



M. LYNNE MURPHY

Semantic Relations and the Lexicon

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Semantic Relations and the Lexicon explores the many paradigmatic semantic relations between words, such as synonymy, antonymy and hyponymy, and their relevance to the mental organization of our vocabularies. Drawing on a century's research in linguistics, psychology, philosophy, anthropology and computer science, Lynne Murphy proposes a new, pragmatic approach to these relations. Whereas traditional approaches to the lexicon have claimed that paradigmatic relations are part of our lexical knowledge, Dr Murphy argues that they constitute metalinguistic knowledge, which can be derived through a single relational principle, and may also be stored as part of our conceptual representation of a word. Part I shows how this approach can account for the properties of lexical relations in ways that traditional approaches cannot, and Part II examines particular relations in detail. This book will serve as an informative handbook for all linguists and cognitive scientists interested in the mental representation of vocabulary.

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Semantic Relations and the Lexicon

Antonymy, Synonymy, and Other Paradigms

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University of Sussex



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For Mom, Dad, and Georgia

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Symbols and typographical conventions

Bold	indicates new terminology where it is defined.
<i>Italic</i>	indicates linguistic data, e.g., headwords of lexical entries.
SMALL CAPS	indicate concepts.
ITAL SM CAPS	indicate (metalinguistic) concepts of words.
'x'	Single quotes surround meanings or senses of linguistic expressions.
$x=y$	x and y are synonyms.
$x\approx y$	x and y are near-synonyms.
x/y	x and y are in a contrastive relation.
$x-y$	x and y are in an undefined or non-semantic relation.
$x<y$	x is subordinate to y in an asymmetrical relation, such as hyponymy or meronymy. (E.g., " x is a hyponym of y .")
$x>y$	x is superordinate to y in an asymmetrical relation, such as hyponymy or meronymy. (E.g., " x is a hyperonym of y .")

Part I

Paradigmatic relations, generally

1 Why lexical relations?

"How are you doing?" I would ask.

"Ask me how I am feeling?" he answered.

"Okay, how are you feeling?" [. . .]

"I am very happy and very sad."

"How can you be both at the same time?" I asked in all seriousness, a girl of nine or ten.

"Because both require each others' company. They live in the same house. Didn't you know?"

Terry Tempest Williams, "The village watchman" (1994)

As for any other phenomenon in the world, the existence of paradigmatic semantic relations among words calls for some kind of explanation – or perhaps several kinds of explanation. Are these relations among words, or among the things the words represent? Are the relations arbitrary or rule based? Language specific or universal? A product of linguistic or general cognition? These questions are the focus of this book. First, however, we must ask what these questions mean, and why we might care to trouble ourselves with them.

As linguistic theories have progressed in modeling human language ability, the lexicon has become more central to those theories. With this new or renewed attention to the mental lexicon, two problems become evident. Firstly, there is no generally accepted theory of how the lexicon is internally structured and how lexical information is represented in it. Secondly, the lexicon must interface with the conceptual system, but there is little agreement about which information should be included on which side of the lexical-conceptual boundary, how conceptual information is represented, and even whether a lexical-conceptual boundary exists.

At the very least, most interested parties agree that the paradigmatic semantic relations among words – antonymy, synonymy, hyponymy and the like – are somehow relevant to the structure of lexical or conceptual information. Beyond this vague statement of "relevance," however, opinions, assumptions, and models vary drastically. For some investigators (e.g., Katz 1972, Kempson 1977, Pustejovsky 1995) accounting for such relations is one of the purposes of lexical semantics, just as accounting for relations like entailment and contradiction is a

foundational problem in sentential or propositional semantics. For others (e.g., Deese 1965, Lehrer 1974, Mel'čuk 1996, Fellbaum 1998c) relations among words constrain or determine meaning, rather than vice versa. These positions are often stated as background to other discussions, as if they are uncontroversial. However, the differences between them underscore the extent to which the genesis, representation, and uses of paradigmatic relations are as yet unsettled matters for linguistic and psycholinguistic theory.

The following chapters have three purposes: (a) to bring into focus the various theoretical positions on paradigmatic semantic relations, (b) to summarize and analyze research about them from a range of disciplines and methodologies, and (c) to present a new, pragmatic approach to these relations. In this chapter, I examine the implications of taking a pragmatic and psycholinguistic perspective on semantic relations, define some of the vocabulary used here, and justify some assumptions about the mental lexicon and the conceptual system. The final section outlines the remainder of the book.

1.1 Approaching semantic relations

Semantic relations among words have captured the interest of various brands of philosophers, cognitive psychologists, linguists, early childhood and second language educators, computer scientists, literary theorists, cognitive neuroscientists, psychoanalysts – investigators from just about any field whose interests involve words, meaning, or the mind. The good news, then, is that we can access a broad and detailed literature that approaches the topic from a variety of methodological and theoretical perspectives. The bad news is that each of these perspectives carries its own implicit assumptions about why semantic relations are interesting, how they are (or are not) relevant to the structure of language or thought, and what research methodologies are (and are not) valid or revealing. So, while I report research from several of these fields, it is important to define the particular perspective taken here before discussing the literature or presenting new hypotheses. Doing so not only makes the presentation more comprehensible, but also serves as an acknowledgment that examining work by others often entails reading it from a different perspective from that in which it was written. In the following chapters, research that originated in a variety of fields and perspectives is critically assessed in light of the assumptions introduced in this chapter.

The overarching goal here is to provide an account of how individuals know (or determine) whether words are semantically related or not and, if they are related, what type of relation is involved. In other words, on what bases are judgments of semantic relatedness made? The perspective taken is pragmatic and psycholinguistic.¹ By **psycholinguistic**, I mean that the goal is to provide a psychologically plausible model of the knowledge and processes involved

in semantic relations phenomena in human language behavior. So while structuralist, formal, and computational models of the lexicon are among those considered here, they are assessed here on the basis of whether they model human language abilities in a mind-like way. By **pragmatic**, I mean that the linguistic phenomena described here are considered with reference to their use and their status in a human mind within a human culture. This contrasts with strictly formal or descriptive accounts of semantic relations, in which words are considered only with reference to their definitional meanings and those definitions' relations with each other. Thus it will not be sufficient here to say *hot* is the antonym of *cold* because our models of the words' semantic properties fulfills the formal requirements for antonyms. As discussed in section 2.1, semantic relations among words can depend on more than just the semantic qualities of a word, and they are highly context dependent. So we must discern (for example) how one determines in a certain context that *hot* is the best candidate to be the antonym of *cold*, but in another context *warm* or *cool* or something else might be a better opposite for *cold*. In essence, this means that I do not start from the position of considering semantic relations as a matter of analytic or objective truth, but instead as a matter of language users' idiosyncratic mental representations (and processes involving them), which can be investigated through their judgments and behavior. While paradigmatic semantic relations have been defined in logical terms (with varying degrees of success – see Part II), such definitions reveal little about the roles of semantic relations in lexical memory and language use.

The pragmatic and psycholinguistic perspective, then, is concerned with the relationships between competence and performance. Studying these relationships involves determining *what* one must know in order to know *how* to do something (like produce or interpret a meaningful utterance) and *what* we know as a result of having done this thing. The English language, unfortunately, is not very helpful in making plain the differences among these (and other) kinds of knowing. For the following discussion, at least four kinds of knowledge are relevant. **Fixed mental representations** in long-term memory are needed for some types of knowledge of language. For instance, for any word in my active vocabulary, I must have some representation of its phonemic structure in long-term memory.² For example, I know that *night* is basically pronounced [najt] because I have some fixed mental representation of this fact of English. Knowledge of language also involves **procedural knowledge**, which linguists usually represent as rules. So, for example, I know that most English plurals are made with *-s*, and I know to vary the pronunciation of the plural marker in accordance with the morphological context. These first two types of knowledge allow for a third kind: **generated mental representations**. So, once I use my ability to make *night* plural, I have a mental representation of this plural in my short-term memory (which may come to be stored in long-term memory as

well). All of the foregoing types of knowledge do not necessarily involve the fourth type: consciousness or **awareness** of the representations or processes involved. Of course, if we were aware of these rules and representations, we would not need to do much linguistic research, since the answers to our research questions would be plainly evident. In awareness, some “higher-level” part of the mind has access to some “lower-level” subconscious part. For instance, my awareness that a book is in front of me is dependent on all sorts of knowledge that I am not aware of, including perceptual processes and representations and their interface with my conceptual representation of what a book looks like. Awareness is the least interesting type of knowledge for our current purposes, since it is not so much about what we know, but what we know we know (and knowing about knowing is a problem for epistemologists, not linguists). If we are aware that *night* is the antonym of *day*, it is because the conscious mind has some access to what is going on in the subconscious mind.

Knowing that two words are antonyms or synonyms could involve any of the subconscious types of knowledge. If such relations are mentally fixed, then we either know them because we were innately programed with this knowledge or because we learned that the two words are related and added that information to our mental representations of these words. We can rule out innate representation of lexical relations, since the knowledge is language specific. *Hot* and *cold* cannot be innately programed as antonyms, since this fact is only relevant to English speakers. Having innate mental representation of every relation for every possible language is plainly impossible since there is an infinite number of possible languages. Even if we suppose that only semantic information (not words per se) is opposed in the semantic relations, the knowledge is still too language specific, since the particular semantics of *hot* are quite different from the particular semantics of French *chaud* (see chapter 5 and Cruse 1986) or Chinese *rè* (Prator 1963).³

This leaves us with two possibilities as to how we know that two words are semantically related. We may know the relation because we learned it as fact, just as we learn other facts about words such as their pronunciation or part of speech. In this case, experience of the words in relation is recorded in long-term memory. So, for instance, I might know that *hot* and *cold* are antonyms because I heard them being used in contrast and I (subconsciously) made this information part of my mental representation of these words. Another possibility is that semantic relations among words are generated. The knowledge that two words are antonyms would then involve a generated mental representation based on some set of rules or principles for generating relations among words. In this case, my knowledge that *hot* and *cold* are antonyms is something that I regenerate whenever the need arises. As discussed in chapter 2, neither of these possibilities alone is sufficient to explain our linguistic performance with respect to semantic relations. While I argue for principles that generate instances of

semantic relations, the derivability of relations does not preclude experiential learning and fixed mental representation of some relations as well. So, while all semantic relations among words can be generated via a single relational principle (introduced in chapter 2), this does not mean that the relations have to be generated each time they are needed.

A pragmatic and psycholinguistic perspective on semantic relations entails an interdisciplinary approach, since this perspective acknowledges that language must be considered with reference to social, communicative, and psychological constraints. Thus a wide range of types of evidence is available for determining how semantic relations are mentally represented and linguistically expressed. Among the types of evidence to be discussed are:

- Speakers' judgments of semantic relatedness
- Corpus-based studies of semantically related words
- Descriptions of semantic relations in thesauri and dictionaries
- Tests of computational models of lexical knowledge
- Psycholinguistic experimentation that is intended to reveal lexical organization (e.g., word association, lexical priming)
- Naturally occurring and experimental data on language acquisition
- Naturally occurring and experimental data on lexical loss or speech errors caused by anomia, aphasia, and run-of-the-mill disfluency
- Discourse analyses of the uses of semantic relations.

Each of the above sources of information has its own limitations. Speakers' intuitions and judgments are notoriously at odds with real language use (Labov 1975). Corpus studies often over-rely on written sources and tend to assume that the form of a lexical item is graphic, rather than phonemic. Dictionaries and thesauri reflect conscious reasoning about language and usually have commercial and practical missions that conflict with their descriptive usefulness. Computational, psychological, and neurological studies frequently fail to distinguish between linguistic and non-linguistic knowledge, since they often use words to represent concepts. One challenge here is to identify which work from other perspectives can be integrated into a discussion in the pragmatic perspective. That is, we must be cautious regarding interdisciplinary studies, and even intradisciplinary ones, because some alleged evidence for or against a position might be uninterpretable or irrelevant when considered in the framework of the current discussion. Another challenge is to use information from fields other than linguistics with caution and humility. As noted by Pederson and Nuyts, "There has been an increased sharing of methodological techniques across the traditional disciplinary boundaries . . . However, such techniques are all too often borrowed without a clear sense of their strengths, weaknesses, and underlying theoretical assumptions" (1997: 6). As is clear throughout the following chapters, my intellectual biases are toward linguistics, and my foremost purpose is to contribute to that field of inquiry. Nevertheless, I hope that the

cross-disciplinary nature of the material discussed will make this work useful to readers in any of the cognitive sciences.

1.2 Relations and 'nyms: some definitions

So far, the topic of study has been described as *paradigmatic semantic relations among words*. In the literature, these relations are usually called *lexical relations* or *semantic relations*, and sometimes those two terms are used contrastively. The common element, **relation**, is fairly vague, but in its most basic use it describes co-membership in a definable set. So, for example, *sky* and *high* are related in that they are members of the set of English words that rhyme with *eye*. *Relation* is also used to distinguish the types of definitional criteria that define such a set. So, the relation between *sky*, *high*, and *eye* is the rhyme relation (i.e., the criterion for membership in the relational set is similarity of word-final sounds). For our purposes, *relation* can stand for **paradigmatic relation**, in which the set of words forms some sort of paradigm, such as a semantic paradigm that contains members of the same grammatical category that share some semantic characteristics in common, but fail to share others. So, for example, the set of basic color terms forms a paradigm whose members are adjectives (or nouns), each referring to a different section of the color spectrum. Not all paradigms are semantically defined, of course. Inflectional paradigms, for instance, include the possible variations of a lexical item in some inflectional category, such as number. So a morphological paradigmatic relation exists between *child* and *children*. Paradigmatically related words are, to some degree, grammatically substitutable for each other. For example, *blue*, *black*, and any other member of the color paradigm can sensibly and grammatically occur in the phrase *a ___ chair*. In this way, paradigmatic relations stand in contrast to **syntagmatic relations**, which are relations between words that go together in a syntactic structure. For example, we can speak of a syntagmatic relation between *eat* and *dinner*. The two types of relation are not always easy to distinguish (see 2.1.5), although the (debatable) rule of thumb for distinguishing them is that paradigmatic relations hold between members of the same grammatical category, while syntagmatic relations involve members of different grammatical categories.

For present purposes, it makes sense to use the term **semantic relations** to indicate relations defined by semantic paradigms – but not before issuing some caveats. *Semantic relations* is sometimes used to denote phrasal or sentential relations such as paraphrase, entailment, and contradiction, but here it should be understood to mean ‘paradigmatic semantic relations among words.’ Given the pragmatic perspective taken here and the fact that non-semantic factors may affect these so-called semantic relations (see 2.1.5), one might argue that they should be called *pragmatic relations*. But that term misses the point that even

if non-semantic factors (such as phonetic form or register) come into play in antonymy or synonymy, the most basic requirement is semantic relatedness. Non-semantic factors may affect judgments of how well a set of, say, synonymous words exemplifies the synonym relation, but the meanings of the words make or break the relation.

The term **lexical relation** is used here to indicate any paradigmatic relation among words, not just a semantic relation. So, lexical relations include phonetic relations (such as rhyme or alliteration), morphological relations (such as inflectional variation), and morpho-syntactic relations (such as co-membership in a grammatical category). Again, a caveat is in order. The term *lexical relations* is ambiguous, in that it could refer to relations among words (on a page, in a mind, or wherever they might exist) or to relations (among lexical items) within the mental lexicon. For some authors, the two meanings are interchangeable, since they hold (or assume) that if words are related, then that relation is represented in the lexicon (see 3.3). However, I (in chapter 2) take the position that relations among words are not among the types of information about words that can be represented in the lexicon. This position contrasts with that of, for example, Gross, Fischer, and Miller (1989). They distinguish between antonym pairs like *big/little* and other semantically opposed pairs, such as *gigantic/tiny*, claiming that the former are lexical antonyms (i.e., intralexically related) as well as conceptual opposites (semantically related), while the latter are only conceptually opposed. For them, this means that the *big/little* contrast must be represented in the mental lexicon, but the relation between *gigantic* and *tiny* is not a part of those words' representation in the lexicon. In the context of the term *lexical relations* in this book, **lexical** should only be assumed to mean 'involving words' rather than 'contained in the mental lexicon.' The term **intralexical** indicates that a structure or piece of lexical information is contained within the lexicon. **Metalexical** indicates information that is not contained in the lexicon, even though it may be information about words.

The main relations discussed here are exemplified as follows:

synonymy: *sofa=couch=divan=davenport*

antonymy: *good/bad, life/death, come/go*

contrast: *sweet/sour/bitter/salty, solid/liquid/gas*

hyponymy, or class inclusion: *cat < mammal < animal*

meronymy, or the part-whole relation: *line < stanza < poem*

The equals sign (=) is used to indicate **synonymy**. The slash (/) between members of antonym or contrast sets signifies the semantic incompatibility of the contrasting words. **Antonymy** is a subtype of **contrast**, in that it is contrast within a **binary** paradigm. While the term *antonymy* is sometimes reserved for more specific relations, it is used here for any binary semantic contrast among lexical items (whereas *opposite* is used more broadly here, not limited to contrast between linguistic expressions – see 2.2.2). The 'less than' sign (<)

in the hyponymy and meronymy examples indicates that these relations are hierarchical and asymmetrical. That is, *stanza* is a meronym of *poem*, but *poem* is not a meronym of *stanza*. The converse relations of hyperonymy and holonymy can be represented by the 'more than' sign (>), as a *poem*>*stanza* (i.e., '*poem* is the holonym of *stanza*'). For example, *cat* does not have the same relation to *mammal* (*cat*<*mammal*) as *mammal* has to *cat* (*mammal*>*cat*). In one direction, it is a relation between a category and its superordinate category, and in the other, it is a relation between a category and its subordinate. On the other hand, synonymy, antonymy, and contrast are **non-hierarchical** relations, and are usually characterized as **symmetric** relations in that the relation between, say, *couch* and *sofa* is not distinguishable from the relation between *sofa* and *couch*.⁴ Thus, we can say that *couch* and *sofa* are synonyms of each other, but cannot say that *cat* and *mammal* are hyponyms of each other. *Cat* is a **hyponym** of *mammal*, and *mammal* is a **hyperonym** of *cat*. Similarly, *meronymy* is a unidirectional term, so that *stanza* is a **meronym** of *poem*, but *poem* is the **holonym** of *stanza*. While Lyons (1977) and others discuss *co-hyponymy* and others write of *co-meronymy*, these two relation types can just as well be considered contrast sets. So, *eyes/nose/mouth* could be considered a contrast set or a set of co-meronyms of *face*, and likewise *sonnet/ballad/ode* are a contrast set or co-hyponyms of *poem*. Subtypes of the lexical relations are defined and discussed in Part II.

Other relations, such as morphological or phonetic relations and undefined relations are indicated by a dash (-). Not all semantic relations are discussed in this book. For example **case relations**, like that between *author* and *book*, are disregarded even though they are relevant to some theories of intralexical organization (e.g., Meaning-Text Theory, see 3.3.3). Some miscellaneous paradigmatic relations are briefly discussed in chapter 6, but the attention here is to those relations that have been central in discussions of lexical semantics.

Some instances of relations, particularly examples of antonymy, seem to have special status, in that their relationships are well known in the culture and seemingly stable. For example, *hot/cold* seems like a better example of antonymy than, say, *steamy/frigid*, even though both pairs indicate opposite extremes on the temperature scale. The *hot/cold* pair and others like it (e.g., *big/little*, *good/bad*, *good/evil*) can be considered **canonical** antonym pairs. These are the kinds of antonyms that automatically follow one another in free word association tasks, or that are collected together in children's books of opposites. The **non-canonical** pairs are less common or more context dependent. The differences between the canonical and non-canonical types are discussed in chapters 2 and 5. For now, note that a complete account of semantic relations must acknowledge both types. The two types are not completely separable – their boundaries are fuzzy and it is not always possible to determine whether a pair is canonical

or not. Certainly, *happy/sad* is canonical, but is *happy/unhappy*? If not (on the grounds that morphologically derived antonyms are of a different category than morphologically unrelated antonyms), then why does *happy/unhappy* seem like a “better” antonym pair than *green/non-green* or *straight/unstraight*? *Wet/dry* is canonical, but is *humid/arid*? *Wet/dry* is certainly a more common pair, but cannot uncommon pairs belong to the canon? Language users can intuitively sort “good” (or prototypical) antonym pairs from not-so-good ones and downright bad ones. A complete theory of semantic relations must account for the continuum of relatedness that is revealed by language users’ judgments of “better” and “worse” examples of these relations (see 2.1.4).

Finally, what do these relations relate? So far, I have referred to them as relations among words, but one might ask if they are not really relations among the words’ denotata. After all, isn’t *hot* the opposite of *cold* because heat and cold are incompatible temperature states? While it is true that referring antonyms describe incompatible referents, there is more to antonymy than this. Defining antonymy as referential incompatibility would mean that *hot*, *boiling*, *steamy*, *warm*, *scorching*, and many other words would be equally appropriate as antonyms for *cold* in any context, since all these words describe states that are incompatible with coldness. We thus need to look in particular at how words, or word meanings, are related – not just at how things in the world are related.

Most lexical semantics texts claim that semantic relations are not really relations among words, but relations among word senses. Some of these texts call these relations *sense relations* (Lyons 1977) or *meaning relations* (Allan 1986) rather than *lexical relations*. I have not adopted these terms for two reasons. Firstly canonical antonyms give cause to wonder whether it is just the senses (and not the words themselves) that are being contrasted, since the contrast can extend to many of the words’ senses. The word pair *hot/cold* can be used to describe a number of sense contrasts: ‘high temperature’/‘low temperature,’ ‘near the searcher’/‘far from the searcher’ (in a hiding game), ‘radioactive’/‘not radioactive’ and so forth. The pair *hot* and *cold* has a connection beyond the relation of their temperature senses, and so we can think of them as lexically related. Secondly, as becomes clearer later in the discussion (especially in 2.1.3 and 2.1.5), senses are not the only determinants of lexical semantic relations. Thus, while some semantic relations are sense relations, *sense relations* describes a narrower range of relations than is discussed here.

A basic question that has not been answered yet is: Where should semantic relations be situated in a model of language competence and language use? Many mental model-makers propose (or assume) that semantic relations among words must be represented in the lexicon, with other knowledge of words (see chapter 3). The other option is to consider semantic relations among words as a form of metalinguistic knowledge. In order to evaluate either of these

possibilities, we must first have a clear idea of what the lexicon is and what it contains, as well as how metalinguistic knowledge is to be modeled. The next two sections concern these issues.

