers make categorical judgments, or only judgments of degrees of similarity or zeugmaticity, is a question we turn to in Section 2.4.)

### *2.2.3 Caveats and complications*

For the linguistic tests described in this section to yield insights requires well-designed test sentences and careful data collection methods. Certain methodological problems have plagued much of syntactic and semantic research, such as lack of controls and the potential for introducing bias in introspective judgments (Wasow and Arnold 2005). In addition there are pitfalls and complications from interactions with other aspects of semantic composition.

Cruse (1995) argued that we must distinguish 'discreteness', as indicated by identity tests, from 'antagonism', as indicated by zeugma tests. As evidence he cites the two putative senses of *book*, as text (the contents of the book) or as physical object (its 'cover design, typography, and so on'). These are called two facets of the word; see Section 2.2.4. He argues that the identity and zeugma tests give different results, based on the following examples:

(6) a. Mary likes the book; so does Sue. (from Cruse 1995: 36, ex. 17)
b. The book is difficult both to read and to carry around.

According to Cruse, (6a) abides by the identity constraint: Mary and Sue must both like the same facet of the book, either the text (the contents) or the physical object (its 'cover design, typography, and so on'). But the fact that (6b) is not zeugmatic shows that the two facets are, in Cruse's terms, non-antagonistic. Regarding (6a), I do not share

Cruse's judgment: for example, if Mary and Sue work for a publisher, Mary as book designer and Sue as editor, they could each like the book for a different reason, and (6a) would be perfectly felicitous in my opinion. The judgments are subtle, however.

On the basis of common theoretical assumptions, it would be surprising if discreteness and antagonism were independent. We should expect the identity and zeugma tests to give roughly consistent results. The idea behind both tests is that a single word is used in connection with predicates or modifiers that demand apparently different senses. The tests tell us whether a single token of the word can be general between the senses required by those predicates. But notice that the nature of the informant's task in the two tests differs. In the zeugma test we ask whether speakers judge the utterance to be a sort of pun, while in the identity test we ask how to interpret a sentence. Concerning the latter test, informants' interpretations are likely to vary depending on their proclivity for spinning imaginative scenarios and contexts that allow for a more liberal range of interpretations. Sensitivity to zeugma is a very different matter, probably subject to cross-speaker variation of a different sort, related to the speaker's sense of humor. So we might expect some divergence between the results of these tests, but it would be hasty to draw theoretical conclusions from that divergence. However, I am unaware of any careful, controlled study of such issues with a large sample of informants.

In general, indefinite NPs make for better identity constraint test sentences than definite ones. For example consider a clear case of non-distinct senses, such as our earlier example of *teacher*. Identity and zeugma tests clearly show that *teacher* is not ambiguous between 'male teacher' and 'female teacher'. See (7a), which shows that the putative senses 'male teacher' and 'female teacher' fail the identity test: the teachers liked by Mary and Sue respectively can be of different sexes, as expected. But in (7b), with a definite NP, the teacher liked by Mary and Sue are normally understood to be of the same sex, since they are referring to the same individual.[4]

(7) a. Mary likes a teacher; so does Sue.
b. Mary likes the teacher; so does Sue.

[4] Exceptions arise with definite NPs showing 'sloppy identity' as in *Mary likes her sister and so does John*, on the interpretation where John likes John's sister.

Thus (7a) gives the desired result while (7b) does not. In (8), *light* observes a strong identity constraint: either both coats are light in color or both are light in weight, but crossed readings are possible only as a pun.

(8) Mary was wearing a light coat; so was Sue. (Cruse 1995: 36)

The indefinite *a light coat* is used in (8). Indefinites provide for a better identity test since we are interested in the *sense* of a predicate such as *book*, *teacher*, or *light*. Indefinites allow us to abstract away from the referent and look at the predicate as applied across two different referents. Definites evoke a discourse referent, so whatever is said about that referent in the first sentence carries over to the second, thus clouding the issue.[5]

### 2.2.4 Disjunctive and conjunctive senses; facets

Words can be defined by a cluster of properties that are not jointly necessary. For example, Jackendoff (1985) notes that *climbing* necessarily involves either 'moving upwards' or 'moving in a clambering manner', or both. Hence a person or other creature with appropriate appendages for clambering can climb *up* or *down* a ladder, but bicycles, trains, and other rolling vehicles can only climb *up*, not down:

(9) a. The cyclist climbed up/#down the hill (by bicycle).
b. The monkey climbed up/down the ladder.