1.3 What is a mental lexicon?

1.3.1 *Basic assumptions*

If a lexicon is a collection of information about words, then it stands to reason that the mental lexicon is the mental representation of information about words. But what that information is and how it is represented are anything but simple questions. The foremost assumptions about the mental lexicon (henceforth *the lexicon*) in structuralist and generativist theories are (a) that the lexicon is a collection of information that cannot be derived from other information and (b) that this information is self-contained and specifically linguistic. So, lexical information is arbitrary or “idiosyncratic” (Chomsky and Halle 1968: 12) – “a list of basic irregularities” (Bloomfield 1933: 274) for which the grammar cannot account. Furthermore, the lexicon contains information about words, rather than about the things or ideas that words denote. These assumptions lead to two basic problems for determining what information is in the lexicon. First, the identification of irregularities and idiosyncrasies depends upon the theories of grammar and cognition involved. For example, if we assume that part of the lexical representation of a word is a set of semantic features based on semantic primitives (e.g., Katz and Fodor 1963) and that learning the meanings of words involves filling in feature specifications from available referential information (Clark 1973), then we might conclude that semantic relations are derivable from the words’ featural structures and some basic relational rules (Katz 1972). So, for example, *girl* is an antonym of *woman* because antonymy requires similarity of all features but one, and *girl* and *woman* meet this criterion:

<i>girl</i> :	[+ human, – adult, + female]
<i>woman</i> :	[+ human, + adult, + female]

On the other hand, one could theorize that the relations between words are primary, and meanings arise from the networks of relations in the lexicon (Deese 1964, 1965; Quillian 1968; G. Miller 1998a). On this view, *girl* and *woman* are opposed and their relations with other words (*boy*, *man*, *child*, etc.) are represented as arbitrary facts. Each word, then, has a unique position in a relational network, and the meaning of any particular word is derivable from its position in this network. So, if relations are taken to be arbitrary, then meaning is not entirely arbitrary, but if meaning is taken to be arbitrary, then relations are not entirely arbitrary. Thus the question of what is arbitrary cannot be answered in a theory-neutral way. We can only judge which theory is better on the basis

of (a) theory-internal consistency and (b) ability to account for the largest range of data and behavior.

The assumption that the lexicon is part of a modular linguistic faculty brings other problems to the fore, since it can be very difficult (if not impossible) to distinguish between knowledge about words and knowledge about the things the words denote. Modularity is more easily assumed for the grammatical aspects of language. After all, having the ability to make subjects and verbs agree is not obviously necessary for non-linguistic cognition, nor is it clearly analogous to other cognitive abilities. Thus, positing that grammatical knowledge and processes are separate from other mental faculties is not at all controversial in many linguistic camps. Positing that a lexicon with semantic content is separate from other cognitive faculties requires more justification because the boundary between lexical and conceptual information is elusive. We are left with the questions: To what extent does the lexicon include information about words' meanings? Can word meanings be differentiated from concepts?

Putting off the problem of lexical versus conceptual semantics until 1.3.3, I take the modular lexicon assumption as a starting point in evaluating approaches to semantic relations. The angle of argumentation here is to show that a well-defined lexicon cannot be the locus of semantic relation information. Sticking with a strict modular definition, then, the **lexicon** contains all and only information that is: (a) arbitrary (i.e., not derivable from other information) and (b) necessary for linguistic competence. **Linguistic competence**, as it is understood here, is the capacity to produce grammatical and interpretable sentences. Linguistic performance is not mentioned in the definition, since competence in non-linguistic faculties is also relevant to linguistic performance.

The modular lexicon assumption has several benefits. First, by applying a strict definition of what lexical information is (and is not), the content of the lexicon is limited. This gives us the opportunity to disprove the existence of a modular lexicon by systematically showing that each potential piece of lexical information should not be included in the lexicon because either it is not arbitrary or it does not contribute to linguistic competence. The assumption that lexical information is inseparable from conceptual information is not as testable, since the definition of *conceptual information* is less constrained than that of *lexical information* in modular models of the mind.

Ease (and reliability) of argumentation is not the only reason to assume that lexical information is separable from conceptual information. An alternative is to consider lexical information as a subtype of conceptual information. So, in addition to representing facts about a concept TABLE like 'this thing is furniture; it has a flat top surface; I can put things on it,' part of the concept TABLE would be 'the word for this concept is *table*; it's pronounced [teb!]; it's a noun.' But there are reasons to believe that lexical forms are not represented as parts of (non-lexical) concepts (see also Clark and Clark 1977). For one,

lexical information must be accessible to different types of mental processes than conceptual information is. Since lexical material must all be accessible to syntactic and phonological rules and non-lexical material need not, it is reasonable and expedient to treat lexical matter differently than other conceptual information. The fact that we can fail to make the association between things that we recognize and words that we know for those things also indicates that our means of storing and/or accessing the name of a thing is not the same as our means of storing and/or accessing other knowledge about the thing. While striking examples of this are seen in aphasia and acquired anomia, we all experience this problem sometimes in tip-of-the-tongue syndrome. In this case, you have complete access to the concept, since you can picture it, reason about it, and describe it (“You know, it’s like a puppet, but it has strings”), but you are not able to access its name. Other evidence for the separation of lexical and conceptual information is related to the lack of one-to-one relationships between words and concepts. If names for things were part of our conceptual representations of those things, then we should have unambiguous mapping between name and thing. Words can be used to indicate more than a single concept, however, and the name that we attach to a thing may vary by context. In the first case, the word *knife* can refer to things like scalpels, daggers, butter knives and letter-openers (Cruse 2000a); in the second, a single kind of furniture may be referred to by a variety of terms like *table*, *bedstand*, and *chest of drawers*. We need means to mix and match names and concepts, rather than static concept-word association.

Thus, knowledge of words is a different type of knowledge than knowledge of things. (But words can also be things. See 1.4.) These two types of knowledge interact in the processes of language production and comprehension. The contents and structure of the lexicon are described in the next subsections.

1.3.2 *Lexical items and lexical entries*

While *word* is the word that has been used thus far to indicate lexical items, it is certainly not an accurate one. The lexicon must contain both linguistic expressions that are greater than words and ones that are smaller than words because they too may be non-predictable in their mapping of form to meaning. Non-compositional phrasal expressions, such as *throw up* or *paint the town red* and arguably morphemes, such as *-ness* or *pre-*, are also to be included in our definition of **lexical item**, or **lexeme**.

Some linguists debate whether words are represented in the lexicon as self-contained units. Sinclair (1998) and Weigand (1998a) argue that idiosyncratic form-meaning associations involve larger expressions than words, and thus the lexicon is not a simple catalogue of words (and other non-compositional

expressions) that can enter into productive grammatical processes. For example, Weigand (1998a) notes that different adjectives may indicate the same property when collocated with different nouns, and it is not particularly predictable which nouns go with which adjectives. So, for example, the meaning that she expresses as *SHAPE/DENSE* is communicated by *heavy* in *heavy traffic* and by *thick* in *thick forest*. She concludes that the lexicon must contain complex lexical items that allow for the arbitrary nature of these collocations and the particular meanings they involve. This is a relevant point in accounting for the syntagmatic semantic relations between adjective and noun, but it is less clear that these multi-word constructions are relevant to the study of paradigmatic lexical relations, which stereotypically involve the relation of word-length items. That words are interesting in and of themselves becomes clear when we look for antonyms of these phrases. The opposite of *heavy traffic* is *light traffic*. The opposition between these phrases relies upon the canonical opposition of the adjectives in those phrases, as seen in various uses of *heavy* and *light*, whether they are used to indicate density (*heavy/light rain*), weight (*heavy/light luggage*), richness (*heavy/light meal*), oppressiveness (*a heavy/light mood*), and so forth. Since paradigmatic relations are of primary concern here, words continue to be important to the notion of *lexical item*. So, while not precluding the existence of multi-word lexical items, words should be considered as independent units in those phrases for the purposes of some paradigmatic relations (not to mention morphological processes).

A lexical item in the lexicon is an abstract representation that is instantiated as a **lexical unit** in language use (Cruse 1986), which has a particular form and a particular sense. So, for example, *highest* in the phrase *the highest note in the song* and *high* in *I threw the ball high* are both lexical units instantiating the lexical item *high*.

Unlike inflectional variations (e.g., *high* → *highest*), morphological derivations (e.g., *high* → *highness*) must often be represented as lexical items, either because preference for a particular form is arbitrary (e.g., *typist* over *typer*) or because the meaning is not compositional (e.g., *highness* as referring to a royal person). Whether non-compositional expressions are included in the lexicon is a matter of some debate. Bybee (1985, 1998) has argued that some morphologically derivable words are recorded in the lexicon. A semantically compositional word might be included in the lexicon because its frequency makes it more conveniently stored in the lexicon than derived anew again and again, or it might be included because it was through this form that we learned the base form of the word. In a similar vein, Jackendoff (1997) has argued that conventional yet semantically compositional strings of words (such as nursery rhymes, song lyrics, clichés) should be treated as lexical units. Again, this makes sense because such strings are obviously not composed anew each time

they are uttered. While such arguments may indicate that the lexicon contains non-arbitrary strings of words, they are in fact arbitrary in that they have been conventionalized as a particular form.

Lexical entry describes the collection of information about a lexeme that is included in the lexicon. At the very least, a lexical entry must include phonemic information about the item and some means for mapping the phonemic form to a meaning. The entry might also include grammatical category and other unpredictable information.⁵ Some treatments of the lexicon (especially processing-oriented models, e.g., Levelt 1989) distinguish the representations of a word's form (i.e., phonemic information) from its grammatical and semantic content. The latter is termed the **lemma**.

This abundance of terms (*word*, *lexeme*, *lexical item*, *lexical unit*, *lemma*) brings us back to the question of what semantic relations relate. While I have been calling them "relations among words," would they more accurately be described as relations among lemmata or relations among lexical items or units? *Word* is an insufficient description of the items that can be related. Like words, bound morphemes and some idiomatic phrases sometimes have antonyms or synonyms. For example, we might say that *in-* and *un-* are synonymous in contexts like *inedible*=*unedible*, and that the phrase *black and white* is the antonym of the word *color* when discussing photography or film. So, semantic relations may relate lexically represented expressions other than words. On the other hand, *lexical item*, *lemma*, and *lexical unit* are also insufficient, for reasons that are discussed in chapter 2. I therefore continue to refer to the items in semantic relations as *words*, with the understanding that claims made here about words may be extended to non-word lexical items.

1.3.3 *The dictionary metaphor and the nature of meaning*

The term *mental lexicon* is an artifact of a pervasive metaphor for the mental representation of vocabulary: that of a dictionary in our heads. Of course, the lexicon-as-dictionary metaphor fails on many counts, since the mental lexicon and the printed dictionary represent some different types of information about words. The mental lexicon includes phonemic structures, but print dictionaries record quasi-phonetic forms. My mental lexicon must record that *glad* is not to be used in prenominal position (since **the glad person/opportunity* is ungrammatical), but the particular dictionary beside me (*American Heritage*, 4th ed.) does not. Instead, it gives the word's etymology, which is irrelevant to the mental lexicon. While dictionaries list meanings of words, they cannot list all the meanings for which we use those words, since the potential semantic uses of a word are without limit (Nunberg 1978). Unlike dictionaries, the mental lexicon cannot afford an arbitrary separation of definitional and "encyclopedic"

meaning, nor are its sense divisions the same as those in dictionaries. These last two problems are discussed in turn below.

Hand-in-hand with the lexicon-as-dictionary metaphor is the conceptual-knowledge-as-encyclopedia metaphor. On this view, the lexicon should include only definitional (core semantic) information, leaving encyclopedic (conceptual) information in the realm of what we know about things, rather than what we know about words for things. So, for example, that dogs are used as sled-pullers might be something I know about dogs, but is not part of the meaning of *dog*. One means for differentiating definitional and encyclopedic meaning would be to assume that word meanings can be defined on the basis of necessary and sufficient conditions (Katz and Fodor 1963). However, most of our everyday content words cannot be defined by necessary and sufficient conditions, as Wittgenstein (1958) showed for *game*. Further experimental work (e.g., Labov 1973; Rosch 1973, 1975, 1978) has shown that word meaning seems to be organized around conceptual prototypes. Prototype approaches to meaning blur (or erase) the line between the definitional and the encyclopedic and call into question the separation of linguistic and conceptual semantic knowledge (see Taylor 1995). If we accept the prototype approach to meaning, this blurring between lexicon and encyclopedia is the first problem for the lexicon-as-dictionary metaphor.

Another means for differentiating definitional and encyclopedic meaning is to attempt a separation of linguistic and non-linguistic information. In such an approach, aspects of meaning that have grammatical reflexes and thus are language specific (rather than generally conceptual) must be represented at some linguistic (lexical) semantic level (Gruber 1983; Pinker 1989). Representing these aspects of meaning would not involve representing full senses, and so conceptual meaning would still be crucial in comprehending utterances. Some of this lexically represented semantic information is potentially relevant to semantic relations. For example, the thematic relations for *buy* and *sell* are converse, in that the role assigned to the subject position for *buy* is assigned to the object position for *sell* and vice versa. This converseness of thematic structure could be considered to be related to the status of *buy/sell* as converse antonyms. But if the semantic information in the lexicon is only that which interacts with the grammar, then the lexicon would not encode enough semantic information to account for all semantic relations. For example, *give* and *sell* might have the same thematic structure – but that does not make them synonyms. Similarly, the grammatical information alone would give us no way to distinguish between *give* and *sell* as potential antonyms for *buy*. So, the grammatically relevant information in lexical entries is not sufficient for determining semantic relations. Sense information is needed as well – but it is far from clear that senses are included in lexical entries, as discussed below.

The second problem for the lexicon-as-dictionary metaphor is the fact that lexical items can map to many different concepts, and thus be **polysemous**, but there is no principled limit to a word's polysemy. A dictionary deals with polysemy by listing a small number of senses for any word in an entry, and some lexical semantic theories have treated polysemous words as having multiple senses within lexical entries (e.g., Ullmann 1957; Katz and Fodor 1963). So, like a dictionary, the lexical entry for *horseradish* might list three possible meanings: a type of plant, the vegetable that consists of the root of that plant, and a condiment made from that vegetable. But listing meanings in the lexicon is doomed to failure since, as Nunberg (1978) has argued, the number of usable senses for any lexical item is limitless. Nunberg's argument is based on the observation that different criteria for establishing reference can be invented and used within the particulars of a context – so nonce meanings are possible and not uncommon. Nunberg uses the example of *jazz*, but *tea* illustrates the point as well. *Tea* can refer to a drinkable herbal infusion or the prepared herbs for making such an infusion. It can also refer to a cup- or glass-sized portion of that infusion, as in *I'd like a tea, please*. It can also refer particularly to a hot version of this drink (in contrast to *iced tea*), but in the southern United States it refers to the iced version, in contrast to *hot tea*. It is also sometimes used to refer to certain types of tea (especially those with caffeine), so that we may contrast it to others, as in *I can't drink tea after supper – just herbal tea*. Such conventional uses are probably countable in number, and some may be excluded from any particular English speaker's lexicon because they are not part of that person's dialect. But even within a single language user, the range of concepts that a lexical item indicates is not necessarily limited or static. For example, let us say that in South Africa I grew to like rooibos tea and that I visit Nancy in New York who asks *Would you like some tea?* Now, knowing that Nancy has probably never heard of rooibos, I assume that when she says *tea*, rooibos is not a member of the set of things that she intends to refer to, so I reply, *No, I don't care for tea*. For the purpose of this exchange, the sense I use for *tea* does not include rooibos, but in another context I may refer to rooibos as *tea*, as in *The only tea I like is rooibos*. I leave it to the reader to imagine other contexts in which a speaker might use a sense of *tea* that denotes all teas but chamomile or only peppermint tea. The point is that the category that the speaker intends to refer to with the word *tea* (and that the audience may identify when the speaker uses *tea*) shifts with the speaker's knowledge and expectations of the context. Thus, the number of possible senses of *tea* that may be reasonably intended and understood is limited only by the number of possible combinations of beliefs that the speaker and hearer have about the world and the situation in which the utterance is made. Thus, one cannot take an inventory of a word's senses. Instead, a word's sense in any particular context is the result of some implicit negotiation between the members of

the talk exchange along with beliefs about how that word is conventionally used.

Since words have no fixed number of senses, it is untenable to claim that lexical entries explicitly represent all of a word's senses. One solution is to assume that the various meanings attributed to any particular word are, at some level, illusory. Weinreich (1963), for example, claims that the many uses of the verb *take* indicate not that the word has many meanings, but that it is semantically nearly empty. While Weinreich contrasts such cases to other cases of true polysemy, Ruhl (1989) applies semantic underspecification generally, arguing that all words are monosemous. Another possible approach is to assume that polysemous words have a single sense that is part of the lexical entry and that other senses are derived by lexical rules (e.g., Jackendoff 1976; Pustejovsky 1995; Copestake and Briscoe 1995).⁶ In this case, the lexically represented sense information may or may not be structurally simpler than the other possible senses, but it is a starting point from which semantic information may be added or deleted in order to build new senses. Nunberg holds that knowledge of word meanings is a type of knowledge of "the collective beliefs of the speech community" (1978: iii). In this way, knowledge of word meaning is not simply linguistic knowledge – it interacts with and is constrained by knowledge of how members of the speech community communicate and the beliefs they hold about the words and the objects and situations they designate. Recognizing or intending a particular sense for a word is possible because we are aware of some conventions for the word's use, and we have pragmatic means for creating recognizable new senses for a word.⁷ So, we have three possibilities: (a) multiple senses are illusory (each word has only one sense), (b) additional senses are derived from a basic sense representation, or (c) no senses are basic, but instead meanings are generated through pragmatic knowledge.

If we follow Lyons' (1977) claim that semantic relations relate senses of words and we understand *sense* as Nunberg's context-dependent conditions on reference, then it is impossible to represent semantic relations in the lexicon. In order to represent sense relations in the lexicon, all the senses would have to be represented in the lexicon. In the monosemy approach, all the senses are listed in the lexicon, since every word only has one sense. But words can have more than one hyperonym (or antonym or synonym), and multiple hyperonyms need not be synonymous with each other. For example, *measurement* and *spoon* can both be hyperonyms for *teaspoon*. In order to account for the fact that the same word is involved in incompatible semantic relations, the monosemic approach either has to declare all such examples to be cases of **homonymy** (i.e., each meaning is associated with a different lexical entry, as would be the case for unrelated words like *bat* 'flying mammal' and *bat* 'wooden club for games'), or it has to claim that semantic relations are not sense relations, but relations that arise through the conditions in which a word is used. The

pragmatic approach (Nunberg) would expect that semantic relations are either part of the community's linguistic convention (i.e., not sense-related, but an arbitrary fact about language) or they would be derived from the contextual conditions of a word's use. The lexical-rule approach, in which new senses are generated, would allow for some semantic relations to be represented in the lexicon (but the nature of sense representations would make such information redundant, see 3.2). Since other senses are derived, relations among them would also have to be derived.

Where I need to make assumptions in the next chapters about the nature of word meaning, the following are assumed. Firstly, words are polysemous: they can be associated with more than one sense (i.e., I reject the monosemy solution). Secondly, a **sense** is the set of conditions on a word's denotation. Connotation is a separate matter. So, for example, if I use *green* in *the green grapefruit* or *the green army fatigues*, the two uses do not have different senses even though (a) in the first (but not the second) case it signals unripeness (and hence connotes sourness) and (b) the referent (i.e., the shade of green) is different in the two cases. In both cases, the same conditions of reference applied, namely, whether the color of the item fits within a certain range of hues. Thirdly, while some semantic information may be represented in the lexicon, senses are not represented intralexically. A sense in toto is composed from whatever semantic information is specified in a lexical entry, the information (about the denotation of the word) that the word maps to in the conceptual realm, and contextual information. Sticking with the example *green*, then, the lexical entry might need to represent some semantic information, like that it describes a gradable property (and hence can be used in comparatives).⁸ Through the context, we figure out how to map the word to a concept or set of concepts, such as the concept of a color (as in *the green grass*), of a thing that has that color (as in *I've run out of paint, give me some more green*), or of some specific quality associated with that color (as in *the green intern, green politics*). The context also allows us to determine the boundaries of the denotation, for instance whether for our purposes *green* excludes OLIVE GREEN or refers only to FOCAL GREEN. So, in essence, I assume senses to be dynamic, and assume that the fixed mental representations of semantic information (lexical or conceptual) allow for adaptation to the requirements of a particular context. Senses that seem basic to words are usually those that require the fewest contextual cues or lexical/conceptual processes and/or that refer to more prototypical exemplars of the concepts involved. So, 'green-colored' is a more basic sense for *green* than 'green paint' because the latter includes the meaning of the former and was presumably derived through a process that lets color words stand for things that are the color that the word describes and then applied to a particular context (in which it specifically means 'green paint' rather than 'thing that is green'). A sense of *green* in which FOCAL GREEN is the

defining prototype is more basic than a sense that only refers to shades of chartreuse.

1.3.4 *The thesaurus metaphor*

Besides the dictionary metaphor, some models of the lexicon instead (or also) employ what I will call the **thesaurus metaphor**. In such relational models of the lexicon, lexical entries (or senses within them) are cross-referenced with or linked to other lexical entries (or senses within them). Thus, the information that *high* is the antonym of *low* is represented in the lexicon in such models, and may serve as the means by which they represent the type of basic semantic information about the words that is arbitrary and stable. In such models, since *high* and *low* are in an antonymic relation, they are constrained to always denote the opposite ends of whatever scale they describe. The specifics of such models, and their advantages and disadvantages, are discussed in chapter 3. For the time being, it is worth noting that dictionary and thesaurus models exist on a continuum, and that the two ends of the continuum represent **componentialism** and **holism**. On the extreme componentialist end are dictionary models that are not relational at all, in which the lexical entries are unordered with respect to each other. The assumption of an unordered lexicon is often found in generative linguistics (e.g., Chomsky 1965; di Sciullo and Williams 1987). At the holistic extreme are thesaurus models that contain no definitional information in the lexical entries, but instead expect meaning to arise through the relations of words in the language's lexical network. This position is best represented in some computational models (e.g., Quillian 1968 and early versions of WordNet; see 3.1.5 and 3.4.2, respectively), but it can also be seen in some European structuralist linguistic positions (see 3.1.2) and in philosophical approaches to meaning (see 3.1.1 and 3.4.1). Many models of the lexicon, including several structural semantic models, fall somewhere between these extremes, showing some preference for definition or relation as the basic means for representing semantic information, but not excluding the other means (see 3.3). I use the term **associationist** to refer to any approach (holist or mixed) that embraces the thesaurus metaphor and treats semantic relations as fixed mental representations.

1.4 Words, concepts, and concepts of words

The linguistic faculty involves two types of knowledge: lexical and grammatical. Each of these types of knowledge is relevant to our use of words (and to our linguistic competence in general), but in different ways. The lexicon represents facts about particular linguistic expressions (i.e., the lexical items), such as the facts that there is a word *nicht* that is pronounced [najt] and that word is a noun

(see n. 5). The grammar consists of rules for making new linguistic expressions out of the raw materials that the lexicon supplies.

Like linguistic knowledge, conceptual knowledge involves representations of arbitrary concepts and rules for using those concepts, allowing for the generation of new concepts. Arbitrary facts are things that one has to experience in order to learn. So, for example, I know that mature kiwifruits are kind of hairy because at some point I was introduced to these facts and made them part of my KIWI concept. While there may be breeds of hairless kiwis or explanations for the hairiness of kiwi skins, I do not know about them. The information that kiwis are hairy is, to me, an arbitrary fact about kiwis.

The conceptual system is accessible to principled processes for making inferences about those arbitrary facts and for constructing new concepts (as for ad hoc categories, Barsalou 1983). For instance, in my long-term memory I have concepts of all the clothes I now own. In imagining A GOOD OUTFIT TO WEAR TOMORROW, I use those conceptual representations of my clothes along with my conceptual representations of OUTFIT (color and style coordination, coverage of the body from at least chest to thigh), tomorrow's weather forecast, my plans for tomorrow (and what clothing is appropriate to them), and so forth. I thus build a concept of a new category (A GOOD OUTFIT FOR TOMORROW) using extant concepts and principles for developing new concepts based on old ones.

As in lexical representation, the mechanics of conceptual representation are subconscious. When I imagine a kiwi, I am aware that I have a conceptual representation of KIWI, but I do not see my conceptual representation of KIWI. My imagined kiwi is the result of applying some processes (recall, mental imaging, and whatever sub-processes they involve) to that particular concept. Presumably, my concept for KIWI is schematized so that it can engage in a number of different cognitive processes, such as categorization, recognition, recall, and mapping to a lexical item.

If the conceptual system represents knowledge of the world, then it stands to reason that it includes representations of language, since language is part of the world that we know. So, we need to differentiate linguistic knowledge (the grammar and lexicon) from the metalinguistic knowledge represented in the conceptual system. Thinking about words is a metalinguistic endeavor, since we do not have direct, conscious access to the structures in the lexicon. Thus, the objects we reflect upon when reading a dictionary or writing a linguistics book are our perceptions of words, and the objects with which we are doing this reflecting are the concepts we have of the words. So when we think about words *in the lexicon*, we are always at least one step removed from the object of our study. We make inferences about words, rather than observations of lexical entries.

Like other conceptual knowledge, our knowledge about words may be derived or remembered. So, for example, I have gathered from experience (and now

remember) that certain words offend my mother and others offend my father, that *anil* is a common word in American crossword puzzles, and that my brother used to metathesize the first two sounds in *spaghetti*. None of these facts is relevant to my competent grammatical and meaningful use of these words (although they may affect where I choose to use them), so there is no reason to believe it is part of my lexical representation of the words.

Other conceptual knowledge of words can be derived extemporaneously. To use a phonological example, when thinking about the word *boot*, I know it has three sounds, but there is no reason to believe that this fact is intralexically or conceptually represented. What is more likely represented in the lexicon is the fact that the word has the sounds [b], [u], and [t], in that order. In observing the word, I have made the inference that its sounds are three in number. This fact is not relevant to my actual use of *boot* as a piece of language – there are no phonological rules that apply only to words with three phonemes. Thus, in reflecting upon the word *boot*, I perceive the word and conceptualize it (or make use of my conceptualization of it).

Some word-concepts may be completely ad hoc (see Barsalou 1983). If I have used a word for years without thinking about it and without any incident that might make it remarkable to me, it might exist as a lexical entry in my mind, but not as a concept. If someone then asks me “what do you know about *only*?” I could reflect on it – thereby conceptualizing it – and pull together some facts about *only*: it rhymes with *lonely*, it has four letters, it can be an adjective (as in *an only child*) or an adverb, sometimes it can be interchanged with *just*, it is not easy to say it backwards, and so forth. I come to these conclusions and thus build my concept for *ONLY* by mentally rehearsing its use and noticing things about its pronunciation, spelling, meaning, and grammatical properties.

This differentiation of lexical and conceptual representation of words is probably not controversial, but acknowledgment of the distinction between the two types of word-knowledge is necessary in accounting for some phenomena that traipse the lexical-conceptual divide. Conflicts between metalinguistic beliefs and facts about language use indicate that our metalinguistic knowledge of words is extensive, if not always perfect. For example, corpus studies often reveal that the ways in which we use words are quite different from our beliefs about how the words are used. For example, if you ask someone (preferably not a corpus linguist) for the most common meaning of *run*, they will probably tell you that it has to do with moving swiftly by foot. But checking the uses of *run* in a corpus, very few of the tokens have a locomotive meaning – most mean something more like ‘manage,’ as in *run a business* (Michael Barlow, 1999 LSA Institute lecture). The mismatch between fact and belief indicates that we have (or create, in order to answer the question) some conceptual representation of *run*, and the prototype for that concept is the version of *run* that indicates a certain form of animal (likely human) movement.

The argument in chapter 2 makes use of the distinction between lexical and conceptual knowledge of words, showing that this distinction is necessary in accounting for semantic relations among words.

1.5 Summary and next steps

In this chapter I have defined paradigmatic semantic relations among words as the topic of study. The goal in approaching this topic is to create a psychologically viable model of how such semantic relations are acquired and used. Thus, the overarching question is: How are semantic relations mentally represented? The perspective taken here is pragmatic, in that it is assumed that we must examine the use of words in context in order to appreciate how they might be represented in the mind.

There are two basic types of answer to the question of how semantic relations are mentally represented. Either relations among words are represented directly (thesaurus-style), as facts that we know, or they are derived by some sort of relational rules that take into account other facts that we know (such as the words' meanings). In order to test the idea that semantic relations might be directly represented in the lexicon, I have defined the lexicon precisely enough to make clear the implications of this idea. Thus, the lexicon is defined as the repository of arbitrary facts about language – that is, linguistic information that is not derivable from other knowledge. The problems of polysemy and of distinguishing the lexical-encyclopedic divide necessitate that the lexicon be semantically impoverished. Finally, two types of mental representations of words were noted: (linguistic) lexical entries (represented by italics: *lexical item*) and (metalinguistic) conceptual representations of words (in italic small capitals: *LEXICAL CONCEPT*).

The remainder of Part I concerns semantic relations in general. Chapter 2 describes the properties of semantic relations for which a theory of semantic relations must account. It then introduces a pragmatic, **metalexical** account for paradigmatic semantic relations based on the assumptions outlined in this chapter. Chapter 3 provides a multi-disciplinary survey of other approaches to semantic relations and how they compare to the metalexical approach. Part II (chapters 4–6) concerns particular relations in detail, with chapters on synonymy, antonymy and contrast, and hyponymy, meronymy and other relations. In the final chapter, I summarize the foregoing, reconsider some problems for the metalexical account, review compatible models of the lexicon, and suggest further questions for investigation.

2 A pragmatic approach to semantic relations

It was all so nearly alike it must be different.

Gertrude Stein, *Composition as explanation* (1926)

Following the assumptions of chapter 1, only information that is both arbitrary and relevant to linguistic competence is contained in lexical entries. If relations among words are not arbitrary or not entirely dependent on the linguistic properties of the words, then these relations are not represented in the lexicon. This chapter demonstrates that semantic relations among words indeed are not (and cannot be) represented in the lexicon for three reasons: (a) They are not relevant to linguistic competence; (b) they depend upon the contexts in which they occur; and (c) they are predictable by means of a single relational principle. Semantic relations among words thus consist of conceptual knowledge *about* words, rather than lexical knowledge *of* words (Murphy 2000). In essence, this chapter shows that a **metalexical** treatment of semantic relations is forced by the divisions of labor among lexicon, grammar, and conceptual knowledge, as well as by facts about relational phenomena.

This metalexical treatment provides the means to account for all lexical relations – not just semantic ones and not just the ones that have been acknowledged with *'nym* names. So while Cruse (1986) goes to some pains to distinguish between “interesting” and “uninteresting” semantic relations, this treatment considers any paradigm-based relation interesting and explainable, no matter the basis of the paradigm. Thus, the binary relation between *cat* and *dog*, which many theorists would not include as an instance of one of the *'nyms*, is as much in need of explanation as the familiar relations between *cat* < *animal* or *black/white*. Nevertheless, the traditional *'nym* relations receive the most attention here because of the rich literature on them and hence the increased opportunity to test the current treatment against observations about semantic relations from a number of different perspectives. Antonymy is over-represented in this and the next chapter's discussions, since it is the most controversial semantic relation in terms of whether it is an arbitrary relation among words or a predictable relation among word meanings or concepts.

Another point of interest is that the metalexical treatment is compatible with a number of approaches to lexical semantics, in that it is agnostic with regard to semantic content in the lexicon. No matter the level of semantic specification in lexical entries, information about a word's synonyms or antonyms is part of conceptual or encyclopedic, not lexical, knowledge.

The chapter is structured as follows. Firstly, nine properties of semantic relations, including productivity, variability, and universality, are described in 2.1. These properties present theoretical challenges, since some (e.g., variability and canonicity) seem incompatible. In light of these properties, the requirements for a theory of lexical relations are defined, with reference to the limitations placed by the assumption of lexical modularity. A relational principle (**Relation by Contrast**) that meets these requirements is introduced in 2.2. It holds that items are related if they are minimally different in contextually appropriate ways. In 2.3, several relational phenomena are discussed in light of this principle. These include the particular canonicity of antonyms, metaphorical use of semantically related words, word-association behavior and the “paradigmatic shift,” speech errors, and use of related words for stylistic purposes. Finally, 2.4 summarizes the chapter.

2.1 Properties of semantic relations

A unified approach to the various semantic relation types seems elusive, since the types – and even instances of a relation within a type – inherently have different, often contradictory, characteristics. The subsections below concern the following properties of semantic relations:

1. **Productivity**: New relational links among words can be generated.
2. **Binarity**: Some relations relate only pairs of words, although larger sets of words may be semantically available for the relation (e.g., *black/white* rather than *black/gray/white*).
3. **Variability**: Which word(s) a particular word is related to varies according to which sense of the word is used and the context in which it is used.
4. **Prototypicality and canonicity**: Some word sets better exemplify a relation than others, and some word sets (especially some antonym pairs) seem to have special status as canonical examples of a relation.
5. **Semi-semanticity**: Semantic properties of words are not the only factors at work in relating words and judging semantic relations.
6. **Uncountability**: The number of semantic relation types is not objectively determinable.
7. **Predictability**: Relations among words adhere to general patterns, indicating that semantic relations are rule governed.
8. **Universality**: The same semantic relations are relevant to the description of any language's lexicon.

The challenge at hand is to devise an approach that fits all these properties – in spite of the fact that the properties can be contradictory. For example, while antonymy is variable (i.e., context dependent), particular antonym pairs are often canonical in that they are known without reference to context. This constellation of relational properties leads to the approach proposed in 2.2.

2.1.1 Productivity

If semantic relations are rule generated, then the information that the two words are related should not be included as arbitrary information in the lexicon. One indication that relations are rule generated is that new instances of the relations can be easily produced at any time – that is, relations are **productive**. If we can create new instances of synonymy or antonymy, then there must be a mechanism for predicting that certain words can be related, rather than a just fixed mental record of words' relatives.

The productivity of synonymy is clearly observable. If we invent a new word that represents (to some extent) the same thing that an existing word in the language represents, then the new word is automatically a synonym of the older word. For example, every time a new slang term meaning 'automobile' is invented, a synonym relation is predicted for the new slang term (say, *ride*) and the standard and slang terms that already exist (*car*, *auto*, *wheels*, etc.). *Ride* does not need to be inducted as a member of the synonym set – no one has to say "*ride* means the same thing as *car*" in order for the synonym relation to be understood. All that must happen is that *ride* must be used and understood to mean the same thing as *car* – as in *My new ride is a Honda*.

Turning to antonymy, oppositional morphology is one means by which new antonyms are created for existing words (see Horn 1989). So, for example, the verbal prefixes *dis-* and *de-* can be used to create new reversive antonyms, as in (1). Similarly, for many adjectives, *un-* allows for some productivity in antonym-making, as in (2).

- (1)
 - a. Increased sophistication in analyzing biochemicals and manipulating genetic stocks also allowed bioscientists to "**disendanger**" species. ("Putting the 'servant' back in 'public servant,'" *The Manoa Journal of Fried and Half-Fried Ideas* 4, 1994)
 - b. To determine exactly how much feed to use we need to **defuzzify** the rules. (Fuzzy Expert System Tutorial, <http://ag.arizona.edu/AREC/>)
- (2) *Spawn* is the work of an **unheavenly** creator. (J. Seavor in *Providence Journal*, 1 August 1997)

While the above negated forms are original enough to be rejected by my computer's spellchecker, the productivity of these prefixes is not unlimited. For

example, adjectival *un-* is semantically restricted (e.g., **unlow*). *Non-*, on the other hand, is completely productive, allowing any adjective or noun to have an antonym. However, antonymy created through *non-* is more akin to phrasal negation than to other cases of lexical opposition, in that it does not contrast two particular properties or things – just one property or thing and its absence. For instance, if we hear *The winners are happy and the losers are unhappy*, then we have some idea what properties those winners and losers have. The losers are more sad or upset than neutral or happy. But if we say *The losers are non-happy*, we only know the state the losers are not in (see Horn 1989). So, while morphology provides some means for making new antonyms for existing words, the morphemes and morphological processes either are not entirely productive or do not represent all the varieties of semantic opposition that are described by the term *antonymy* (see 5.3). So we need to look for productivity in non-morphological antonymy as well.

The binary nature of antonymy (see 2.1.2 and 5.2.1) makes it seem less productive than synonymy. If one antonym exists for a word, there should be no room for a second. Occasionally one word sense does have two easily recognized (canonical) antonyms, for instance *happy/sad* and *happy/unhappy*. But we can see the productivity of antonymy more clearly for words that do not have canonical antonyms. Although *red* has no canonical antonym, it has opposites in particular contexts. In color theory, *red* has two opposites: for pigments, its opposite is *green*, and for light, it is *cyan*. In discussing wine, the opposite of *red* is *white*. In the semiotic system of traffic signals, the opposite of the color red (and thus the word *red*) is green (and *green*). Even outside such specific jargons and semiotic systems, English speakers can come up with viable opposites for *red* and explain how they did so. It may be *blue* (because red and blue are contrasted on flags and clothing) or *black* (because red and black oppose each other on a checkerboard), or some other color. The dialogue in (3), from the Blondie comic strip, illustrates that people devise and evaluate opposites for items that do not have canonical antonyms.

- (3) Mr. Dithers: *Why do you always say the opposite of whatever I say?
If I say right, you say left! If I say bad, you say good! If
I say red, you say brown!*

Dagwood: *Brown isn't the opposite of red . . . I think blue is.*

A theory of semantic relations must then account for the fact that we can recognize or propose that words are semantically related although we may not have experienced those words in relation.¹

2.1.2 Binariness

A theory of semantic relations must also account for the fact that antonymy is **binary**, while other relations, like synonymy or contrast (e.g., co-hyponymy) do

not limit the number of items that can be related. Since antonymy is rather similar to negation (as in the morphological oppositions discussed above), its binary nature should not be surprising. After all, negated sentences are in a binary relation to their affirmative counterparts, as in (4b)'s contradiction of (4a). Note, however that using an antonymic predicate, as in (4c), is truth-conditionally different from negating the predicate, as in (4b). In (4b), the referent might be hermaphroditic or sexless (perhaps *it* is a worm or a bacterium), but in (4c) such an interpretation is not possible. (See Horn 1989.)

- (4) a. It is male.
 b. It is not male.
 c. It is female.

So, while antonyms, like sentential contradictions, indicate incompatible states, antonyms usually make more information available about that incompatible state than simple negation does. Since additional information is provided, additional options besides simple contradiction are available – e.g., not just {*male*, *female*}, but {*male*, *female*, *hermaphroditic*, *sexless*}. But just because these options are available does not mean that they are salient. Thus, by considering *male/female* to be antonyms, we deem irrelevant the possibility of other sexed and sexless states.

One approach to binarity in antonymy would hold that antonymy only arises where words are in complementary, contrary, or converse relations, which are necessarily binary. *Dead/alive* are complementary (in that not being one entails being the other), *hot/cold* are contrary (in that they name the extremes of a scale), and *buy/sell* are converse (in that if X buys from Y then Y sells to X – for further definitions, see 5.3). But contrary sets are not necessarily binary, since some semantic fields include more than two extremes, such as the emotion contrast set {*happy*, *sad*, *angry* . . .} or the taste set {*sweet*, *sour*, *bitter*, *salty*}. Within these larger sets exist particular canonical binary antonym pairs, such as *happy/sad*, rather than *happy/angry*, and *sour/sweet*, rather than *sour/bitter* (see 2.1.4 and 5.2.1). Thus, binarity arises where it is not logically necessary.

Contrast sets do not always include such privileged pairs, however. Outside a particular context (like color theory or traffic signal systems), one is hard-pressed to argue that any of the basic chromatic color terms (*red*, *blue*, *orange*, etc.) has a single antonym. So, a theory of semantic relations needs to say something about the privileged position of binary pairs in some contrastive contexts, but not others.

2.1.3 Variability

While canonical examples of antonymy have been noted here, the antonym (or synonym etc.) of any word can **vary** according to context. One reason for this is the fact that words are polysemous, and different senses of a single word may

require different synonyms or antonyms. For instance, *luggage* and *baggage* are not semantically equivalent – they are only synonyms to the extent that they have senses or uses that are semantically equivalent. *Luggage* is a synonym of *baggage* when it is used to denote totable containers filled with (usually) personal items to be carried by transport, as in (5a). They are not synonymous when *luggage* is used to denote the empty containers, as in (5b), nor when *baggage* is used figuratively for a complicated emotional history, as in (5c).

- (5) a. Check your baggage/luggage with the gate agent.
- b. I bought a new set of luggage/*baggage for my trip.
- c. I won't date guys with baggage/*luggage from their divorces.

Similarly, antonymic relations vary by sense. For example, the antonym of *dry* is typically *wet*, but the opposite of *dry wine* is *sweet wine*, not *wet wine*. One might argue that this is an example of homonymy, rather than polysemy. In that case, two lexical items, *dry*₁ and *dry*₂ are involved, rather than two senses associated with a single lexical item, *dry*. However, if we were to use antonymic or synonymic relations as a test for homonymy, the lexicon would need to be indefinitely large. In addition to *dry*₁ in *a dry towel* and *dry*₂ in *dry wine*, we would need *dry*₃ to account for its antonymic relationship with *moist* (but not *wet*) in the context *a dry cake*, and *dry*₄ to account for its antonymic relationship with *oily* in *dry problem skin*, and *dry*₅ to account for its antonymic relationship with *productive* in *a dry cough*. Similarly, Murphy and Andrew (1993) give experimental evidence that people recognize different antonyms for adjectives according to the nouns that the adjectives modify. For example, the antonym of the sense of *fresh* in *fresh fish* is different from that in *fresh bread* or *fresh shirt*. As argued in chapter 1, the polysemy of words is limitless, and so the full array of word senses cannot be intralexically represented. Thus the number of possible antonyms, synonyms, hyperonyms (etc.) for a word is also potentially limitless, and so relations cannot be represented in the lexicon.

Even if we look at a single sense of a word, its antonyms or contrast sets can vary by context. Returning to colors, the sense of *blue* is the same wherever it acts as a simple color descriptor. But depending on context, other colors may relevantly contrast with it. So, if we are talking about photographic positives and negatives, the opposite of *blue* is *orange*. But if the context is the weather, *blue* can be the opposite of *gray* (in reference to the sky).

Thus, a theory of semantic relations must be sensitive to the variability of any word's relation to other words. Not only do semantic relations vary by word sense (as is noted throughout the literature), but they also vary by context, regardless of sense variation. Considering the view of polysemy outlined in chapter 1, in which senses themselves depend on context, it is not surprising that semantic relations are both sense and context sensitive.

2.1.4 Prototypicality and canonicity

In spite of the fact that semantic relations are variable, some associations among words seem to be “better” examples of a relation than others, indicating **prototypicality** effects for semantic relatedness (Cruse 1994). Examples like (6) and (7) (emphases added) show that people naturally make metalinguistic judgments of semantic relations.

- (6) You could become *landed gentry* which I think would be the **best synonym** for *proprietor*. (*Notes on the New Jersey Proprietors*, Edward Ball Group, 1995–1997)
- (7) The phrase tossed around . . . was “Pain is temporary, pride is forever.” . . . I had heard it before as “Pain is temporary, pride is permanent,” which I liked better . . . because “permanent” is a **better antonym** for “temporary.” (<http://is.dal.ca/~susanhal/results/97/imc97.html>)

Prototypicality judgments are not limited to judging which word is the closest relative of another. Prototypicality is also evident in judging sets of words against each other as examples of the relation in question. So, not only is *hot* the “best” antonym for *cold*, but the pair *hot/cold* may be also perceived as a better antonym pair than another pair, like *cruel/kind*. This prototypicality effect can be seen by asking people for examples of antonymy. They most often offer pairs like *black/white*, *good/bad*, and *big/little* – common vocabulary in **canonical** relations. But even among the canonical or among the non-canonical antonyms, some are perceived as more prototypical than others are. Demonstrating this, Herrmann et al. (1986) asked subjects to rate the antonymy of word pairs on a scale from one to five. The average scores for the pairs in table 2.1 are all above 4.60 – indicating that the subjects agreed that these are highly antonymous pairs. But the average scores vary, so that some canonical examples were judged more antonymous than others, and some non-canonical antonyms were judged more antonymous than others. So, although they are both canonical pairs, *love/hate* was judged a better case of antonymy than *big/little*. But displaying a high degree of antonymy is not equivalent to being a canonical antonym. While *maximize/minimize* has the highest score, most people would not think of it

Table 2.1 *Degrees of perceived antonymy (Herrmann et al. 1986)*

≥4.90	4.75–4.89	4.60–4.74
maximize/minimize (5.0)	good/bad (4.86)	cruel/kind (4.71)
love/hate (4.95)	huge/tiny (4.81)	emaciated/obese (4.67)
night/day (4.90)	big/little (4.76)	immaculate/filthy (4.62)

when asked for an example of antonymy, and it is not clear that its antonymy is of the same experientially reinforced type as pairs like *big/little* and *cruel/kind*. (See 2.1.5.)

An antonym canon does seem to exist – somewhat like other aspects of a cultural canon (including etiquette and folk knowledge) that we are expected to know as participants in a society. Explicit teaching may be part of how we learn the canon – for example, in many Western cultures, antonyms receive attention in early education. The US television program *Sesame Street*, for instance, teaches preschoolers the “Up and Down” song and gives Spanish lessons focused on *abierto* ‘open’ and *cerrado* ‘closed’. But a more common source of information about canonical pairs is their co-occurrence in set phrases, like *being cruel to be kind* or *different as night and day*. Such phrases promote the relation of two particular words over other possibilities (e.g., *unkind/kind* or *evening/day*). Canonicity can be measured in terms of a pair’s co-occurrence in natural language, where juxtaposition of semantically related terms occurs both in set phrases and in creative language use, as corroborated by corpus studies. For instance, Justeson and Katz (1991, 1992) have shown that pairs like *long/short*, *pleasure/pain*, and *hot/cold* co-occur in sentences at greater than expected rates, as in the examples in (8) from the Brown Corpus.

- (8) a. [H]e must work long hours in the **hot sun** or **cold rain**.
 b. The **pain** seems **short** and the **pleasure** seems **long**.

Not only do the canonical antonyms co-occur at greater than expected rates, they co-occur far more often than similar, non-canonical pairs do. So, for example, Charles and Miller (1989) show that *big/little* and *large/small* occur together more than three times as often as *large/little* or *big/small* do.