Interestingly, it seems possible to mix these readings without a zeugmatic effect:

(10) a. In this event, you climb up the hill by bicycle, then down using the rope ladder.
b. Would you rather climb up the hill on a bike or down the ladder without one?

Based on this result, we conclude that there is a single lexical unit *climb* with a single disjunctive meaning of 'ascend or clamber'. In example (9a) the surrounding context effectively narrows this meaning to 'ascend', in example (9b) it is narrowed to 'clamber', and in (10) the 'clamber' subsense applies to one predicate and the 'ascend' sense to the other.

[5] On problems with zeugma tests, see also Geeraerts (1993).

Disjunctive senses have been distinguished from conjunctive senses such as the sense of *book* as physical object or 'tome' and as informational entity or 'text'. These two facets of the word's meaning, to borrow Cruse's term, are appropriate for different sorts of predicate (Cruse 1995):

(11) a. *book* as [TOME]: The book weighs four pounds /has a red cover/etc.
b. *book* as [TEXT]: The book is well written.

Pustejovsky's (1995: 31) examples include the following:

(12) Count/Mass alternations: *lamb*
a. The lamb is running in the field.
b. John ate lamb for breakfast.

(13) Container/Containee alternations: *bottle*
a. Mary broke the bottle.
b. The baby finished the bottle.

(14) Figure/Ground reversal: *door*, *window*
a. The window is rotting.
b. Mary crawled through the window.

(15) Product/producer alternation: *newspaper*, *Honda*
a. The newspaper fired its editor.
b. John spilled coffee on the newspaper.

Two observations about such cases have fueled some theoretical interest. First, at least some facets are non-antagonistic (Cruse 1995: 36ff.; Pustejovsky 1995; Pinkal and Kohlhase 2000). Thus examples like the following, which mix predicates that are suitable for physical and informational entities, are not zeugmatic (16a is from Cruse 1995; 16b and 16c are from Pinkal and Kohlhase 2000: 521):

(16) a. Mary is reading a book. The book is difficult both to read and to carry around.
b. Mary burned the amusing book.
c. Mary understands the book on the shelf.

Second, each facet of a word may be independently involved in lexical relations such as hyponymy (type/subtype relations). For example, *book* qua TOME is a subtype of 'physical object' and a supertype of 'hardback', while *book* qua TEXT is a subtype of 'information' and a supertype of 'novel'.

(17) hyponyms of different facets of book:
a. book[TOME] < hardback
b. book[TEXT] < novel

The combination of these two properties, namely being non-antagonistic and yet involved in independent hyponymy relations, brings about a problem of some theoretical interest, especially for theories of the lexicon such as Pustejovsky's, in which semantic inference is driven by semantic type hierarchies. Pustejovsky addressed this problem by introducing 'dotted types' (see Section 2.3.4).

## 2.3 Polysemy and sense extension

### *2.3.1 Systematic polysemy*

The English systematic polysemy pattern *institution X ~ building that houses X* was noted earlier (example (2)). Some patterns of systematic polysemy (also called regular polysemy) are found across languages, while others vary from language to language. In a classic study of regular polysemy in Russian, Apresjan (1974: 18) notes that a Russian noun referring to a type of vessel can also designate 'the quantity of substance that the vessel is capable of containing.' The same applies to English nouns for vessels. While (18a) entails that there are three wheelbarrows, (18b) does not, since John could have made three trips with one wheelbarrow:

(18) a. John hauled three wheelbarrows from the shed.
b. John hauled three wheelbarrows of bricks from the shed.

In (18b), *wheelbarrow* designates the quantity of bricks contained in a wheelbarrow. Other Russian rules do not apply to English, as when the name of a bodily organ is used to refer to a disease of that organ. The Russian expression that translates literally as 'She has kidneys' (*počki* 'kidneys') can mean that she has a disease of the kidneys (Apresjan 1974: 24). A general English 'grinding' rule converts count nouns for objects to mass nouns referring to the stuff derived from the object: *There was too much apple in the cake*. But the English rule cannot apply to liquids: *???We fried the chicken in safflower/olive/corn*; *???I enjoyed a glass of orange*. French names of fruits can be used to refer to brandies made from them (*une prune* 'a prune', *une poire* 'a pear'), but not so in English (Nunberg 1995: 118).