Word association tasks show that some relations between words are automatic and stable across speakers, while others are not. In such experiments, subjects hear or read single-word stimuli and give an automatic one-word response. In school-age children and adults, responses are very often related to the stimulus paradigmatically, mostly by antonymy, synonymy, or hyponymy. For example, in the 1952 Minnesota word association norms (Jenkins 1970), nearly 75% of the respondents said *white* in response to *black*. Considering the number of idioms and compound words that involve *black* and the number of black things in the world, it is remarkable that more subjects did not give syntagmatically related responses (e.g., *black* – *widow, bird, board, sheep, jack, flag, Monday*) or other conceptually related responses from different grammatical or semantic categories (e.g., *funeral, night*). Twenty-five of the 100 stimulus words in the norms led more than 50% of the more than 1,000 subjects to the same response. Of these, twenty-two of the responses are paradigmatically related to their stimuli. The paradigmatic relations represented in this set include fifteen instances of binary contrast (including five instances of gender contrast, for

example *king/queen*, and the binary sets *bread/butter* and *butter/bread*), five instances of co-membership in a larger contrast set (i.e., co-hyponymy: e.g., *bitter-sweet*, *sour-sweet*), and a case each of hyperonymy (e.g., *eagle* < *bird*) and synonymy-hyperonymy (*blossom* ≤ *flower*) (see 4.5).

Not all stimuli evoke such consistent responses. For example, the top response for *trouble* (*bad*) was given by only 8.83% of respondents. And not all stimuli evoke paradigmatically related responses – even within a single grammatical category or semantic field. For example, while the set-contrastive relation *table-chair* had the highest association rate of any item in the Minnesota norms (83.25%), the top response for another furniture item, *bed*, was *sleep* (57.93%), rather than another member of the furniture category. Thus, part of what must be explained is why certain words have more consistent responses than others do, and why not all words within a syntactic or semantic category evoke the same types of responses.

One bit of evidence that some instantiations of relations are canonical is the fact that less-common words elicit more syntagmatic responses than more-common ones (Meara 1978). If learning canonical relations involves repeated exposure to the words co-occurring, then it would stand to reason that common antonymic words have a greater chance of being ‘canonized’ than less common ones. Repeated exposure to the co-occurring words reinforces their status as opposed *words* (rather than just opposing concepts).

We also see evidence of canonicity in the fact that some antonym pairings are stable across word senses, while others are not. The discussion of antonym variability above might have led us to the conclusion that antonymy relates senses or word uses rather than relating the words themselves. But if we posit that each of a word’s senses has its own relations to synonyms and antonyms, we miss important generalizations for some words that have the same synonyms or antonyms for a number of senses. For example, the color senses of *black* and *white* are opposed and so are their racial senses and their ‘good’/‘evil’ senses as in *white magic* and *black magic*. Canonicity of antonym relations also plays a role in context-specific antonymy. As Lehrer (2002) notes, if a frequent or basic sense of a word is in a semantic relation with another word, that relation can be extended to other senses of the word. For example, the basic temperature sense of *hot* contrasts with *cold*. While *cold* does not usually mean ‘legally acquired,’ it can have that meaning when contrasted (with enough context) with *hot* in its ‘stolen’ sense, as in (9).

(9) He traded in his hot car for a cold one. (Lehrer 2002)

For readers to understand the intended sense of *cold* in (9), they must know that *cold* is the usual antonym of *hot*. Next they must deduce that if *cold* is the antonym of *hot*, then no matter what *hot* is used to mean in this context,

cold means the opposite thing. The stability of some such antonym pairs across senses and contexts is evidence that those antonymic pairings are canonical.

Since canonicity is most relevant to antonymy, other discussion of canonicity is left for chapter 5. The discussion so far has indicated that a theory of semantic relations must allow for prototypicality effects and for the existence of both canonical and non-canonical antonym pairs.

2.1.5 *Semi-semanticity*

Although the topic of discussion here is *semantic* relations, **semantic properties of words are not the only relevant properties** for these relations, although they are certainly the most important. In looking for a word's "closest" relatives – its "better" or "best" antonyms, synonyms, and hyponyms – we often consider non-semantic properties of the words. One non-semantic (or, not strictly semantic) factor for paradigmatic relations is grammatical category, or part of speech. For instance, although *happy* and *joy* denote nearly the same emotional state, they are not good synonyms because one is an adjective and the other is a noun. This could lead to the assumption that semantic relations relate lemmata (i.e., the syntactic and semantic portions of lexical entries) rather than the word's sense or its full lexical entry (i.e., including information about the word form). However, a corpus study by Fellbaum (1995) shows that similarity of grammatical category is not as important as semantic opposition in the co-occurrence of antonym pairs. Just as Justeson and Katz (1991, 1992) found that canonical antonyms co-occur at greater than expected rates, Fellbaum found that morphologically related variants of these forms also co-occur at greater than expected rates. It stretches the definition of *paradigmatic relation* to call the noun *dead* (as in *the dead*) and the verb *live* [lɪv] "antonyms." Nevertheless, Fellbaum's data show that these words are used contrastively, much like the verb pair *live/die*. (In fact, the noun/verb pair co-occurs at a much higher rate than *live/die* does.) Thus, semantic relatedness is the core requirement for semantic relations, and similarity of grammatical category is less central to these relations.

Defining semantic relations as lemmatic relations is also problematic because matters of form are often important to judgments of semantic relatedness. Social register is one factor, so that *liquor* and *spirits* are better synonyms than *liquor* and *hooch*. For some antonyms, having the same root is important, so that *edible/inedible* is better than *edible/uneatable*. For others, similarity in morphological complexity and form is relevant, such that *awake/asleep* are better antonyms than *awake/sleeping* or *up/asleep*. Morphological form and etymology affect phonetic form, and so many "good" antonym pairs are alliterative (*awake/asleep*) or rhyming (*ascend/descend*).

If we look hard enough at the semantics of the related words in these examples, we might find that semantic properties *are* sufficient to explain some of the preferences for one antonym or synonym over another. But the non-semantic factors may still have a role in making the words seem more semantically similar. It is not coincidence that *maximize/minimize* is the only antonym pair in Herrmann et al.'s (1986) study (see table 2.1 above) that got a perfect score of 5 for its degree of antonymy. It would be difficult to argue on purely semantic grounds that *maximize/minimize* are better antonyms than *hot/cold* or *huge/tiny*. But if we look beyond semantic opposition, *maximize* and *minimize* are alliterative, rhyming, and parallel in metrical structure (in fact, they only differ by the first syllable's rhyme). These non-semantic facts affect perceptions of how antonymous the pair is.

The discussion of canonicity above also indicates that non-semantic factors are at play in antonym or synonym choice. For instance, in example (9) (in 2.1.4 above), where *hot* means 'stolen,' *purchased* or *non-stolen* would be more semantically appropriate antonyms than *cold*. The association of the word forms *hot* and *cold* in other contexts has led them to be chosen as good examples of antonymy regardless of context. That is, the forms are understood to be opposed, and the semantic particulars follow from reasoning about their use in context (see 2.1.4).

Finally, sometimes "semantic" relations are applied to items without reference to their semantic qualities. In fact, the *OPPOSITE* category is so broad that it can even apply (on non-semantic grounds) to proper names. In the conversation in (10) (reported by Georgia Green, personal communication), the name *Tom Jones* is the opposite of *Engelbert Humperdinck* because they reflect opposite extremes on the scales of commonality and complexity for names.

- (10) *Parents explaining to daughter why pop singer Engelbert Humperdinck named himself after a nineteenth-century composer.*

Mother: You know, to call attention to himself, and differentiate himself from the competition.

Father: The other guy that sang the same kind of music went by the name *Tom Jones*. As a name, *Engelbert Humperdinck* is the opposite of *Tom Jones*.

So, a theory of semantic relations must explain why non-semantic factors sometimes play a role in allegedly semantic relations. In a principle-based account, this means that the rules for word relation need to have access to the form and grammatical properties of the words as well as their semantic properties. This, again, contrasts with the notion that semantic relations relate meanings, rather than words.

2.1.6 *Uncountability*

Many approaches to semantic relations have involved devising taxonomies of these relations. As an example, Lyons (1977) and Cruse (1986) provide taxonomies of opposition that divide equivalent sets of antonymic pairs into different numbers of types and subtypes. Lyons has four basic types (complementary, contrary, directional, and converse) and divides the directional type further into orthogonal and antipodal subtypes. Cruse, on the other hand, divides the same variety of relations into three basic types (contrary, complementary, and directional), and divides these into multiple subtypes: contraries have three subtypes and one sub-subtype, complementaries include three subtypes, and directionals have four subtypes, two of which are divided into further subtypes. (See chapter 5.)

One problem with such approaches is that there is **no way to determine when the types have been reduced to a perfect taxonomy**. Is it better to define three or four basic types of antonymy? Four types of part-whole relation (Iris et al. 1988) or eight types of an inclusion relation, which subsumes meronymy (Chaffin and Herrmann 1984)? Defining more types implies that we need different accounts for how each of these types of relations is acquired and used. Chaffin and Herrmann (1984) claim that an untenable proliferation of lexical relations is prevented by the fact that we can only have as many different relations as pairs of words. But this is false, since it is entirely possible that two words could be in more than one type of relation with each other. For example, *hot* and *cool* are opposed when they refer to temperatures, but similar when referring to fashion (*hot/cool new swimsuits*). Of course, different senses of *hot* and *cool* operate in these two relations, and this reveals further why Chaffin and Herrmann are wrong about the limits on the possible number of relations. Since the number of senses a word may have is open ended (chapter 1), so is the number of possible relations among the senses for any two words.

While such taxonomies do help us to appreciate the variety within any of these types, they probably say more about the individual words in the relations than about antonymy, hyponymy, or meronymy. So, for example, considering directional and converse antonymy as different types of relations misses the generalization that they are both simple oppositions. All that differs among these relations is the types of words they oppose. The fact that *north/south* is an example of directional opposition is predictable from the fact that directions have to be opposed to other directions. Likewise, the fact that *give/receive* exemplifies converse opposition is predictable from the fact that actions involving unidimensional movement can be seen from two perspectives: that of the source and that of the goal. Rather than asking “what types of antonymy exist?” we might better ask “what properties do word meanings have, and can they all be

opposed?” or “which semantic properties of words are relevant to antonymy and which are not, and what is the difference between the two?”

Another problem is that the number of ways in which two or more words can be semantically related is more than just the four we have named so far (antonymy, synonymy, hyponymy, and meronymy). What, for example, is the relation between *scotch* and *soda*? We could say that they are in a contrast set, but *binary contrast set* usually means ‘antonyms,’ and many people would balk at using the name *antonymy* for relations involving words for things that accompany each other. What about *happy* and *smile*? Or *cat* and *dog*?

Not only is it difficult, if not impossible, to determine how many semantic relation types and subtypes exist, it is difficult, if not impossible, to determine the semantic relations between any two words in a context-independent way. The same words are not always in the same relation. For example, some words stand in both meronymic and synonymic relations to each other, for example, *flower* $\geq$ *blossom*, and Jones (2002) notes that pairs that are usually or nearly synonyms can be used as antonyms in certain contexts. For example, the italicized pairs in (11) (from Jones 2002: 51) are interpreted as opposites by virtue of their association with other opposites (in bold).

- (11) a. a rather clinical building that is **easy** to *respect* and **difficult** to *love*
 b. crème de cassis had too **low** an alcohol content to be classed as a *liqueur* but too **high** an alcohol content to be classed as *wine*

Such examples underscore the interrelatedness of the relation types, leading one to question whether taxonomical efforts are just counterproductive.

Part II returns to the issue of relational (sub)types. In the meantime, we are motivated to develop a generalized theory of semantic relations – one that accounts for all relations, not just the ones that someone has bothered to name.

2.1.7 Predictability

Semantic relations are productive (see 2.1.1) – that is, we can invent new pairs (or triplets, etc.) of synonyms, antonyms, hyponyms, and the like. This indicates that language users have some knowledge of how to recognize or devise relations among words. As mentioned in 2.1.1, demonstrating productivity is a step toward showing that semantic relations are not arbitrary – that they are predictable, and therefore rule based. However, the fact that some semantically available antonym pairings are “better” than others has led some to propose that antonym relations are not predictable (e.g., Gross et al. 1989). Instead, they argue, it is an idiosyncrasy of *hate* that it is a better antonym for *love* than *abhor* is. If so, this information must be represented in (or across) the words’ lexical entries. But if it can be shown that the differences between “good” and “not so good” antonym pairings are **predictable**, then relational information need not

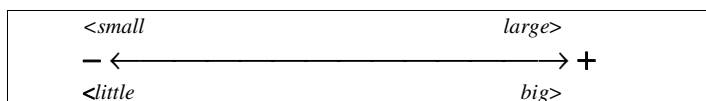


Figure 2.1 Size measurement scale

be intralexically specified. Instead the relations can be derived by a “grammar” of semantic relations.

Several studies have asserted that size adjectives prove that antonym relations are not predictable (Gross et al. 1989; Charles and Miller 1989; Justeson and Katz 1992; K. Miller 1998). Since they are a crucial example, I focus on size adjectives here as well, but with different conclusions. As the previous studies have noted, *big/little* and *large/small* are common antonym pairs, but *large/little* is not. In fact, *large/little* sounds like a downright bad pairing. It is argued that since *big=large* and *small=little* are synonymous, it is idiosyncratic that *big* is a good antonym for *little*, but *large* is not. But if we examine the data deeply and broadly, our preferences for and against pairings of these adjectives can be shown to be predictable. Looking deeply involves re-examining the alleged synonymy of *large=big* and *small=little*. Looking broadly involves considering non-semantic information (see 2.1.5).²

Antonymy, it has been noted (Clark 1970; Hale 1971, *inter alia*), can be basically defined in terms of **minimal difference** (to be refined and further discussed in 2.2). In order to be minimally different, two words must share all of their crucial semantic properties but one. If *big/little* and *large/small* follow this definition but *large/little* does not, then it is not arbitrary that these words are antonymically paired in the way that they are.

Big and *large* are obviously very similar to *little* and *small* since they all describe extremes in size measurement. In Bierwisch’s (1989) semantic analysis, gradable adjectives indicate directions on measurement scales, as in figure 2.1, where *little* and *small* indicate the leftward direction and *large* and *big* indicate the rightward direction on the size scale.

So, while all these words are similar in that they denote directions on that scale, the words for great size differ from the words for lesser size in that they denote opposite directions on the same scale. At this point, it looks like either of the words on the right of figure 2.1 could be antonyms for either on the left.

But if we look more closely, we find that *large* and *little* have more than one difference between them and thus are not *minimally* different. Not only do they represent different directions on the size scale, but they also differ in what they measure. As shown in the examples in (12), the size adjectives differ in the numbers and types of senses they are used to express. *Large* (like *small*) measures (a) quantities and (b) gestalt size. *Little* (like *big*) can be used

(b) for gestalt size, (c) for synaesthetic effect, (d) to express metaphoric size (e.g., importance or complexity), and (e) to express emotive content.

- (12) a. QUANTITY: I'd like a {large/#big/small/#little} amount of cash.
 b. GESTALT: Here comes a {large/big/small/little} dog.
 c. SYNAESTHESIA: The dog let out a {#large/big/?small/little} yelp.
 d. METAPHOR: They made a (?large/big/small/little} mistake.
 e. EMOTIVE: What a cute {#large/big/#small/little} doggie!
 f. 1-D SIZE: The twins are {#large/big/small/?little} for their age.

In addition, *big* and *small* have sense-types in common, in that they both are used for (d) metaphor and (f) one-dimensional size (in this case, height). Although *big/small* may not be as "good" a match as *big/little* in many contexts, there are contexts in which they appropriately (and idiomatically) contrast (e.g., *big/small business*, *big/small problem*), and some (Deese 1965; Lehrer and Lehrer 1982) consider *small* to have two antonyms, *large* and *big*. This indicates that canonical pairing does not rule out the possibility of multiple antonyms for a single word. So the oddness of *large/little* is not because each size adjective has a unique antonym.

Instead, the reason that *large/little* seems odd is that they are too different to fit the condition that antonyms share all semantic properties but one. The only sense-type that *large* and *little* have in common is the gestalt sense-type. Since that is the most prototypical sense-type for the four basic size adjectives, people think of *large-big* and *little-small* as synonymous. However, a closer look reveals that the synonymy of these terms is limited to that one sense, and whether that one sense is really separable from the other senses is another matter. In language use, a word used in a single sense may carry connotations that depend on its other conventional senses, or those senses may exist more on a continuum than as separate entities (Cruse 1986; Taylor 1995). So even when *big* and *large* are used to describe the size of three-dimensional objects, *big* may communicate 'importance' (of some sort) in a way that *large* does not. We can see this in the use of size adjectives in nicknames. *Big* is favored in nicknames (like *Big John* or *the Big Apple*) in which it not only indicates large size but also makes some affective contribution. So, we might call the larger of two Johns in a group *Big John*, but it would not be the same to call him *Large John*. Referring to someone's size in a nickname is only socially acceptable if we use a word that carries connotations of importance or endearment. Here again, *big* is the only appropriate antonym for *little*, since they are similarly able to occur in nicknames (e.g., *Little John*, *Little Italy*).

Since *big* and *large* are hardly equivalent (and neither are *little* and *small*), we do not have a case of two synonyms taking different antonyms. Thus, it is not necessarily the case that antonymic pairings are idiosyncratic.

Taking the broad view and considering non-semantic factors in antonym choice, Murphy and Andrew (1993) and Cruse (1994) point out that while the basic size adjectives are similar in sense, they may still differ in register. For example, *big* and *little* are about three times more common than *large* and *small* in third-grade reading materials (Carroll et al. 1971), while *large* and *small* predominate in the *Wall Street Journal*'s prose style.³ Another factor in linking *big/little* and *large/small* might be the assonance within the pairs.

Considering both semantic and non-semantic factors, the preference for *large/small* over *large/little* is hardly idiosyncratic or arbitrary. If we posit a basic definition for antonymy, that antonyms must be minimally different, then we can rule out the possibility that *large/little* would be acceptable antonyms in most contexts. They are just too different. *Big/little*, *large/small*, and *big/small*, on the other hand, are just different enough to be antonyms.

Other canonical antonym pairs are similarly predictable. For instance, *dead* and *(a)live* have more in common (senses, register, and commonality) than *deceased/alive*. *Hot* is better contrasted to *cold* than to *cool* because only *cold* exactly mirrors *hot*'s properties on the scale of temperature. Given the predictability of canonical antonym pairings, one might wonder again whether canonicity is really a property of semantic relations: Are canonical pairs simply the most predictable ones? While the two properties interact, *canonicity* describes the property of being learned through cultural experience of the pairs, which is quite different from predictability. For example, it might be perfectly predictable (by minimal difference) that *bandicoot* is the opposite of *bilby* (since they are the only direct hyponyms of *Peramelidae*), but the opposition is not likely to be canonical for most English speakers since the pair is not frequently used contrastively (and so their relation is not experientially reinforced).

2.1.8 Universality

Semantic relations are **universal** at both general and particular levels. On the general level, the same types of relations are available to speakers of any language. On the particular level, the same concepts enter into the same semantic relations in different languages.

Starting with the general level, many types of evidence show that speakers of different languages recognize and use the same relations. For instance, speakers across languages respond paradigmatically in free word-association tasks (see Postman and Keppel 1970 and below). In many cultures, metalinguistic commentary or language play reveals awareness of these relations. In Australia, for example, Walbiri men use a ritual language that involves replacing words with their antonyms (Hale 1971; see 5.4.5). Many cultures invent synonyms in order to avoid taboo terms, as exemplified by American English's proliferation of synonyms for a room with a toilet (*bathroom*, *restroom*, *powder room*, etc.).

Cross-linguistic experimentation has established that similar categories of relations are recognized across cultures. Raybeck and Herrmann (1990) investigated relation recognition in speakers of American English, British English, Cantonese, Croatian, Greek, Italian, Urdu, and Vietnamese. Subjects were asked to sort pairs of related words into groups that were related in the same way. So, for instance, subjects were expected to put *male/female* in a group with *remember/forget*, but to put *car/tire* in a different group. Raybeck and Herrmann's conclusions are affected by their particular taxonomy of relations. They looked for five relation types: opposite, similar, part-whole, representational (e.g., *map/city*), and categorical (e.g., cause-effect relations: *joke/laughter*). While these do not correlate exactly with the relations highlighted in this book, their use of *opposite* is generally equivalent to this book's *antonym*. For that relation, subjects from all the cultures agreed that three subtypes (contradiction, directional opposites, and reversives) belonged together as one relation. Subjects also agreed that object-proper part (*car/tire*) and object-stuff (*table/wood*) are similar relations, fitting with our definition of *meronymy*. For the less traditional relations in Raybeck and Herrmann's taxonomy, results varied more. For example, speakers from different cultures differed on which other relations to group cause-effect relations with.

Speakers of different languages also seem to have the same ideas about which meanings can stand in which relations.⁴ Word-association tests have shown marked similarities in the types of associations made by speakers of various languages. Comparing translationally equivalent stimuli, Rosenzweig (1961) found that the most common responses in French and German were translationally equivalent to the most common responses in English 48% of the time. Rosenzweig's data for Italian were only partially reported, with 35% translational equivalence to English, where responses were available. So, for example, the primary response for a word that means 'table' was a word that means 'chair' in English, French, German, and Italian. For 'dark,' the response was 'light,' and for 'soft,' it was 'hard.' Szalay and Windle (1968) found that 38% of Koreans' and 42% of Colombians' word-association responses were translational equivalents of English speakers' responses. They noted that where associations differ across cultures, the differences can often be attributed to specific lexical or cultural differences, rather than differences in the semantic structures of the languages. For example, the most common Korean response to the word for 'hungry' is 'cooked rice,' whereas the most common English response to *hungry* is *food*. This difference reveals more about the cultural status of cooked rice in Korea than about the nature of word-association responses. Most typical antonym pairings occur cross-culturally, so that the opposite of the word for 'hot' can be translated as *cold*. This indicates that the meanings (rather than word forms) are primary in determining the relations. Thus, the relations are not arbitrary.

Of course, all languages have different vocabularies, and so a map of relations in one language is not the same as that in another. While the relation types are universal, one cannot say that every language has the same relational tokens. So, for example, English has borrowed the Italian word *pasta*, but English speakers typically would not have the same range of hyponyms for *pasta* that Italian speakers have. The fact that languages have different lexical-semantic inventories cannot be taken as evidence that the same relations are not available in all languages or that the relations among words are arbitrary.

Where cross-linguistic studies find (seemingly arbitrary) differences, they are among relational *subtypes*. For example, Cruse (1986) compares antonym relations across languages, noting that in different languages the members of an antonym pair like ‘hot’/‘cold’ might have different distributions in the types of constructions that reveal markedness relations (e.g., measurement questions and comparisons). This allows Cruse to conclude, for example, that the words for ‘good’ and ‘bad’ are overlapping antonyms in English, polar antonyms in German, and privative antonyms in Egyptian Arabic. Given the problems in determining an inventory of relational types (2.1.6), we are left to note that antonymy is the constant relation among these meanings in all languages and that the different antonymic subtypes seen among words for ‘good’ and ‘bad’ might not be arbitrary if we can show that the words involved are not exact translational equivalents. This task is left for chapter 5. Meanwhile we can note that the more general types of relation are universal, and that the language-specific differences in the relational subtypes found in a semantic field do not entail that different languages have different relations.

2.2 Semantic relatedness as metalinguistic knowledge

The above properties of semantic relations place some constraints on a theory of semantic relations. Firstly, since semantic relations are productive, variable, predictable, and universal, they do not constitute the kind of arbitrary information that belongs in the lexicon. If they are not represented in the lexicon and they are not relevant to grammatical competence (and we have no reason to believe that they are), then they must be represented as part of non-linguistic knowledge. Secondly, since they can relate words, rather than just relating meanings, they are not simply relations among the concepts that the words represent. So, while semantic relations must be represented in the realm of non-linguistic knowledge, they still constitute knowledge about language. Thus, knowledge of semantic relations is a part of our metalinguistic knowledge about the words in our language. Thirdly, since semantic relations among words are productive, predictable (yet context dependent), and universal, we must have some mental means for deriving semantic relations. In other words, semantic relations are not necessarily fixed in our minds, but can be generated as needed. Given the

metalinguistic, conceptual nature of these relations, we should expect that the principles for deriving semantic relations are general cognitive principles rather than specifically linguistic principles. Fourthly, since some relational pairs are canonical, we must also have means for storing some relations among words. However, such fixed representations must not interfere with the generation of new relations involving the same words. So, even though *wet* and *dry* are canonically opposed, we must allow for other context-specific antonymic pairings of these words, such as *dry/productive* in the description of coughs or the opposition of *wet* and *seasoned* in comparing novices and experts in a field. Finally, since the number of semantic relation types is indeterminable, the principles involved in predicting semantic relatedness should be general and adaptable. Rather than having one principle that predicts WHOLE > FUNCTIONAL PART relations (*hammer* > *handle*) and another for OBJECT > MATERIAL relations (*knife* > *metal*) and yet another one for COLLECTION > INDIVIDUAL relations (*forest* > *tree*), it would be better to have a single principle of holonymy and meronymy and different ways of applying it to get different results. Better yet is to have a single principle that predicts all of the semantic relations.

In this section, I argue for what can be called a “metalexical” treatment of semantic relations, in which relations among words are not represented in the lexicon.⁵ This contrasts with several “intralexical” treatments of semantic relations, which are discussed in chapter 3. The relational principle proposed below accounts for all of the semantic relations discussed so far, and also accounts for other lexical and conceptual relations.

2.2.1 *Relation by Contrast*

Semantic relations as a group have a lot in common. In each of the relations, the related items are required to be very similar. In the case of synonymy, words are expected to be similar in meaning. Antonymy also requires similarity of meaning. For example, the antonyms *up* and *down* describe directions in the same dimension. Hyponyms and meronyms are semantically similar to their respective hyperonyms and holonyms, in that each refers to a part of the larger thing – for example, *dog* denotes part of *animal*’s denotation and *handle* denotes part of a thing that *hammer* denotes. So, when we say that two things are related, we are saying that they are similar, and thus similarity requirements must be basic to any principle of semantic relatedness.

A relational principle must also say something about how the related items are different. The types and subtypes of semantic relations can be described on the basis of the differences among members of relational sets. So, for instance, the members of an antonym set differ in that they refer to incompatible things (but otherwise they are the same). Perfect synonyms only differ to the extent that that they are different lexical items – semantically they are the same. A hyponym

differs from its hyperonym in its level of categorization, and a meronym differs from its holonym in terms of completeness. While the types of semantic relations involve various types of difference among relation set members, the relations as a group are the same in the amount of difference required within the relational sets. In each of these cases, the members of the relational set can be said to be **minimally different**. That is, for the purposes of semantic relation, the words involved should only differ on one relevant criterion. For synonymy, the relevant difference is form; for hyponymy it is level of categorization. If two words differ on more than one of these levels, then they are not a relational set of any of the types described here. For instance, *cat* is not normally in a contrast relation with *dalmatian*. Although these two items qualify as contrastive since they are referentially incompatible, their difference in level of categorization prevents them from being a “good” contrast set in a neutral context. Minimal difference, then, is the underlying principle of semantic relations.⁶

The **Relation by Contrast (RC)** principle defines relations on the basis of minimal difference.

(13) **Relation by Contrast (RC)**

The contrast relation holds among the members of a set iff:
they have all the same contextually relevant properties but one.

Contrast, then, is a general category for semantic relations that includes all relations, including synonymy, antonymy, co-hyponymic contrast, hyponymy, and any others.

2.2.2 *Relevance and other relational criteria*

Relation by Contrast does not refer to criteria for judging similarity or difference, other than to say that “relevant” criteria are applied. Because of this, RC is general enough to account for any of the lexical relations mentioned thus far. So, all relations are cases of minimal difference, but they vary in what objects they relate and on what criteria they contrast those objects. Semantic relations are those in which the information that is relevant to minimal difference is semantic in nature. Synonymy, antonymy, and other semantic relations are semantic applications of RC. Grammatical paradigms represent another type of lexical relation. Each of these relations is an instantiation of RC, and their particular requirements for minimal difference are summarized in table 2.2. All these relations are relations among concepts, so where the table indicates that certain relations relate words, they do not relate lexical entries, but instead relate conceptual representations of words – that is, they are represented as part of what we know *about* the words.

The *Similarity* column in table 2.2 is incomplete, and not every related set will be similar on all the listed criteria, since RC only requires similarity in

Table 2.2 *Instantiations of Relation by Contrast*

Relation	Relates	Similarity	Incompatibility	Example
synonymy	words	meaning, syntactic category, register, etc.	word form	<i>COUCH=SOFA=</i> <i>DIVAN=SETTEE=</i> <i>DAVENPORT . . .</i>
antonymy	words	semantic category, categorization level, register, morphology, etc.	sense	<i>RISE/FALL</i> <i>HAPPY/SAD</i> <i>LIFE/DEATH</i>
categorical opposition	categories	semantic field, categorization level	categorization criterion	<i>RISE/GO DOWN</i> <i>HAPPY/SAD</i> <i>HAPPY/ANGRY</i>
hyponymy	categories or names of categories	semantic category	level of categorization	<i>BIRD>{ROBIN/</i> <i>SWIFT/SWAN . . .}</i>
meronymy	categories or names of categories	same object	level of completeness	<i>HOUSE>{WALL/</i> <i>ROOF/FLOOR/</i> <i>DOORS . . .}</i>
grammat. paradigm	words	lexeme, inflectional category type	inflection	<i>DRINK-DRANK-</i> <i>DRUNK</i>

contextually relevant properties. In some contexts, for instance, register is not relevant to synonymy. In “neutral” contexts, synonyms that are similar on as many counts as possible are acknowledged as “better.”

Binary instantiations of RC involve two-member sets, and can be referred to as **oppositional relations**. So *brother/sister* are opposite because they are the only two co-hyponyms of *sibling*. (The issue of binarity is discussed in more detail in chapter 5.) In cases where more than two items are candidates for membership in the relational set, more properties of those items are relevant to the oppositional relation than to a contrastive relation within a larger set. Because the basic criterion for the relation is *minimal* difference, the more similar two items are, the better they suit an oppositional relation. So, for example, if two colors are opposites, it is because they have more in common with each other than one of them has in common with any other color. *Red*, then, is the opposite of *green* only if, within the context, it is more similar to *green* than to any other color term. This is the case in the traffic signal context. Among the three colors in this context, *red* is more similar to *green* than to *yellow* (or *amber* in some dialects), because *red* and *green* (unlike *yellow*) are situated at extremes of the traffic signal and represent directives (‘stop’ and ‘go’) rather than warnings. This information about traffic signals is irrelevant to determining antonyms for *red* in other contexts.

By treating lexical relations as relations among word-concepts, both linguistic form and semantic properties are available as material for choosing “better” antonyms. Thus, although antonymy and categorial contrast are listed as separate relation types in table 2.2, they are quite similar. Their only difference is that the form of the word becomes relevant for antonymy in order to exclude other potential antonyms. In colloquial uses of the terms *opposite* and *antonym*, it is often unclear whether the items being contrasted are the words or the things the words represent. Here, however, *antonym* refers specifically to the opposition of words, and *opposite* applies to any binary relation. *Gin* and *tonic* can thus be considered antonyms on the grounds that they are the two noun members of the set phrase *gin and tonic*, or they can be considered to represent opposite concepts since they refer to things that are similar by virtue of being liquids in the same drink and minimally different by virtue of being different ingredients in the drink.

Hyponymy and meronymy are included in table 2.2 because, although a word might have many hyponyms or meronyms, the relationship is between two levels, opposing a set of one to a set of many. We can also consider hyponymy and meronymy as non-binary contrast relations if we extend the relations to more than two levels. In that case, *animal* > *bird* > *eagle* > *bald eagle* would be a set of words in a hyponymic relation. Since RC requires the items in relation to be as similar as possible (given the context), the best hyponyms are only one level of categorization away from their hyperonyms, and parts are better meronyms than subparts are. So, *bird* > *eagle* is a better example of hyponymy than *animal* > *bald eagle*, and *foot* > *toe* is a better example of meronymy than *foot* > *cuticle*.

The description of meronymy in table 2.2 is the least satisfactory of the group, in that “completeness” is not a very good description of the difference between whole and part, since a part can be complete on its own. (Consider *tree* in the relation *forest* > *tree*.) Part of the problem in formulating this description is the asymmetry of the relation. While a part of a hammer is a handle, a handle is not necessarily a part of a hammer (it could be part of a shovel). So, the handle is part of the HAMMER concept, but hammers are not necessarily part of the HANDLE concept. Chapter 6 discusses the lack of evidence that meronymy is a lexical relation.

Table 2.2 presents very general relational types, but they could be expanded in order to describe the various subtypes of antonymy, hyponymy and so forth. In the present treatment, the relational subtypes arise due to one of two factors: (a) the characteristics of the items in the relation, or (b) the contextual requirements for relevance in determining similarity and difference. For instance, the difference between complementary (*dead/alive*) and contrary (*big/little*) antonyms is that the first type is a relation among words for non-gradable states and the latter is among words for gradable states. The difference between equipollent (*hot/cold*) and polar contraries (*long/short*) is that the scale

on which the polar antonyms are measured has an inherent starting point (e.g., 0 inches), while the equipollent scale extends indefinitely in either direction (Bierwisch 1989; Murphy 1995). Thus these types of antonymy differ in that different kinds of adjectives are opposed in each. Different types of meronymy, for example, OBJECT>FUNCTIONAL PART, GROUP>MEMBER, ARTIFACT>INGREDIENT (Chaffin et al. 1988), come about because different types of parts are relevant to different situations and different kinds of things. So, for example, in one context *finger* is an appropriate meronym of *hand*, and in other cases *flesh* is an appropriate meronym of *hand*. *Finger* and *flesh*, however, are not co-meronyms of *hand*, since different relational criteria (functional part versus material) are applied in each case. The application of RC to the relational subtypes is discussed in more detail in Part II.

To conclude, the types of lexical relations can be divided into as many categories as we like, but all of these are examples of RC.

2.3 Implications of the metalexical treatment

Treating lexical relations as relations among concepts of words, rather than as relations among lexical entries or among meanings, is consistent with the facts about lexical relations phenomena. Such phenomena indicate the importance of paradigmatic relations in our everyday language use. Firstly, words can be used in both canonical and non-canonical relations, indicating that canonical relations do not prevent new relations from being derived. Nevertheless (and secondly), canonical relations seem to play an important role in metaphorical use of words. Thirdly, children undergo a 'paradigmatic shift.' Before about age seven, children prefer to pair words syntagmatically, but later they shift to a paradigmatic orientation in metalinguistic tasks. Fourthly, slips of the tongue often involve words that differ paradigmatically from the target. Traditionally, this has been taken as indication that the lexicon is semantically organized, but that assumption is at odds with the metalinguistic approach introduced here, and therefore requires further investigation. Fifthly, semantic relations often seem to ignore grammatical category (as discussed in 2.1.5), but are nevertheless sensitive to word form, indicating that they might relate families of related words. And finally, knowledge of semantic relations is important to our competence in some rhetorical styles. Each of these facts about semantic relations is addressed in turn in the following subsections, which show how such facts support (or challenge) the metalexical approach.

2.3.1 Canonical and non-canonical relations

The contrast between canonical and non-canonical relations is easily accounted for if one assumes that these relations constitute knowledge *about* words. Our conceptual representation of the world (and hence our concepts of words as

part of the world) is dynamic and composed of both remembered facts and derived inferences (see 1.1). Canonical antonyms (like *up* and *down*) and similar relational sets (like *gin* and *tonic*) may exemplify the type of remembered fact that is represented in the conceptual store. Nevertheless, these relations are still consistent with Relation by Contrast (RC). So, I may know the fact that *up* is the antonym of *down* either because I was taught this fact once and now remember it, or because I initially derived the antonymic relation between them myself – by realizing that the two words stand for things that are minimally different – and I may then have stored this information about those words. The *up/down* relation became part of my antonym canon when my first experiences of its antonymy (either independently derived or taught) were reinforced by further experience of *up/down* antonymy, including antonym lessons in kindergarten and exposure to co-occurrences of the words in utterances (including my own).

This account explains more about antonym acquisition than is explained by Charles and Miller (1989) and others who argue that the primary source of antonymic associations is the experience of the antonyms co-occurring in utterances. The claim that co-occurrence is the source of antonymy fails to explain why the pairs originally began co-occurring. The present treatment uses the relational principle RC to account for the preference for particular pairings on the basis of minimal relevant difference, but also acknowledges the role of co-occurrence in making antonym pairings more memorable, and thus part of the antonymic canon that an individual knows.

2.3.2 *Metaphorical extensions*

As mentioned in 2.1.4, words often have fewer different antonyms than they have different senses. For example, while *up* has senses relating to vertical direction and mood, it only has one antonym for these two senses: *down*. Similarly, other oppositional relations hold across word senses. For example, the converse relation of *mother/daughter* holds both for families and for syntactic tree nodes. Such relational consistency is not surprising, since metaphor involves using a set of concepts within another conceptual schema. So, *up* is the antonym of *down* in their mood senses because moods are thought of as being directional, and thus if one mood is conceptualized as UPWARD, then the opposite mood must fall in the opposite direction, DOWNWARD. In this case, since an entire schema (VERTICAL DIRECTIONS) is applied to the conceptualization of moods, opposite moods become opposite directions (see Lakoff and Johnson 1980). Since these directions have names, those names act as mood antonyms as well as directional antonyms.

However, as mentioned in 2.1.4, sometimes the antonyms seem to guide the metaphor, rather than vice versa. Lehrer's (2002) example of *a cold car* being

used to mean ‘a legally acquired car’ demonstrates this point. In this case, the entire temperature schema has not been applied to the realm of legal/illegal acquisition. For example, it would probably take some explanation for an audience to understand that a car was kind of, but not really stolen (e.g., borrowed from one’s spouse without asking), if it was described as *a lukewarm car*. In Lehrer’s *cold car* example (see [9] above), it is *cold*’s canonical relationship with *hot* (along with contextual clues) that allows the audience to identify the appropriate sense for *cold*. Lehrer has used this example to argue that words themselves, not just their meanings, are related by antonymy. Given the distinction between intralexical knowledge and conceptual word-knowledge assumed here, the possibility of extending the uses of opposed words exists without claiming that those oppositions are part of our intralexical representations of the words. In this case, speakers choose not to elect a semantically appropriate opposite for this sense of *hot* (such as *non-stolen*), but instead to exploit what they and the hearers know about the word *hot*: that it is the canonical opposite of *cold*. Speakers can then use *cold* in a novel way, making an implicature based on the common knowledge that *hot* means ‘stolen,’ that *hot/cold* are antonyms (and are being semantically opposed in this context), and that antonymy involves minimal difference in meaning (thus the most likely relevant meaning for *cold* is ‘not stolen’). Thus, the metalexical account of antonymy is consistent with the fact that words, not just meanings, can be in established contrastive relations, and that these established relations might be metaphorically extended.

2.3.3 Paradigmatic shift

Children below school age use antonyms contrastively in utterances, just as adults do (Murphy 1998a, see also 5.4.4). But in free word-association tests (WATs), children and adults behave differently when it comes to paradigmatic relations. Young children tend to respond syntagmatically (Brown and Berko 1960), giving a response that would follow the stimulus in a phrase. For example, in responding to *black*, young children tend to give nouns for black things – *crayon*, *cat*, *bird* (Entwisle 1966). After they enter school, children increasingly answer as adults do, preferring antonyms, synonyms, hyponyms, and the like (Brown and Berko 1960; Ervin 1961). McNeill (1966) refers to this as the “paradigmatic shift.” Preference for paradigmatically related responses is also stronger in adults with more formal education. For example, Rosenzweig (1970) found that French laborers gave far fewer paradigmatic responses than French university students, and that the French students’ responses were more like American and German students’ responses than like their less-educated compatriots’, whose responses were more like children’s.

In interpreting WAT results, it is hard to tell what exactly is being associated – the words or the concepts evoked by those words. In the present treatment,

concepts are being associated in either case: the non-linguistic concepts symbolized by the words, or the concepts of the words themselves. Sometimes, it is clearly the word forms that are being related, as when rhyming responses are given (*high-try*). In cases where words have canonical antonyms, it seems that the words (not just their denotations) are contrasted, because of the subjects' consistency in making canonical responses (e.g., *black/white*) rather than semantically plausible non-canonical responses (e.g., *black/gray*, *black/Caucasian*). In syntagmatic responses like *black-crayon*, it is less likely that the word-concepts (and not the concepts represented by the words) are being associated. Instead, it seems that a phrase begun with the first word is completed with the second word. School experience and literacy encourage paradigmatic responses because the process of becoming (and being) literate causes people to form theories of words. As language speakers, we can get along fine without reflecting on the qualities of words; we use words in order to refer to the things that the words represent. But in learning to read, we begin to notice things about words and their written form – commonalities among them that allow us to remember how to spell them, similarities in form that help us to remember the meanings of difficult words, and so forth. And as we acquire more literacy skills, we may gain exposure to types of rhetorical communication or language play that exploit similarities and differences among words. This process might be hastened by school activities and materials that reinforce canonical relations and that encourage students to think about relationships among words. For instance, Ervin (1961) found that children whose school experience included antonym and synonym substitution exercises gave paradigmatic responses to word-association stimuli, in contrast to an earlier study, done before such exercises were popular, in which nine- to twelve-year-old children used as many syntagmatic responses as kindergartners.

The metalinguistic awareness that results from literacy is most likely part of the reason (along with greater understanding of what is expected in WATs) for the paradigmatic shift. Literate people are more apt to react to the words as the stimuli in a word-association task, rather than reacting only to the meanings of the words. They react to the words by making use of their conceptualizations of those words, which may include knowledge of lexical relations.

2.3.4 *Errors in language processing*

Semantically related words often substitute for one another in production errors. Many theorists have taken this as evidence that words are connected in the lexicon, either by shared semantic space or elements or by networked links between the two words (Emmorey and Fromkin 1988). This section concerns speech errors and related phenomena, concluding that the evidence does not necessitate intralexical semantic organization.

While speech errors come in many forms, we are of course most interested in those that involve words and their meanings, rather than their phonetic or morphological forms. Semantic errors are of two types, word substitutions and word blends. In substitution errors, one word is spoken when another is intended. In reviewing a number of spoken corpora, Hotopf (1980: 98) found that between 13.1% and 34.6% of whole-word errors involved “a close semantic similarity between error and target word.” Of the 224 speech errors that he analyzed, Hotopf judged 31.25% of the substitutions as antonyms of the target word (*husband* for *wife*, *early* for *late*), 44.6% as co-hyponyms (*red* for *black*, *breakfast* for *lunch*), and 24.2% as “approximately hyponymous” (*Europe* for *Britain*, *chicken* for *bacon*, *uncle* for *husband*), by which Hotopf meant that error and target “were dominated by a more distant and general superordinate so that error and target word were semantic cousins, as it were, rather than siblings” (1980: 98–9). Garrett (1992) offers a five-way classification for noun substitution errors. In his corpus of 181 noun substitutions, 75.7% are classified as common category (co-hyponymy; *fork* for *spoon*), 14.4% as opposites (*today* for *tomorrow*), 5% as analogies and rough synonyms (*foot* for *wheel*, *aisles* for *alleys*), 3.3% loose associates (*audience* for *orchestra*, *cards* for *tricks*), and 1.6% “other” (*fingernail* for *telephone*). For adjectives, Garrett distinguishes three types of antonymic substitutions (basic, morphological, and functional) plus analogy and “other” substitutions, while the smaller collections of verb and other substitutions are classed either as one of three types of opposition or contrast or as “other.” Both Hotopf and Garrett’s classifications are rough and impressionistic. For instance, why Hotopf classifies *hour-week* as semantic siblings (co-hyponyms) but *Saturday-January* as semantic cousins is puzzling, considering that both could be classified as meronymic relations (i.e., an hour is a part of a week). So we have (again) run into the problem that taxonomies of semantic relations are subjective, and thus must recognize that classifying semantic substitutions according to semantic relations is not evidence that those relations in particular are represented in the lexicon. If we choose to lump rather than split the types of semantic substitution errors, what is clear is that almost all recorded substitutions involve antonymy or contrast (including co-hyponymy). In other words, they are all relations that can be defined using RC.

Using substitution errors as evidence for semantic organization of the lexicon presents a problem, in that some types of relation are over-represented due to the nature of the data collection. Errors involving hyperonymy or synonymy would be very difficult to detect in others’ speech or writing. Who would be any the wiser if one said *That animal is rabid* when one meant to say *That dog is rabid*? As long as we are describing a rabid dog, then both could be truthfully uttered and thus would pass under the speech error radar. If we use semantic substitution errors as an inspiration for hypotheses about lexical representation of semantic relations, we run the risk of over-emphasizing the contrastive relations.

Besides substitution errors, semantic relations can be observed in blends, in which a new form combines parts of two or more words. Both synonymy and contrast (including opposition and co-hyponymy) are evident in these cases, but synonymy and near-synonymy are more common (Aitchison 1994). For instance, in Fromkin's (1973) corpus, four times as many blends appear to be formed from (near-)synonyms as likely cases of contrast.⁷ Synonymous blends include *tummach* (*tummy* + *stomach*), *sleat* (*slightest* + *least*), *frowl* (*frown* + *scowl*), while contrastive ones are *Noshville* (*Nashville* + *Knoxville*) and *taquua* (*tequila* + *kahlua*) (Aitchison 1994: 198–9). In the case of synonymous blends, either of the two words would have been appropriate in the context (e.g., *I haven't the slightest/least idea*), and so one explanation for such errors is that the speaker had two (semantically equivalent) plans for the utterance in mind, and some failure occurred in narrowing it down to one plan (Garrett 1980). The contrasting cases could involve the same mechanism as the substitution errors, except in this case a full substitution is not made – both words are lexically accessed and (partially) uttered.