More directly relevant to the present work are Apresjan's examples of verb polysemy. Many of them are diathesis alternations by another name. A Russian or English verb meaning 'to deform OBJ in a definite way' can alternatively be used to mean 'to cause (i.e. create) OBJ by deforming something in this way', where OBJ corresponds to the direct object: one can *drill the metal* or *drill the hole*, in the latter case causing the hole by drilling; *carve the wood* or *carve a notch*, in the latter case causing the notch by carving. Another rule relates 'action' to 'causation of action', e.g. *The meat has thawed* versus *We thawed the meat*. Such alternations are better known as diathesis alternations, or argument structure alternations (see Sections 3.2–3.5). As we review more recent theories of regular polysemy in this section, one question to keep in mind is whether or not such argument structure alternations should fall under a more general theory of regular polysemy.

### 2.3.2 Pragmatic roots of polysemy

Systematic polysemy is thought to be rooted in the pragmatic phenomena of 'reference transfer' and 'predicate transfer' (Nunberg 1979; 1995). In the right utterance context speakers can use any predicate *P* to refer to an entity *x*, even if *P* does not apply to *x* directly, but rather to an entity *y* that is related to *x*. The speaker uses *x* to mean *y*, where *y* bears a systematic relation to *x*; for example, *x* may be a part of *y*. In (19a) the speaker, a parking valet, utters the demonstrative *this*, where a key is the demonstratum but the referent is a car. In (19b) it is not the speaker but the speaker's car that is located out back (examples 19–21 are from Nunberg 1995: 110–11):

(19) a. This (*displaying a key*) is parked out back.
b. I am parked out back.

These two examples differ in an important respect. The subject *this* in (20a) actually refers to the car and not the key, as shown by the following:

(20) a. This is parked out back and may not start.
b. ???This fits only the left front door and is parked out back.

But the subject *I* in (21b) refers to the speaker, not the car:

(21) a. I am parked out back and have been waiting for 15 minutes.
b. *I am parked out back and may not start.

Both examples in (19) involve a meaning transfer: the speaker uses a predicate *P* to refer to an entity *x*, even if *P* does not apply to *x* directly, but rather to an entity *y* that is related to *x*. (It also must be obvious and "noteworthy" about *x* that it stands in this relation to a *y* with the property *P*(*y*), within the given utterance context. See below.) In the first example the meaning transfer involves the subject NP, while in the second it involves the predicate *parked out back*:

(22) a. (19a): *this* (key) ⇒ 'the car that this key fits'
b. (19b): *be parked out back* ⇒ 'be the driver of a car that is parked out back'

Note that the 1st person verb agreement in (19b) also suggests that the subject refers to the speaker, not the car: *I am/*is parked out back*. This can be contrasted with a different example that shows the agreement going the other way. In a restaurant context the server can refer to a customer by means of the dish he ordered, as when she says *The hash browns at table 20 wants(/*want) his(/*their) check*. Here the verb and pronoun show singular, not plural, agreement, suggesting a transfer from *the hash browns at table 20* (which is plural) to 'the person who ordered the hash browns at table 20' (which is singular).

The property contributed to the subject by the new predicate must be obvious or 'noteworthy', i.e. a useful classification in the context of utterance. A painter is more likely to say *I'm in the Whitney Museum* than *???I'm in the second crate from the right*, because when a painting goes to a museum the artist acquires a noteworthy property, but not so in the case of the crate (Nunberg 1995: 113–14). It's not clear that it is always the context of utterance that matters so much as the context of the described situation, as shown by contrasts in a past tense narrative:

(23) a. I was out back.
b. I was idling.
c. I was leaking oil.
d. #I was for sale.
e. #I was brand new at the time.

The predicates in (23a–c) allow a shift to predication on the car driven by me: 'I [drove a car that] was parked out back', and so on. It is not clear why (23d, e) do not allow such a shift, but the constraint, whatever it is, seems to apply to the past situation and not to the utterance context.