Speech errors reveal the same types of paradigmatic relations as word-association tasks, with binary opposition strongly represented in both behaviors. And just as verbs do not tend to trigger paradigmatic responses in word association, verbs rarely suffer substitution by paradigmatic relatives. Just 3% of substitution errors in Hotopf's English sources involved verbs, as compared to 80.2% for nouns and 16.8% for adjectives and adverbs. On the other hand, blends, which tend to involve synonyms rather than contrasts, often involve verbs. Nearly 30% of the semantic blends in Hotopf's English sample involve verbs. Thus, both speech errors and WAT results suggest lexical organization by semantic contrast for nouns and adjectives, but not verbs.

Linguistic impairments, caused through brain injury or illness, also reveal semantic connections. Semantic substitution errors are pathological in some forms of non-fluent aphasia (including Broca's aphasia) and deep dyslexia (in which one does not recognize the form of written words, but does mentally access some of their semantic information). Garrett (1991) compares the semantic substitutions made in published case studies of two aphasics and a deep dyslexic. Their substitutions show the same types of semantic relations to the target words as are found in speech errors in uninjured speakers, including many instances of contrast substitutions, such as *checkers* for *dominoes* (by an aphasic) and *uncle* for *nephew* (as read by a deep dyslexic).

In other cases of aphasia, the vocabulary of a particular semantic field may become inaccessible. In general, nouns are more frequently affected than verbs, leading some to argue that nouns and verbs are organized in separate mental lexicons (Caramazza and Hillis 1991). Concrete nouns are frequently more affected than abstract nouns, but the converse is also found (Warrington and Shallice 1984). Names for living things may be more impaired than names

for inanimate objects, or vice versa (Tranel et al. 1997) – and so on and so forth. In all of these cases, the naming process is affected but semantic knowledge about the unnamable things is unimpaired. For instance, a person with an anomic aphasia may be able to describe the thing whose name he cannot recall, as can be seen in the dialogue in (14) (from Goodglass and Wingfield 1997: 8):

- (14) Examiner: And [the patient's stroke] was after the operation?
Patient: Right, about a day later, while I was under whatchamacall . . .
E: Anesthesia?
P: No. Under where they put you, just two or three people, and you stay in there for a couple o'days.
E: In the intensive care?
P: Right. At that time I got the stroke.

This man is not suffering a semantic deficit. He knows the meaning of the term he needs. His only difficulty is in finding a word form to communicate that meaning. Similarly, in semantic errors in non-aphasic speakers and in the familiar "tip of the tongue" experience, the speaker's semantic representation for the intended utterance seems to be fine. All of these cases involve dissociation between the intended meaning and the word for that meaning. Since these lexical failures occur within semantic fields (either as losses of or substitutions within fields), several theorists have argued that lexical entries are organized on the basis of semantic relations (see 3.3).

Does the evidence from linguistic errors and disorders argue for intralexical representation of semantic relations, and is it thus proof against the metalexical view? Not necessarily. Other assumptions about linguistic processing affect how we interpret this evidence.

Whether or not semantic errors indicate intralexical semantic organization depends on the constraints of the language-processing model. Serial, modular models of speech production maintain that linguistic processing is a self-contained mental operation, and thus they do not allow for on-line interaction between linguistic and conceptual structures, except for the initial mapping between the idea to be communicated and some form of lexical information in the linguistic module. The first level of processing, the semantic level, may involve a semantic lexicon (e.g., Butterworth 1982, 1989) or a process involving semantic information within the lexicon (Fromkin 1971; Fay and Cutler 1977). On this view, semantic substitutions and blends occur after we have matched the idea that we want to express with the wrong semantic representation in the lexicon (because it was close to or linked to the semantic representation we had meant to access). The wrong lexical-semantic representation

then mapped to a phonological form that is correct for the ill-chosen semantic form, but wrong for the idea that we had wished to express. But the intralexical semantic information in these models might be an unnecessary mediator. As discussed in chapter 1, representing semantic information in the lexicon is at best unnecessary (since it would have to mimic information in the conceptual realm) and at worst impossible (since the information required is contextually determined). What is referred to as “the semantic lexicon” may not be a proper subset of modular linguistic information then, but is more likely the non-linguistic representation of conceptual information. If we consider the semantic component of such models to be conceptual rather than lexical, then the errors discussed above are not “semantic errors” because the wrong semantic representation is not selected at any point in the process (Bierwisch 1982). Instead they are mapping errors between conceptual and linguistic processing. So, if you say *right* but mean ‘left’, you have not mistakenly accessed the meaning of *right*.

The metalexical approach to semantic relations offers a different level at which semantic substitutions and blends might be triggered: the level of word-concepts. In this case, the concept we wish to express (*LEFT*) is linked to a concept for the word *left* (i.e., *LEFT*) and to the concept *RIGHT* in the conceptual realm. In addition, both the concepts *LEFT* and *LEFT* must map to the lexical entry for *left*. The concept *RIGHT* is also linked to the word-concept *RIGHT*, and the two word-concepts *LEFT* and *RIGHT* are linked to each other as canonical antonyms. However, there is no particular reason for a serial, modular model of language processing to access this metalinguistic level in the course of a non-metalinguistic conversation. In other words, if I am giving you directions and need to use the word *left*, there is no reason to believe that I am thinking *about* the word *left* just because I have thought *of* it.

Thus, serial, modular approaches to language processing require a semantically organized lexicon in order to account for semantic blends and substitutions. However, we have seen that intralexical semantic organization does not account for all semantic relations phenomena (especially regarding contextually mutable relations). So, the semantically organized lexicon required by the serial processing model must be supplemented by conceptual representations of words, their relations, and a mechanism for deriving new relations. Seeing as the lexicon must be semantically impoverished (see chapter 1), it is possible that the only semantic information in the semantic lexicon is the network of relations that allow for substitutions and blends. This leads to the questions of how this semantic lexicon comes to be organized, and whether it serves any purpose other than allowing for mistakes to be made. The first question has no clear answer, since if the lexicon contains little semantic information, then the relations cannot be derived by means of semantic similarity (via RC), and so

would have to be linked either arbitrarily or through some non-semantic criteria, possibly frequency of co-occurrence in utterances. The answer to the second question might relate to language comprehension. So, for instance, if you hear a word beginning with [r] after hearing the word *left*, then the semantic link between *right* and *left* could facilitate identifying the [r]-word as *right*. But since you would also have accessed the concept LEFT upon hearing *left*, and LEFT is linked to RIGHT (which is linked to the lexical entry for *right*), contextual priming effects on comprehension could as well be explained by conceptual, rather than intralexical, links among the items.

In contrast to serial models, interactional models allow for varying levels of interaction among linguistic and conceptual information. These allow for semantic substitutions and blends to be accounted for while not proposing that semantic relations are represented intralexically. Interaction is supported by the fact that substituted or blended words are frequently both semantically and phonologically similar, such as *comma* for *colon* or *syntactic* for *semantic* (Dell and Reich 1981; Harley 1984). Spreading activation models (e.g., Collins and Loftus 1975; Dell 1986) allow for such errors in ways that are conducive to the metalexical model of semantic relation.

Spreading activation models (see also 3.1.5) involve a network of relations among nodes that can be activated. If a node is activated (say, if it is one of the nodes involved in the representation of a word that is being accessed), then its activation spreads to the other nodes to which it is connected. The strength of the related nodes' activation depends on the strength of their connections to the initial node. In a particular model, nodes might represent identifiable elements of conceptual or lexical items (e.g., semantic features or phonetic components) or they might not represent anything at all, in which case any symbolic import in the network is distributed through patterns of activation, rather than associated with particular nodes. For ease of illustration, I have assumed the former scenario, in which nodes have symbolic import, and simplified the illustration further by assuming that the nodes stand for whole concepts or words. While such gross simplicity is unlikely in an accurate model of mental processes, we can assume (for the sake of this illustration) that the symbolic nodes stand for the more complex networks that would be needed to model a concept or lexical entry. The links between them, then, stand in for a number of links between their respective subparts. Figure 2.2 shows a possible network among words and concepts relating to RIGHT and LEFT, with thicker lines indicating stronger connections. Those links that are not illustrated here can be assumed to be weak links.

One difference between this network and the usual illustrations of lexical or conceptual networks (e.g., Collins and Loftus 1975; Dell 1986) is that word-concepts are shown as well as concepts and lexical entries, thus demonstrating

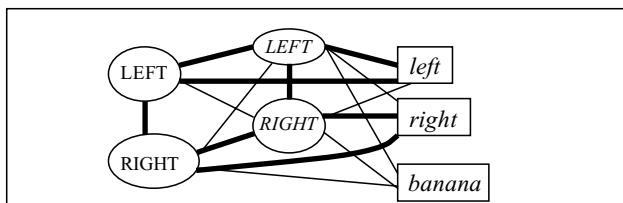


Figure 2.2 Spreading activation network for *left/right*

how the metalinguistic relations discussed in this chapter would fit into a spreading activation model.

Given such a network, if the concept *LEFT* is activated, then its activation spreads, in diluted strength, to other nodes to which it is connected, with more strongly connected nodes receiving more fallout from *LEFT*'s activation than the ones with weak connections to *LEFT*. Once *LEFT*'s activation affects nodes like *RIGHT* and *LEFT*, those nodes in turn activate the nodes to which they are connected. Speech errors could then arise when the incorrect lexical node is more strongly activated than the correct node or when the system for some reason notices a less strongly activated node before it notices the correct node. As figure 2.2 shows, a likely cause for systemic confusion is that contrasting concepts (*RIGHT/LEFT*) are strongly linked to each other⁸ and to their respective word-concepts (*RIGHT/LEFT*), which are in turn strongly linked to each other. Since activation of *LEFT* entails activation of the concepts *RIGHT*, *LEFT*, and *RIGHT*, the lexical items *left* and *right* are more likely to be incorrectly accessed in a speech error than pairs like *left* and *banana*, whose concepts activate each other to lesser degrees.

A spreading activation model thus predicts that the stronger a relationship between two concepts or words, the more likely they are to blend or substitute for each other in a speech error. This entails that words for the most similar meanings (i.e., synonyms) and canonically related words (mostly antonyms) will be over-represented in speech error data, since those words will be related semantically (by their respective concepts' relations) and metalinguistically (through their word-concepts' relations). Since this is, in fact, what has been found for speech errors, a spreading activation model representing the metalexic approach to paradigmatic relations succeeds. Because errors are more likely to be triggered when word-concepts are more strongly connected than when their relations are weaker, the more that a relation between two word-concepts has been reinforced, the more likely that the two words will trigger each other and cause speech errors. Thus, the firmest members of the antonym canon may trigger each other more frequently. Individual patterns of error-making,

for instance a person who frequently says *cow* for *horse*, may arise when that person's environment has provided additional reinforcement for the relation among that pair. These last two claims are more difficult to test, as they would involve devising an instrument to measure antonym canonicity and a means for determining people's word histories. Still, they do suggest further tests for the metalexical treatment of lexical relations in a spreading activation model. Chapter 7 returns to these issues briefly.

2.3.5 *Categorization and word families*

If word-concepts, rather than lexical entries, are contrasted or opposed in lexical relations, then we should expect the word-concepts to exhibit the same kinds of properties as other concepts. Given that word-concepts are a subtype of object-concepts (since words are objects), we should expect that they are organized with reference to prototypes and that they may involve multiple levels of categorization. Evidence that words are conceptualized like other object categories comes from evidence that we categorize words in ways that are not linguistically necessary. The lexicon must have separate entries for expressions that are non-compositional, even if they look or sound alike and are derivationally or otherwise historically related. So, words like *death* and *dead* and *die* are represented in three unrelated lexical entries, since the morphological processes that were historically responsible for these derivational variants are no longer productive. Nevertheless, we perceive the words as related, and this type of information could be represented in metalinguistic concepts. So, my lexicon may not represent any morphological relation between *death*, *dead*, and *die*, but my concepts of the words may be related and thus form a larger category of short, underivable *d*-words to do with DEATH. Similarly, *life*, *to live*, and *(a)live* are not related in the mental lexicon, but can be related in our conceptual apparatus, since we can recognize the phonetic and semantic similarities among them. Honvault (1993) and Gruaz (1998, and elsewhere) refer to such groups as "synchronic word families." These words may be conceptually grouped as families, but are not related in the mental lexicon.⁹

Such conceptual word groupings are evident in semantic relations. If I know that *dead/alive*, *die/live*, and *death/life* are canonical antonyms, then I know that the supercategories (or word families) *DEAD-DIE-DEATH* and *ALIVE-LIVE-LIFE* contrast. Thus, any of the members of those supercategories might be opposed (*die/live*, *death/alive*, etc.) when grammatical category is irrelevant to the opposition. In natural language use (unlike thesaurus-building, word-association tasks, and other artificial contexts), the relevance of grammatical category to semantic relations may be overridden by the structural requirements of the utterance. So, while grammatically similar items prototypically

contrast, as in (15), grammatically asymmetrical contrasts are not uncommon, as in (16).

- (15) a matter of life and death; life after death [nouns]
live and die by the sword [verbs]
Wanted: Dead or Alive [adjectives]
- (16) *Night of the Living Dead* [adjective, noun]
What man is he that liveth, and shall not see death? (Psalm 89:48)
[verb, noun]
Life's a bitch, and then you die. [noun, verb]

Fellbaum's (1995) corpus study confirms the intuition that grammatical category is not always relevant to semantic relations. As discussed in 2.1.5, canonical antonyms co-occur in discourse at far greater than expected rates. Fellbaum's study shows that historically or morphologically related variants of canonical antonyms also co-occur at far greater than expected rates. So, not only do the verbs *begin* and *end* and the nouns *beginning* and *end* occur at greater than chance rates, but also *begin* (N) and *endless* (Adj), and *beginning* (N) and *end* (V). Fellbaum concludes that "[r]egardless of their syntactic category, words expressing semantically opposed concepts tend to be used together in the same sentences" (1995: 289). If only a semantic contrast were involved, then we would have little reason to prefer pairing *end* (V) with *beginning* (N), rather than with nominal *start*. But these relations *do* concern more than the semantic qualities of words, since our word-family categories are based upon our perceptions of similarity in the words' forms and so our extension of semantic relations to other members of the family is based on the formal similarity within the category. Thus, *beginning* (N) is related to *end* (V) because *end* (V) is canonically opposed to *begin* (V), and both *beginning* (N) and *begin* (V) are associated with the word-concept *BEGIN*. The same cannot be said for *start*, which is associated with its own word-concept and canonically opposed to *finish*.

In summary, if lexical relations relate word-concepts, rather than lexical entries, the relations can utilize information about words that transcends the lexical boundaries among words. While the above examples involve semantic opposition of the non-linguistic concepts that the words indicate, the semantic qualities of the words are not the only issue. Because the canonical status of certain antonym pairs can carry across to other members of the antonymous words' metalinguistic families, we must allow that a word's form and its perceived morphological family are relevant to its semantic relations to other words. Since the metalexic treatment considers lexical relations to hold among word-concepts, rather than words or meanings, both semantic and form-related criteria can be relevant to these relations.

2.3.6 Stylistic competence

Claiming that semantic relations are conceptual relations is tantamount to saying (in a modular linguistic theory, at least) that these relations are not relevant to linguistic competence. Nevertheless, skilled users of a language employ related items to great pragmatic and rhetorical effect. Halliday and Hasan (1976) particularly associate synonymy, hyponymy, and hyperonymy as components of lexical cohesion, and Jones (2002) demonstrates the functions of antonymy in discourse. Within a discourse, semantic relations are exploited in order to create coherence while avoiding repetition (17), to draw parallels (18), to emphasize contrasts (19), and so forth.

- (17) Furman University's new alumni **house** made its way across a construction site . . . before coming to rest on its new site here on campus . . . [T]he 150-year-old **structure** has been located four miles from campus . . . Onlookers lined Poinsett Highway to watch as the two-story **building** slowly made its way along . . . [T]he 11-room **mansion** . . . arrived on the campus intact. [synonymy, hyponymy] ("Old mansion makes a big move to Furman University campus," *Chronicle of Higher Education*, 2 April 1999)
- (18) after he put down his **horn** and retreated to his dressing room or hotel . . . Louis Armstrong often grouped his guests around his other favorite **instrument**: his **tape recorder**. [hyponymy, co-hyponymy] ("Satchmo again, on his own tapes," by Ralph Blumenthal, *New York Times*, 3 August 1999)
- (19) But "cyberspace" can also evoke a tohu-bohu of databases, catalogs, newsgroups, and net services extending indefinitely in all directions, a fortuitous concourse of the **scholarly** and the **popular**, the **public** and the **private**, the **perduring** and the **ephemeral**, which presents a different aspect to every observer. [antonymy] (Nunberg 1993: 31)

While such uses of semantically related words demonstrate the writer's facility with the language, they also show the writer's facility with certain rhetorical styles. Zwicky (1999) has argued that stylistic competence is attributable to metalinguistic knowledge. While I will not repeat the entirety of that argument here, this view holds that linguistic system is only concerned with the mental nuts and bolts of language: the generation of structures that are appropriate to the grammar and lexicon of a particular language. Since stylistic competence involves metalinguistic knowledge about a language (as opposed to lexico-grammatical knowledge *of* a language), it should not surprise us that the metalinguistic knowledge of semantic relations is brought to the task of creating interesting and evocative language. Thus, a metalexical treatment of

semantic relations complements (and perhaps also contributes to) metalinguistic approaches to other areas of language use, including style.

2.4 Summary

This chapter introduced a metalexic approach to paradigmatic relations among words. This approach is based on the assumption that paradigmatic relations are represented as part of our metalinguistic knowledge about words, as opposed to being represented in the lexicon. The conceptual treatment of lexical relations explains why such relations act like concepts (displaying prototypicality effects, being learned or derived, being fixed or context dependent), rather than acting like linguistic relations (i.e., contributing to competence in forming expressions in the language). Relation by Contrast, then, does not relate words, but instead relates concepts. This correctly predicts that concepts of non-word things and concepts of words are involved in very similar types of relations, for example similarity and synonymy, opposition and antonymy, inclusion and hyponymy.

As seen in this chapter, metalinguistic knowledge about words is used in such (meta)linguistic activities as achieving rhetorical effect, developing metaphors, and responding to word-association stimuli. Beyond the scope of this book is the very interesting question of what other roles metalinguistic word-knowledge plays in our use of and interaction with words.

This metalexic approach can also be termed a *pragmatic* approach, since it describes an interaction between linguistic and non-linguistic knowledge and because of its reliance on context in determining semantic relations. These issues will be explored further in Part II, but first chapter 3 details other approaches to semantic relations and evaluates them with reference to the properties of semantic relations introduced in the first part of this chapter.

3 Other approaches

I do not believe in things, I believe only in their relationship.

Georges Braque (quoted in Jakobson 1962: 632)

In the last chapter, I proposed that paradigmatic relations among words relate conceptual representations of words, rather than linguistic representations in a modular lexicon. That approach is founded upon the assumptions that (a) relations among words can be studied as cognitive phenomena, (b) relations must be interpreted with respect to their linguistic use, (c) nonlinguistic context is relevant to these relations, and (d) definitional and encyclopedic aspects of meaning cannot be neatly separated. This chapter surveys other approaches to paradigmatic semantic relations, starting (in 3.1) with a historical survey of the role of these relations in five disciplines: philosophy, anthropology, linguistics, psychology, and computer science. The approaches to semantic relations in these disciplines frequently overlap, and so three (cross-disciplinary) categories of approaches are critically discussed in the following sections. Section 3.2 concerns those approaches that treat lexical meaning as composed of features or primitives. In these theories, semantic relations arise from the similarities and differences among words' internal semantic structures. In 3.4 we look at approaches in which word meanings are not defined. In these cases, semantic relations must be explicitly stated in the lexicon or semantic memory. Between these two extremes, the approaches in 3.3 have it both ways: defining words in the lexicon *and* explicitly representing semantic relations among words. The theories discussed in 3.2 through 3.4 model the lexicon or semantic memory, and, as a result, they must contend with semantic relations. Section 3.5 concerns approaches to the conceptual status of the semantic relations themselves.

Throughout the chapter, but especially after 3.1, theoretical positions are compared with those of the "metalexical" position of chapter 2. Possible contrasts include: approaching language as a cultural phenomenon, rather than a psychological one; assuming that the mental lexicon is structured on the basis of semantic relations among words; or treating word meaning as an emergent property of networks of lexical-semantic relations. They might overlap with the metalexical approach by assuming that semantic information and conceptual

information are one and the same (and therefore they propose no semantic relations in a modular mental lexicon) or by proposing general principles of word or sense relation, like Relation by Contrast.

Most semantic theories have something to say about such relations, since accounting for the relations is one of the central goals of traditional semantic inquiry; thus this survey is necessarily selective. Attention is limited here to modern work, thus ignoring the fact that semantic relations have been an area of academic interest for as long as there have been academics. A few approaches to lexical relations are intentionally left out of this chapter because their literature only discusses a particular type of relation, rather than relations in general. Such work is discussed in the relation-specific chapters in Part II.

Any attempt at a chronological discussion of approaches to paradigmatic relations is undermined by the tendency of interesting ideas to recur and by the accidental similarities of work in disparate fields at different times. So, rather than a strictly chronological discussion, I have tried to arrange the topics in an order that minimizes redundancy while giving some sense of the development of ideas within and across particular disciplines.

3.1 Disciplinary interests in lexical relations

Since lexical relations lie on the cusp of several disciplines' interests, ideas are commonly borrowed or re-invented, so that the models by, say, psychologists, descriptive linguists, and natural language processing (NLP) researchers may have only cosmetic differences. Collaboration across disciplines is also common, and thus the treatments discussed in this chapter often defy categorization as, for example, "psychological" rather than "linguistic" or "computational." However, philosophy, linguistics, anthropology, psychology, and computer science all have their own motivations for their interest in paradigmatic relations, and so this section gives some history of the traditional roles of semantic relations in each discipline before particular lexical models are discussed in the remainder of the chapter. Evens et al. 1980 is recommended for its similar disciplinary history of lexical relations (lacking philosophy), with much more detail about work done from the 1950s to 1970s.

3.1.1 *Philosophy*

As Marconi (1997: 1) notes, "There isn't much on lexical meaning in the tradition of philosophical semantics." Instead, most work in the philosophy of language has concerned the nature of meaning itself or the composition of sentences or propositions, with much attention to the role of logical operators and quantifiers – the function words of natural language. In formal approaches to language, meaning is typically discussed in terms of truth-conditions, which

only propositions, not words, can have. And while meaning holism is a major issue in the philosophy of language (see Fodor and Lepore 1992), the discussion of it almost always concerns sentence meaning, rather than lexical meaning.¹ Philosophical and formal analyses of language tend to focus on the relations between lexical items and their extensions (and thus the truth values of the propositions to which they contribute), with little or no regard to their relations to other lexical items or any sub-lexical semantic structure. Philosophers have generally accepted the notion that a word's extension is not the same thing as its meaning (thus Frege's [1985 (1892)] differentiation between *sense* and *reference*). But because of the interest in determining truth values for propositions, model-theoretic formal semantics (which has more intellectual links to its philosophical home than its linguistic shelter) rarely considers the internal construction of word senses (e.g., whether they are to be decomposed into features).

Paradigmatic semantic relations among words have been of philosophical interest to the extent that they play roles in logical relations among sentences. Entailments may involve hyponymy, contradictions may include antonyms, and paraphrases may differ only by synonyms.² Other lexical relations, such as lexical entailment (*kill* → *die*) and lexical presupposition (*manage to do X* ← *attempt X*) also affect sentential relations.

The relation of word meanings to sentential entailments gives rise to the notion of **analyticity**. Analytic propositions are those that require no external verification, so that their truth or falsity can be established by examining only their linguistic matter, rather than appealing to empirical verification of the extralinguistic facts they describe. The sentences in (1) illustrate seemingly analytic truths that involve antonymy, hyponymy, and (near) synonymy.³

- (1) a. No **unmarried** man is **married**.
- b. If this is a **rose**, then this is a **flower**.
- c. A **circular** shape is **round**.

To claim that the sentences in (1) are analytic statements is to say that the definitions of the words alone (without recourse to any world-knowledge of the things the words represent) is sufficient to determine whether these sentences are true or false.

In order to represent the relations among these meanings, some philosophers (e.g., Carnap 1947; Montague 1973⁴) employ **meaning postulates**. These are logical statements that serve as constraints on extensional set membership within a particular model. Synonymy, antonymy, and hyponymy and other relations (including subtypes of antonymy) can be described with such statements, as demonstrated in (2)–(4).

- (2) *Phone* and *telephone* are synonyms.
 $\forall x [PHONE(x) \equiv TELEPHONE(x)]$

In other words, any thing is a phone if and only if it is also a telephone. Thus, synonymy is presented as mutual entailment.

- (3) *Hot* and *cold* are antonyms.
 $\forall x [HOT(x) \rightarrow \neg COLD(x)]$

That is, if any thing is hot, then it is not cold.

- (4) *Apple* is a hyponym of *fruit*.
 $\forall x [APPLE(x) \rightarrow FRUIT(x)]$

That is, if any thing is an apple, then it is a fruit.

While meaning postulates are regularly employed in model-theoretic semantics, it has been repeatedly pointed out that the postulates explain nothing about relations among meanings (e.g., Katz 1972; Lakoff 1972). Since the only “meanings” involved are extensional sets, meaning postulates essentially express relations among things (i.e., the denoted things in the words’ extensions) rather than among words or word senses. Furthermore, they simply assert those relations – they do not explain why certain relations (and not others) hold between certain expressions. Some maintain that there is no more to meaning than such relations, that word meanings are unanalyzable wholes that cannot be broken down into parts. In that case, meaning postulates are necessary to explain how analytic truths arise. Meaning postulates are further discussed in this vein in section 3.4.1.

Responding to Carnap’s (1947) approach to meaning postulates, Quine (1961) argued that analyticity cannot be satisfactorily explained. His argument depended in part on the position that analyticity must ultimately be defined in terms of the paradigmatic semantic relations and that the paradigmatic semantic relations must ultimately be defined in terms of analyticity. While this argument discouraged further attempts at distinguishing analytic and synthetic truths, accounting for (or at least describing) analytic statements has remained an issue in formal theories.

For the most part, the assumptions of these philosophical approaches to meaning are quite contrary to the pragmatic and psycholinguistic assumptions presented in chapter 1. Since philosophy of language has generally been concerned with language in relation to the world (or possible worlds), it is not so much concerned with the status of words and their relations in the mind. Thus, little comparison can be made between the metalexical approach and traditional philosophical interest in paradigmatic relations. A model-theoretic approach to meaning treats inferences as formal relations among expressions, but the current approach views inference-making as a psychological process. Nevertheless, we see the equivalent of meaning postulates in several mentalistic approaches to semantic relations in section 3.4.

A more recent philosophical approach to the lexicon, Marconi 1997, seeks to shift philosophical interest from abstract and idealized theories of meaning to the problem of how it is that people know how to use words in semantically appropriate ways. Marconi makes the traditional assumptions that, in order to be able to use a word, one must know both how words relate to things in the world (referential competence) and how words relate to each other (inferential competence), and he argues that certain cases of agnosia and aphasia prove that the two abilities are psychologically real and separate – one can lose the ability to name things while not losing the ability to describe them⁵ and vice versa.⁶ Looking at this evidence, he claims that

inferential competence can no longer be described . . . as the ability to manage a network of relations among *words*. The distinction between word forms (output lexicons) and the semantic lexicon obliges us to redescribe the kind of performances in which inferential competence is typically displayed (such as paraphrasing, semantically based inference, etc.) as following word-word routes *through* the semantic lexicon. (Marconi 1997: 71)

Those word-word routes would be the paths of lexical relations (paradigmatic as well as syntagmatic) that allow us to make inferences like: if something is a *cat*, then it is a *feline* and it is not a *dog* and it probably *meows*. The word forms are not stored in the semantic lexicon, but in the phonological lexicon. So lexical relations are relations among word meanings, but not relations among words. While Marconi does not discuss how those word-word routes arise, he does suppose that the types of information in the semantic lexicon might be varied and organized into specialized subsystems. Marconi's picture of the lexicon looks much like Jackendoff's (especially Jackendoff 1992), which is quite compatible with the metalexical view, as discussed in chapter 7 (but see Marconi 1997: 79–82 for contrasts with Jackendoff's model). So, while Marconi represents a more cognitive turn in philosophy, it still gives few details on how semantic relations come to be.

3.1.2 *Linguistics*

In linguistics, several traditions of structural semantics have dealt with paradigmatic relations in depth, and semantic explorations in generative linguistics have also sought to explain paradigmatic relations. This section provides some twentieth-century chronology and geography of attitudes toward paradigmatic relations and lexical meaning.

Most of the theoretical approaches to paradigmatic relations have their origins in various structuralist linguistic traditions. The variety of structuralist traditions and the vagueness of the word *structural* have resulted in a certain amount of polysemy for the term **structural semantics**. Coseriu and Geckeler (1981) identify three general meanings of *structural semantics*. The first is an

interest in the structure of the lexicon based on associations of similarity or contiguity. This is the association of words with the other words (or things) that “go with” them, whether on semantic, syntactic, or morphological grounds. We could call this **associative semantics**, and it can be attributed to Saussure and his followers. The second meaning of *structural semantics* concerns the relations among a single word’s meanings, with particular interest in polysemy and homophony (and thus not of direct interest here). The third type is what Coseriu and Geckeler term “structural in its analytical respect” (1981: 18). This concerns the organization of vocabulary on the basis of contrastive relations. They term this form of structural semantics **analytical** because it leads to the componential analysis of word meanings; “[o]nly on the solid basis of . . . a paradigmatic semantics can a well-founded combinatorial semantics be built up” (1981: 19). It is this analytical type of structural semantics that is of most concern here, although we must note its roots in the Saussurean associative approach.

For Saussure, the study of relations is central to the study of language, since “the sign by itself would have no signification” (Saussure 1959 [1915]: 130). In other words, Saussure advocated semantic holism, holding that there are no positive representations of meanings. In order to be meaningful, words must be related to other words, such that the word is “the point of convergence of an indefinite number of coordinated items” (1959 [1915]: 126). Saussure’s associative relations were not limited by any fixed number of relation types, nor did he distinguish between semantic and other types of relation. His disciple Bally (1940) limited his attention to semantic associations among words, in the form of **associative fields**. He describes a word’s associative field as a “halo” radiating from it and dissipating. Translating his example, the word *ox* brings to mind related words of different categories: *cow*, *bull*, *calf*, etc., and *plow*, *tilling*, *yoke*, etc. In addition, the word brings forth associations with qualities like patience and strength. Linguistic interest in associative fields was fairly limited to French-speaking linguists, however echoes of it exist in many of the approaches discussed later. In contrast to (the more widespread) analytically oriented structural semantics, associative fields are entirely unconstrained in the types of relations that they may incorporate. So while paradigmatic relations may be a part of an associative field, so are syntagmatic and more idiosyncratic associations (e.g., *apron-Grandma*).

The more analytic departure from the associative approach was nurtured in the European movement that Basilius (1952) termed *Neo-Humboldtian Ethnolinguistics*. This approach is cognitive-anthropological, in that it is concerned with the linguistic middle ground between thought and reality, and it inspired much of the work in anthropology discussed in 3.1.3. Investigators in this tradition compared lexicalization patterns across languages in order to hypothesize culturally characteristic conceptualizations of the world based on each culture’s

particular lexical structures. It was in the neo-Humboldtian tradition that the notion of semantic or lexical **fields** was developed furthest, particularly by Trier (1931, 1934),⁷ and field theory continued to be developed for decades. Weisgerber (e.g., 1963) devoted the most attention to developing field theory after Trier, but, unlike Trier, he emphasized the Humboldtian notion of linguistic relativity (language influencing thought). Later theorists, including Coseriu (e.g., 1977), mostly ignored this angle.

Field theory came late to the English-speaking linguistic world. Lehrer and Lehrer (1995) credit Lyons with introducing it there, and Lyons and A. Lehrer (1974 and elsewhere) have been its greatest English-language contributors. Lexical semantics has developed and thrived in England, where a strong tradition in lexicography and the influence of the London school of linguistics (based on the work of Firth and continued by Sinclair *inter alia*) allowed interest in words to flourish. The British structural semantic tradition is best exemplified by Lyons (1977) and Cruse (1986), who have given linguistics its most exhaustive definitions and descriptions of semantic relations.⁸ For Cruse and Lyons, paradigmatic relations are central to the study of meaning. According to Lyons (1968: 443), “As far as the empirical investigation of the structure of language is concerned, the sense of a lexical item may be defined to be, not only dependent upon, but identical with, the set of relations which hold between the item in question and the other items in the same lexical system.” For Cruse (1986: 16) “the meaning of a word is fully reflected in its contextual [including semantic – MLM] relations; in fact, we can go further and say that, for present purposes, the meaning of a word is constituted by its contextual relations.” Cruse (1986) terms his approach **contextualist**, which is certainly related to the Firthian notion of meaning, in which a word’s meaning can “be known by the company it keeps” (Cruse 1986: 21, adapted from Firth 1957: 194–6). Thus, Cruse (1986: 1) states that “the semantic properties of a lexical item are fully reflected in appropriate aspects of the relations it contracts with actual and potential contexts.” This position is discussed in more detail in section 3.3.2. While the Firthian tradition today usually concentrates on syntagmatic relationships (which are more obvious in corpus studies), Cruse has focused his efforts on paradigmatic relations, and others have pursued corpus studies of paradigmatic relations as well (from Lyons’ 1963 treatment of the works of Plato, to Mettinger 1994 and Jones 2002). In later work, Cruse (1994, 1995; Cruse and Togia 1995) is concerned with bringing Cognitive Linguistic approaches to bear on lexical relations. Some of this work is discussed in 3.5.2. Cognitive Linguistics is discussed more generally in 3.1.3.

Elsewhere in Europe, the Prague school contributed the notion of **markedness**, first to phonology and later to semantics (initially in Jakobson 1984 [1932]). The issue of semantic markedness is particularly important to antonymy, and so is pursued further in chapter 5, but for now it is worth noting

that the vocabulary for describing markedness relations among meanings is borrowed from Trubetzkoy's (1939) vocabulary for oppositions among phonemes. Thus, Coseriu (1964) describes **privative**, **gradual**, and **equipollent** oppositions among meanings. The influence of the Prague school, specifically Jakobson (1936), and of the Danish functionalist Hjelmslev (1961 [1943]) can also be seen in the development of semantic features for componential analysis of word meanings (see 3.2.1).

In the American linguistic traditions, study of lexical relations (and of lexical semantics in general) was until recently marginalized. American structuralism, following Bloomfield, discouraged the study of meaning, since "the linguist cannot define meanings, but must appeal for this to students of other sciences" (Bloomfield 1933: 145–6). In keeping with the behaviorist psychology of the time, the question of whether lexical semantic relations are linguistic or conceptual in nature is determined by default, since concepts were considered to be "merely a traditional but useless and confusing way of talking about [speech forms]" (Bloomfield 1985 [1936]: 24). While this particular brand of American structuralism could not survive the dethroning of behaviorism, the psychological and rather anti-semantic nature of American linguistics persevered. In the generativist tradition, interest in the lexicon has waxed and waned, but the most influential approach to lexical semantics has been one of lexical decomposition: identifying sub-lexical semantic components that are combined to form lexical meanings. One of the main aims of decomposition is to account for paradigmatic relations. So, unlike the associative-structural view, which takes the relations as primary, componential approaches to lexical semantics see paradigmatic relations as entailed by lexical semantic structures. Componential semantics is incorporated into most modern structural semantics approaches, whether or not they make claims for the mental representation of the structures they describe. See section 3.2.

Generativism did mark a shift in interest from language as a cultural phenomenon to language as a mental phenomenon. Field theory, which has spanned the structuralist and generativist periods, often has a foot in both the culturalist and the mentalist camps. Frame semantics (Fillmore 1976, 1985) has followed in the footsteps of semantic field theory, while adopting the notion of **FRAMES** from artificial intelligence and similarly inspired cognitive psychology. Frame semantics is an essentially cognitivist approach to the lexicon, looking for non-linguistic cognitive explanations for linguistic phenomena. This is discussed in more detail at the end of section 3.3.1.

Similarly cross-disciplinary is Meaning Text Theory (MTT), an approach to the lexicon that has its roots in Russian lexicography and machine translation research (and therefore might better be included in the computer science section – but such are the difficulties of disciplinary reviews of cross-disciplinary interests). MTT makes use of lexical functions, which specify a word's paradigmatic

and syntagmatic relatives in the lexical entry, and perhaps holds the world record for the theory with the largest number of labeled relations represented in the lexicon (sixty-four in Mel'čuk 1996). It is discussed in detail in 3.3.3.

Most of the views introduced in this section are further discussed later in the chapter. This section has been limited to linguistic approaches to lexical relations that are (a) theoretical in nature, (b) relevant to relations in general, rather than to just one type of relation, and (c) specific to the linguistic discipline. The next section, on anthropology, concerns much that might have been included in this linguistics section, including the Cognitive Linguistics movement, which at times has more in common with ethnolinguistic anthropology than the generative linguistic program. Lexicography is also glaringly absent from the foregoing. Lexicographers have done much in the way of categorizing semantic relations (e.g., Egan's [1968] taxonomy of antonyms), and the products of their work have inspired many of the above viewpoints (hence the dictionary and thesaurus metaphors introduced in chapter 1). Their contributions are also central to the computational approaches discussed in 3.1.5.

3.1.3 *Anthropology*

Separating the histories of semantic relations in linguistics and anthropology, as I have done here, is rather arbitrary, since anthropological work on semantic relations is more often to be found in journals of linguistics than in the anthropological press. Anthropology is treated separately here, however, because of its particular motivations for and methodological approaches to the study of semantic relations. While many linguistic approaches investigate meaning through introspection or text corpora, anthropological research depends primarily on the interview as a source of linguistic-semantic information. The types of semantic relations discovered depend in part on the methods used in such interviews, as is discussed below.

Anthropological interest in semantic relations has often centered on the study of **folk taxonomy**,⁹ which has been particularly fueled by interest in kinship terminology (see Tyler 1969 for many examples), with Kroeber (1909) paving the way for further componential treatments of kinship semantics. The mid-twentieth century saw an explosion of taxonomical interest, and taxonomies were investigated for parts of the natural world (e.g., Chao 1953), diseases (e.g., Frake 1961), and colors (see Berlin and Kay 1969). Early studies seemed to assume that only advanced, literate cultures would be capable of taxonomic organization of the natural world. This assumption was based on anecdotes such as Jespersen's (1934) mention of a Brazilian tribe that had no equivalent of *parrot*, just names for kinds of parrots, and the oft-repeated assertion that Eskimos do not have a general term for 'snow' (see Martin 1986). Such lexical lacunae were seen as proof of a culture's primitiveness. As Kay (1971: 867)

notes, “that extensive and precise taxonomies exist among illiterate primitives originally occasioned surprise bordering on incredulity in some quarters.” The rise of ethnolinguistic studies that demonstrated these precise taxonomies led to the suspicion that taxonomical organization is inherent to the lexicons of all languages, and to the question of whether the relations represented in these taxonomies are universal. An underlying mission is to determine which concepts are universal (and thus available in every language) and which are culture specific (and the relation of culture-specific concepts to culture-specific beliefs and behaviors). This may entail interest in (potentially universal) sub-lexical semantic features (e.g., Goodenough 1956, 1965; Lounsbury 1964). Where semantic universals are not found, taxonomical studies can give rise to semantic typologies of languages (Greenberg 1957). The ethnolinguistic approach to taxonomy has a practical side as well – the creation of dictionaries for previously undocumented languages. The relation between taxonomies and dictionaries is reciprocal. Most taxonomists share Conklin’s (1962) belief that “better ‘dictionaries’ will result in better ethnographies” (Werner et al. 1974: 1477–8), while acknowledging that the best “dictionaries” for such purposes are not alphabetical glossaries, but semantically organized networks.

Taxonomic research lent itself to the use of semantic field approaches. Since taxonomies are most concerned with the ways in which categories are divided into subordinate categories, hyponymy/hyperonymy and contrast are key semantic relations in taxonomic studies. Interest in these relations encouraged the use of two-dimensional representations of lexical relations, or box diagrams, as used in 3.3.1 below. However, as interest in semantic relations and taxonomies developed, the numbers of relations represented increased, and network representations of semantic relations took off. The rest of this section focuses on anthropological approaches that involve different methods and relations than typically seen in the analyses discussed in 3.3.1.

Frake (1964) described semantic networks based on relations discovered through anthropological interviews. In his method, words are related if one of six questions including one word is answered by the other word. The relation type is represented by a label that abbreviates the question. The labels and example questions are listed below with more traditional labels in parentheses:

?u	What is X used for?	(instrumental)
?k	What kind of X is it?	(hyperonymy)
?w	What is X a kind of?	(hyponymy)
?i	What is an ingredient of X?	(meronymy)
?p	What (separable) part of X is it?	(meronymy)
?s	What does this come from?	(source)

Frake also notes **interlinkages**, which are reciprocal relations among two concepts in a network. Frake’s relations do not conform to the traditional list of

semantic relations. Not only are contrast-type relations notably absent, but the interlinkages do not reflect the relatedness of hyponymy and hyperonymy, and meronymy and holonymy. Instead source (?s) and use (?u) relations interfere, making it clear that these are not relations among word meanings, but instead are culturally determined relations between the objects the words describe. For example, Frake's data from Subanun (an Austronesian language) show interlinkage between the words for 'tree' and 'palm tree' involving the ?k and ?w relations, echoing the traditional hyponym<hyperonym relation. But between the words for 'areca nut' and 'betel quid part' (a preparation containing areca nut that is chewed for pleasure) there are reciprocal ?k (hyponym) and ?u (instrumental) relations. (That is, 'areca nut' is used for 'quid part', and 'quid part' was said to be a kind of 'areca nut'.) It is not clear whether this reveals a semantic network or whether Frake's informants were just doing their best with a set of inconsistent relation types. Frake's approach does not reveal the full range of semantic relations in a language, since the questions all concern object names. Furthermore, even among nouns, the question-asking method is only able to identify which of a small set of relations holds between two words. Thus, it is not able to determine the full extent of relations among words because it does not involve asking about all potential relations.

To get around these problems, Casagrande and Hale (1967) introduced a method for discovering which semantic relations are important within a language and culture. Rather than asking about an object's parts, uses, or subtypes, Casagrande and Hale asked their Papago (Tohono O'odham) informants for a definition of each word under study. Next, they analyzed the definitions into simple declarative sentences each of which represents a fact predicated of the defined word/object. They then determined what relations were communicated in each of these statements. The result was a list of thirteen relations – some paradigmatic, some syntagmatic. These are listed below, in order of their frequency in the definitions (Casagrande and Hale 1967: 168ff.). I have highlighted the relations between words in the examples, rather than exemplifying the type of definitional statement involved, but examples of definitions are given where clarification might be helpful. The formula $X \rightarrow Y$ is used here to mean 'X is defined in terms of Y.'

1. Attributive X is defined with respect to a characteristic, Y (Y can be distinctive marker, habitat, behavior, or other attributes):
horned toad $\rightarrow$ *small*
2. Contingency X usually or necessarily follows Y; Y is concomitant with X: *lightning* $\rightarrow$ *rain*; *laugh* $\rightarrow$ *funny*
3. Function X (noun) is a means of effecting Y: *ear* $\rightarrow$ *hearing*
4. Spatial X is described in terms of its spatial position with respect to Y: *tongue* $\rightarrow$ *mouth*

- | | |
|--------------------|---|
| 5. Operational | X is characteristically part of an action: <i>shirt</i> → <i>wear</i> |
| 6. Comparison | X is compared or contrasted to Y: <i>wolf</i> → <i>coyote</i> (i.e., “a wolf is like a coyote, but it’s big”) |
| 7. Exemplification | Y appropriately co-occurs with X: <i>stand</i> → <i>fence</i> ; <i>circular</i> → <i>wheel</i> ; <i>horn</i> → <i>cow</i> |
| 8. Class inclusion | X is a member of hierarchical class Y: <i>bee</i> → <i>insect</i> |
| 9. Synonymy | X is equivalent to Y: <i>thousand</i> → <i>ten hundreds</i> |
| 10. Antonymy | X is the negation of Y: <i>low</i> → <i>high</i> |
| 11. Provenience | Y is identified as the source of X: <i>milk</i> → <i>cow</i> |
| 12. Grading | X is ordered on a scale with respect to Y: <i>Monday</i> → <i>Sunday</i> ; <i>yellow</i> → <i>white</i> |
| 13. Circularity | X is defined as X (e.g., “when one gives us something, we call it <i>to give</i> ”) |

Since the topic at hand is paradigmatic relations, we can reduce the thirteen to at most eight: spatial, comparison, class inclusion, synonymy, antonymy, provenience, grading, and (if we wish to include it) circularity. Comparing these to the relation types defined in the preceding chapters, it is clear that Casagrande and Hale’s analysis (aided by their method) tended toward splitting rather than lumping together types of contrast (spatial, comparison, antonymy, and grading), which perhaps indicates that contrast plays a central role in (folk) definition. Casagrande and Hale added the constituent (i.e., meronymy) relation to their list, in spite of not classifying any of the folk-definitions as including constituents. While it is surprising that PART > WHOLE relations were not included in the original thirteen, some seem to be lumped into exemplification. Each major grammatical category has its own type of exemplification. For verbs and adjectives, the relations are cross-categorical, and therefore syntagmatic relations. (Verbs are exemplified by typical subjects or objects, and adjectives by nouns to which they typically apply.) For nouns, exemplification takes the form of “Y is a characteristic possessor of X,” which often means “X is a part of Y.” So, for example, *wing* is defined (in part) by “any kind of bird has wings” (Casagrande and Hale 1967: 181). Conversely, defining X by mentioning its part, Y, (e.g., *scorpion* > *stinger*) is included under attribution. Thus, the differences between Casagrande and Hale’s list of relations and traditional lists of *’nym* relations are mostly differences in the boundaries among the relations, rather than differences in their substance. The only new paradigmatic relation noted here is provenience (which corresponds to ?s, or source, in Frake’s work). Their methods confirm that semantic relations are not simply abstractions that linguists use to organize a vocabulary. They are real conceptual/language phenomena for which we can find evidence in natural language texts, such as folk-definition.