For Nunberg, such meaning shift is essentially a pragmatic phenomenon; these shifts are not instances of lexical polysemy. But when a usage becomes less context-dependent and more useful—that is, where the relation between *x* and *y* is obvious in many or most contexts for a given word—the result is systematic polysemy.

(24) Examples of systematic polysemy (Nunberg 1995)
  a. transmissions for cars: *4 speed*, *automatic*, etc.
  b. texts for inscriptions: a *Webster's Third*, a *Guide Bleu*, etc.
  c. painters for works: a *Picasso*, a *Derain*, etc.
  d. containers for volumes of stuff: *She drank two glasses*, etc.
  e. writer for oeuvre: *fifty pages of Wordsworth*
  f. place for inhabitants: *Indianapolis voted for the referendum*
  g. tree for wood: *The table is made of oak*.

Even these meaning shifts fall under a pragmatic theory for Nunberg, but he also claims that they can become 'idiomatic' or conventionalized, which thus allow for shifts that are less and less context-dependent. Importantly, these conventions vary from language to language, as noted already in the previous section. Next we look more closely at theories of how the mechanisms of meaning shift are represented in the synchronic grammar.

### *2.3.3 Sense extension in the grammar*

Quite a few grammatical theories of regular polysemy have been developed, many of them formalized (Sag 1981; Pustejovsky 1993; 1995; Pustejovsky and Bouillon 1995; Copestake 1992a; 1995; Copestake and Briscoe 1995; Asher 2011). There are several issues facing such theories. A first question concerns the extent to which the rules of regular polysemy are lexicalized, as opposed to being general pragmatic processes that are not tied to particular words. A second issue is the role of the syntactic and semantic *context* of a polysemous word, and the process of semantic combination, as distinct from the role of the word meaning itself. The various theories offer different answers to those questions.

**2.3.3.1 Sense enumeration** In a 'sense enumeration lexicon' the many senses are simply listed separately for each word, as in a traditional dictionary, and the syntax combines sense-specific words. Such sense enumeration accounts are inadequate for several reasons discussed by

Pustejovsky (1995: ch. 4). First, it conflates homonymy with polysemy. Two homophonous expressions are obviously different words that happen to have the same phonology. Using a feature notation, this suggests lexical entries like (25) for homphony, where "GENUS" refers to a semantic sort:

(25) $\left[\begin{array}{l}\text{PHON: } \textit{bank} \\ \text{CAT: count noun} \\ \text{GENUS: financial institution}\end{array}\right]$, $\left[\begin{array}{l}\text{PHON: } \textit{bank} \\ \text{CAT: count noun} \\ \text{GENUS: shore}\end{array}\right]$

But this format is inappropriate for polysemous expressions such as the following:

(26) $\left[\begin{array}{l}\text{PHON: } \textit{bank} \\ \text{CAT: count noun} \\ \text{GENUS: financial institution}\end{array}\right]$, $\left[\begin{array}{l}\text{PHON: } \textit{bank} \\ \text{CAT: count noun} \\ \text{GENUS: building}\end{array}\right]$

One problem with this representation is that the *institution ~ building* pattern is very general and productive, suggesting the application of a rule. The next question is the nature of that rule and where it applies.

**2.3.3.2 Lexical rules** A first approach is to posit a lexical rule that operates within the lexicon and productively derives variant lexical entries from basic ones. Such systems for deriving words or word senses were worked out in some detail beginning in the 1990s, including Pustejovsky's (1993; 1995) theory of the Generative Lexicon, and related work by Copestake (1992a; 1992b; 1995) and colleagues. Copestake and Briscoe (1995) distinguish between 'constructional polysemy' and 'sense extensions'. In constructional polysemy, sense differences of a word are determined by the word's local syntactic and semantic context within the sentence (we postpone further discussion of this until Section 2.3.3.4). Sense extensions are genuine cases of systematic polysemy, where a class of words productively alternates between systematically related senses. The sense extensions are generated with productive lexical rules. For example, a 'grinding rule' takes a count noun as input and returns a mass noun; a 'portioning rule' applying to a mass term for a beverage and returns a single portion.

(27) 'grinding': count noun ⇒ mass noun
  a. Bugs Bunny is eating a carrot. (count)
  b. There's too much carrot in this cake. (mass)