A more elaborated approach to semantic networks in anthropology is that of Werner (1974, 1978; Werner and Topper 1976), who developed computer simulations for the organization of cultural knowledge in memory. As is often the case for anthropological studies, the semantic study of a language's vocabulary is used as "an explicit representation of human knowledge" (Werner 1978: 48). Thus, analysis of the lexicon is taken to be roughly equivalent to analysis of conceptual knowledge. Like Quillian's (1968) model (see 3.1.5), word meaning is composed of networks of word types and tokens: the types representing headwords for lexical entries, and the tokens being used as elements of other words' meanings. In other words, meanings are built through the interrelation of words in the network.

Werner (1978) posited universal primitive relations: **T**—taxonomy (i.e., hyponymy), **M**—attribution (e.g., the property *yellow* is attributed to a *canary*), and **Q**—queuing (e.g., *Monday* is followed by *Tuesday*). The relations are expressed as formulae, as in (5). In addition to these relations, Werner uses propositional relations from first-order logic (conjunction, disjunction, negation, implication, and bidirectional implication).

- (5) robin T bird ('robin is a member of the bird class')
 canary M yellow ('the canary has the property yellow')
 Sunday Q Monday ('Sunday is followed by Monday')

The lexical relations here can be seen as representing propositions about the words (as in the parenthetical descriptions in [5]). Relations other than those listed in (5) are thought to be derivable from the other relations. Synonymy is a bidirectional T relation, as in (6) (Evens et al. 1980). Other relations involve more lexical matter. Meronymy involves T and M relations as well as the component, 'part,' as in (7), which can be translated as 'a thumb is a type of hand-part.' Square brackets indicate token, rather than type, nodes.

- (6) Synonymy: (*sofa* T *couch*) & (*couch* T *sofa*)
 (7) Meronymy: (*thumb*) T (*part* M [*hand*])

Werner (1978: 76) held that long-term memory is composed of "an associative network of lexical/semantic relations representing tacit cultural knowledge." Since its formulae can be read as propositions, Werner proposes that his model is not limited to the representation of word-relations, but is also a means for representing other types of knowledge as well, including memories of events, which are broken down into a series of M, T, and Q relations among predicates and referring expressions. While he differentiates word types and tokens in memory, most lexical relations are shown as type-type relations: i.e., relations among words, unanalyzed into component parts. Thus, the information in

long-term memory is “not necessarily logically coherent” (1978: 76) since any two types can be associated in the network, regardless of whether their relational structures are compatible or not.

In the 1980s, ethnosemantics, and the attendant interest in taxonomy, was largely replaced by “ethnography of speaking” approaches, in which discourse replaced the lexicon as the locus of inquiry, and sociolinguistic methods replaced semantic ones (Palmer 1996). Work on specific semantic fields, especially color, has continued throughout this period, but concerns about the nature and number of lexical relations has fallen out of the disciplinary spotlight. Some ethnosemanticists, for example Frake (1981), had begun to advocate frames and scripts as the necessary theoretical step beyond semantic fields, but this work was not generally pursued as such within anthropology. More recently, some linguistic and anthropological work in lexical meaning has been pursued within the theoretical program of Cognitive Linguistics (following, e.g., Langacker 1987; Lakoff 1987; henceforth, CL). Again, these inquiries move away from lexical field analyses, focusing instead on how linguistic forms might be influenced by our physical experience of the world and by metaphors for conceptualizing more abstract experiences. Although CL has been explored by some lexicologists (see the discussion of Cruse’s work in 3.1.2 and 3.5.2), paradigmatic relations have not particularly caught the imagination of the CL research community. Part of the reason for this may be that CL has tended to focus more on relational concepts and meanings than on words for natural categories and artifacts, the old war-horses of anthropological linguistics and lexical field studies. Since the hot issues in CL are things like prepositional meaning (e.g., Brugman 1989; Dirven 1995), issues of taxonomy and hyponymy are not so likely to be of pressing interest. However, the issue of antonymy, at least, is relevant to the study of gradable adjective meaning (pursued by Taylor 1992a; Dirven and Taylor 1988) and polar states in metaphor, such as Lakoff and Johnson’s (1980) study of UP and DOWN metaphors, in which many other conceptual opposites (HAPPY/SAD, MORE/LESS, GOOD/BAD) are mapped onto this metaphorical *Ur*-opposition. Nevertheless, the nature and role of antonymy as such is not explored in these works. On the other hand, some CL attention has been paid to problems of synonymy (Taylor 1992b, forthcoming). Discussion of this work is left for chapter 4.

3.1.4 *Psychology*

Cognitive psychology has concerned semantic relations for a number of reasons, and provides a great deal of literature to survey. Much of the relevant work in psychology is not directly about words, but instead concerns the mental representation of concepts, which may or may not be equivalent to word meanings (see Murphy 1991). Because of the interest in modeling long-term memory,

some work has overlapped with artificial intelligence approaches (e.g., Collins and Quillian 1972; see 3.1.5). Other work concerns the role of relations in the acquisition of word meanings and the acquisition of the relations themselves (discussed in Part II). Still other work in psychology is relevant here because it concerns the building blocks of the relations discussed in chapter 2: the notions of relevance, similarity, and difference. This section concentrates on two competing claims regarding semantic relations in cognitive psychology: (a) that semantic memory consists of word-concepts organized by semantic relations, a position I will call **associationism**, and (b) that semantic relations are derived from semantic knowledge, that is, not directly stored as part of word-knowledge. But first, the notion of semantic memory requires discussion.

Semantic memory is the mental store of knowledge about the world in general, and as such it is distinguished from episodic memory, our memory of our experiences. While psychologists debate whether semantic and episodic memory are really two separate memory stores, we can at least concede that *semantic memory* and *episodic memory* describe different kinds of content. Only semantic content, that involving concepts represented by words, is of interest to us here. Tulving, who explicated the semantic/episodic distinction, defined semantic memory as

the memory necessary for the use of language. It is a mental thesaurus, organized knowledge a person possesses about words and other verbal symbols, their meanings and referents, about relations among them, and about rules, formulas, and algorithms for the manipulation of these symbols, concepts, and relations. (Tulving 1972: 386)

Whether semantic memory is indeed “a mental thesaurus” is a matter for debate (depending, of course, on what one thinks a thesaurus is). Tulving has defined semantic memory as knowledge about words, but it has become more common in the last decades to speak of concepts, rather than word meanings, as the basic units of semantic memory. Nevertheless, word meanings and concepts are completely intertwined in most theoretical discussions. Jackendoff (1989: 73), for example, gives an operational definition of *concept* as “a mental representation that can serve as the meaning of a linguistic expression” and differentiates *lexical concepts* and *sentential concepts* – the former are stored representations (thus finite in number), the latter are built from lexical concepts (and thus the number of potential concepts is limitless). In less linguistic terms, psychologists distinguish simple and complex concepts, and we are interested in the simple ones, like DOG or GREEN, rather than complex ones like GREEN DOG. Organization of simple concepts might involve networks in which concepts are associated by the types of paradigmatic relations that concern us here, while organization of complex concepts is likely to involve semantic frames or scripts (see 3.3.1).

A consistent problem for discussing words and concepts in the psychological literature is that it is extremely difficult to investigate the two separately. When

investigating conceptualization, experimental psychologists tend to rely upon words as stimuli or output, and in discussing models of semantic memory, theorists tend to use object names to stand for the concepts with which they are associated. So it is often unclear whether an experiment that demonstrates relations among words is really demonstrating relations among the things the words stand for. Thus it is not always clear whether lexicon and semantic memory are or can be distinguished.

Theories of memory are often **associative** in nature, accounting for the fact that one item can spur (or reinforce) the memory of another item (see Estes 1987). Early associative theories of memory just recorded associations among items (e.g., CAT and TAIL concepts are linked), but since the computational turn in the 1960s many models of semantic memory have labeled the associations between items. In this case, the relation between CAT and TAIL is treated as a different relation (e.g., a HAS-A relation) from that between CAT and ANIMAL (e.g., an IS-A relation). The types of relations represented in such models often echo the basic paradigmatic lexical relations we are interested in here, although they are by no means limited to them. (See 3.1.5.)

Deese (1962, 1964, 1965) was an early advocate of semantic memory by association (especially as discovered through the free word-association test), and is associated with the viewpoint that meanings arise through these associations, hence the term **associative meaning**.¹⁰ In particular, Deese was interested in words that elicited each other in free association (i.e., the association is symmetrical), and so antonyms and synonyms are particularly evident in the associative dictionary included in his 1965 book. Other paradigmatic relations, such as co-hyponymy and hyperonymy, are also common (although Deese has idiosyncratic terms for all these relations), but the associative dictionary also includes syntagmatic associates (e.g., *concord-grape*, *glass-drink*) and relations that Deese did not define (e.g., *climb-walk*, *confetti-party*). Because context (other words in the experiment, subject's state of mind) can affect word-association responses, such experiments must involve a large number of subjects, so as to determine distinct patterns in the responses. Hence, the meanings one can derive from this process are for a population of language users, rather than for the individual mind of a language user. Deese held that this allows us to determine something about individual minds, in that the combined responses of a group of speakers show what is common in all the speakers. So, these associative meanings can only be seen as skeletal portions of the meaning represented in any speaker's mind.

Deese hoped to determine the non-linguistic sources of associations, which are anchored in our perceptions of the world. He suggested two associative laws, contrast and grouping. In contrast, "elements are associatively related when they may be contrasted in some unique and unambiguous way," and in grouping, "elements are associatively related when they may be grouped

because they have two or more characteristics in common” (Deese 1965: 165). Which of these operations is in effect in any association depends upon the context. Thus, for example, in some situations or for some individuals, *pink* and *rose(-colored)* are grouped because they are similar enough for the purpose, while in another situation, say when coordinating parts of a decorating scheme, they might be contrasted. Thus, since meanings are dependent upon association, meanings change as new relations are established through the accumulation of experience in particular contexts. One of the implications of an associationist position is that semantic relations must be learned through experience, rather than by deduction. Following this assumption, studies of antonym learning (e.g., Ervin 1963; Charles and Miller 1989; Justeson and Katz 1991) often assume that one learns that words are antonyms by experiencing their association (as co-occurrence) in speech or writing. Further discussion of these is left for 5.4.4.

Deese’s model did not receive a great deal of attention at the time, and since it was steeped in the assumptions of behaviorism, it has not aged well. Nevertheless, it was a source of inspiration in the 1980s for the WordNet model (especially WordNet’s treatment of the adjectival lexicon; Gross and Miller 1990; K. Miller 1998), to which we turn in 3.4.2.

Contrasting with the associationist position are “classical” theories of categorization, which assume that the mental representation of concepts involves some indication of necessary and sufficient conditions for membership in the conceptual category. So, for example, the meaning of the word *girl* might be composed of semantic features (as introduced in 1.3.1) such as [+HUMAN, -ADULT, +FEMALE]. Most theories involving such componential representations of meaning have their origins in philosophy and linguistics, but have been tested by psychologists (e.g., Bruner et al. 1956; Armstrong et al. 1983). The classical approach is discussed further in 3.2.1.

Classical componential theories of meaning were challenged by Rosch’s (1973, 1975, 1978; Rosch and Mervis 1975) groundbreaking work on conceptual structure. Rosch showed that in various identification and categorization tasks, subjects treat categories as having fuzzy edges, and that membership in categories seems to rely on the members’ similarity to a prototypical example (or abstraction of an ideal member) of that category. Unlike the “necessary and sufficient” conditions of classical theories, the prototype approach requires only that a category member meet some fuzzy criteria of similarity to the ideal, such that there is no specific set of properties that any two members must have in common.

Rosch (1978) characterized prototypes as providing horizontal organization for concepts – that is, prototypes contrast with each other by representing different things at a single level of taxonomic organization. Vertical (i.e., taxonomic) organization takes the form of different levels of categorization, particularly a

basic level (the most perceptually, linguistically, and conceptually salient level) and other levels subordinate and superordinate to it. Thus, the model acknowledges class inclusion and contrast relations. However, since categories have fuzzy edges (i.e., borderline cases may or may not be part of the category, depending on the context), relations among categories are also fuzzy, in that categories may overlap. Thus, LIQUID contrasts with SOLID, but also overlaps with it, such that the two categories share members (like SLUDGE).

Rosch's work concerns conceptual categorization, not word meaning, so it cannot be said that she has described lexical contrast and hyponymy. Any theory of simple concepts, however, is likely to be treated as a theory of word meaning, and some linguists and psychologists have embraced prototype theory as a linguistic semantic theory (e.g., Hampton 1991; Taylor 1995). Prototype theory has also been extended to linguistic categories, such as part-of-speech categories (Hopper and Thompson 1985), grammatical relations (Givón 1984), and semantic relations (Cruse 1994). The prototype approach to semantic relations contrasts with Relation Element Theory (Chaffin and Herrmann 1984), which holds that relation types are built out of relational components. These proposals are discussed in 3.5.

Returning to categorization generally, a compromise position between the classical approach and prototypes is offered by feature-comparison approaches (e.g., Rips et al. 1973; Smith et al. 1974; McCloskey and Glucksberg 1979), in which the conceptual features are of two types. Any concept has a core of definitional features, which are necessary (but not necessarily sufficient) characteristics of category members, while the prototypical, or characteristic, features are those that category members usually or characteristically have. A potential category member with a high proportion of prototypical features is a better exemplar of the category than one with just the core features. Thus, a robin is a better example of a bird than a penguin is because the robin has wings (not flippers), and flies (not swims), and nests in trees (not on ice). But both are nevertheless birds, and they share the core definitional features (e.g., being born from eggs, having feathers rather than fur) and have other features in common (e.g., having bills). The *comparison* of feature-comparison models refers to the process of determining whether individuals are members of categories, which is done by comparing the characteristics of the individual to the core and prototypical features of the concept. For feature-comparison models, semantic relations are computed, not directly represented in the conceptual store (Glucksberg 1987). The process of feature comparison itself can be used to determine such relations, as argued by Smith and Medin (1981). In this case, the core features predict the relations among concepts and the identification procedure allows for prototype effects in the categorization process. So, for example, the core features determine that PENGUIN belongs to the BIRD category (and, lexically speaking, *penguin* will be recognized as a hyponym of *bird*), but

the identification procedure may hamper this category assignment. Smith and Medin suggest that less typical members of a category have more features than typical members, and thus the feature-comparison process takes longer. While it is no more or less true that either *robin* or *penguin* is a hyponym of *bird*, because the relations between ROBIN, PENGUIN, and BIRD are computed, rather than stored, it should nevertheless not be surprising that one relation is recognized more quickly than the other. Feature-comparison models fit squarely in the componentialist family of theories described in 3.2.

Much other work involving paradigmatic relations in associative memory has involved attempts to represent semantic memory as computational networks (Collins and Quillian 1969, 1970, 1972). We return to these in 3.4.

These are only a few of the many approaches to categorization that have been proposed in the last few decades, but they have been highlighted here to focus on the matter of componentialism (3.2) versus associationism (3.3, 3.4) and holism (3.4). With the exception of Deese's work (and that of the WordNet group, to be discussed in 3.4.2), the psychological approaches to categorization discussed here mimic anthropological interests in that they are most interested in SUPERORDINATE > SUBORDINATE relations. This naturally follows from the facts that categorization is their focus and that hierarchically organized concepts are favored in psychological (and anthropological) approaches to categorization. The focus on these hierarchical relations, however, means that these approaches are of limited interest for the study of relations among words. As discussed further in chapter 6, hyponym relations are not likely to be stored in the mind as relations among words (either intralexically or metalexically). So, while the relation between ROBIN and BIRD may (or may not) be explicitly represented in the conceptual realm, there is little evidence that the lexical relation *robin* < *bird* or the metalinguistic knowledge *ROBIN* < *BIRD* is represented there. Since the lexical relation of hyponymy is a direct reflex of the conceptual relation of subordination, theories of categorization do explain how the hyponymy relation is computed. However, it is not computed as a hyponymy relation (i.e., among words); it is computed as a relation among things and then represented as a relation among words. Thus, later in the chapter more attention is paid to the approaches that are more concerned with the full range of semantic relations, rather than to those that are primarily bent on explaining categorial hierarchies.

This section has only scratched the surface of psychological contributions to the study of semantic relations. Of course, psychology particularly contributes experimental studies to the discussion, as seen throughout this book. Recently, the most active discussions of paradigmatic relations in psychology have been led by the Princeton WordNet group and, in the 1980s, by Chaffin, Herrmann, and their colleagues. Their contributions are mentioned throughout this book, and in this chapter, 3.4.2 and 3.5.2 (respectively) concern their contributions.

3.1.5 *Computer science*

Interest in lexical relations takes many forms in computer science, which is not terribly surprising since the lexicon is “the central component of natural language processing” (Handke 1995: v). As noted in the preceding sections, some of the most elaborate models of cultural knowledge (in anthropology) and semantic memory (in psychology) exploit computational modeling techniques. Thus artificial intelligence is the application of the combined intellectual output of psychology, cognitive anthropology, and linguistics, but at the same time it feeds the more traditional fields by providing them with computational metaphors on which to build models of mental representation and process. Computational semantic networks are valuable for many practical NLP tasks. These include word-sense disambiguation (finding the appropriate sense of a word by noting its relation to other words in a text), search engines (which use relations to recognize appropriate conceptual fields for a query), and lexical database formation (determining a word’s place in a semantic network through automated use of lexicographic tools).

Lexical-semantic relations are central to the problem of creating artificial lexical and conceptual structures (i.e., **knowledge representation**). Typically, such structures are modeled as taxonomies or as more diversely structured semantic networks, exploiting the thesaurus metaphor (see chapter 1). One issue that immediately arises in reviewing such models is to what extent they can serve as models of a human mental lexicon. As Collins and Quillian (1972: 311) note, “For computers, the question of whether a theory is correct is answered in an entirely different way than for psychologists.” Some differences between computer and human systems that immediately spring to mind relate to the fact that NLP systems are generally built for inferential competence, but not referential competence. So, for example, one is interested in having a computer know that cats are animals and animals are concrete objects (and thus a statement like *The cat has no dimensions* is semantically anomalous), but one is less likely to be making a computer system that is required to recognize and label actual cats. Since a computer typically interacts with the world through some kind of language input (rather than through direct experience), it might be more economical for semantic knowledge to be represented as lexical knowledge, rather than trying to maintain the linguistic/conceptual division that might be required for a model of human cognition. While computational linguists have become more and more aware of the need to incorporate world knowledge in the interpretation of language, computational lexicons tend to be heavier in semantic content than the mental lexicons of theoretical linguistics, which increasingly have been treated as semantically empty – including only pointers to the non-linguistic semantic information in conceptual knowledge. (Compare, for example, linguist Nunberg’s [1978] argument that the lexicon

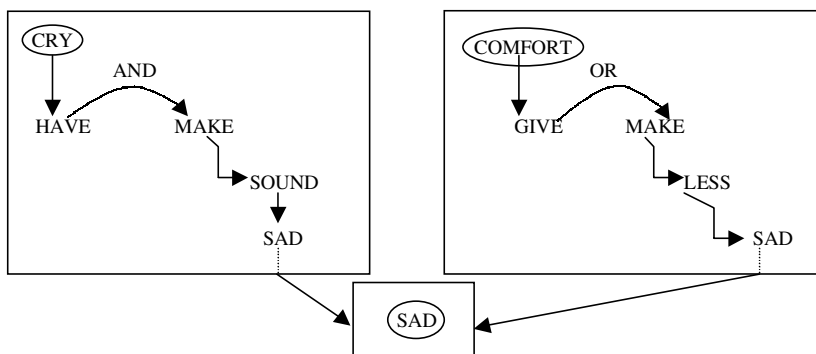


Figure 3.1 Quillian's (1968) semantic network

must be semantically empty with computational linguists' approaches in which the lexicon is full of richly structured information – e.g., Copestake 1992; Pustejovsky 1995.) On the other hand, since computer programs are created for specific tasks (unlike the human mind) and do not usually require referential capacity, the amount of information required for a computational lexicon might be significantly less than or significantly different from that required for the mental lexicon. As Wilks, Slator, and Guthrie (1996: 71) conclude, “whatever the mental lexicon may turn out to be, we have no evidence yet, apart from hunches, that a computational entity isomorphic with it is required for NLP.”

Because we are interested in relations among words (rather than sentence parsing or other NLP projects), semantic network models are of most interest here. Histories of semantic networks usually start from Quillian's work (1962, 1966, 1967, 1968), particularly his 1966 dissertation. (For a more detailed history, see Sowa 1991.) Although networks were already being pursued in machine translation, Quillian's work made innovative use of spreading activation (see 2.3.4) and parallel processing. The semantic network consists of nodes on a **plane** (each plane representing a word-concept), connected by uni-directional **associative links**. Two kinds of nodes are involved: a **type node** represents a single sense of a word, which can recur in **token nodes**, which are the building blocks of a type node's sense. Within planes, relations between nodes include a type-to-token subclass relation, and token-to-token relations: modification, disjunction and conjunction, subject and object. Between planes, token nodes are linked back to the type node representing the same word-sense. Figure 3.1 demonstrates the planes for **COMFORT** and **CRY**, and their relation to the type node for **SAD** (adapted from Quillian 1968: 250). The type nodes are circled.

Figure 3.1 illustrates how word-senses, as token nodes, serve as elements of other word-senses, while being related to other meanings through the relation of

the token nodes to their associated type node. Spreading activation can follow this interrelation of types and tokens, thus enabling inferences and allowing for semantic priming effects.

Types are never directly related in this model of semantic memory – types only indirectly relate to each other through a series of type-token and token-type relations. So, the relation between *DOG* and *ANIMAL* in such a network is not a relation of the concepts or words as such, but the inclusion of a token instance of [*ANIMAL*] on the plane of the *DOG* type node. So, while *ANIMAL* participates in *DOG*'s semantic representation, we cannot say that hyponymy is represented here. Instead, hyponymy can be computed on the basis of the interrelation of the two types.

Such a network embodies an associationist approach to meaning – any concept is part of a greater system of concepts and can only be understood as a part of that system. The linguistic correlate of this claim would be that meanings are interdependent. However, Collins and Quillian (1972) make clear that concepts and definitions are different things. For instance, *buy* and *sell* might be represented by a single concept, with the word meanings linking to that concept as two different perspectives on the same event. Although it is tempting to see figure 3.1 as a network of words, it is a network of concepts, which unfortunately must be represented using words. Thus, the semantic network does not determine relations among words, but it does provide the semantic information to which words map, and therefore the semantic bases for computing relations among words.

A number of network models followed in psychological (e.g., Rumelhart et al. 1972; Anderson and Bower 1973; Glass and Holyoak 1974–75; Collins and Loftus 1975) and anthropological (see discussion of Werner in 3.1.3) veins. By the end of the 1970s, these efforts had slowed, as the networks were getting too complex for the computers. Following improvements to user interfaces, they were revived in the late 1980s (Handke 1995; see Evens 1988 for examples). Since the inception of WordNet at the end of the 1980s (see 3.4.2), many computational linguistics projects have relied on it for relational information. Computational networks today are much less likely than their predecessors to serve as models of human memory, and much more likely to be developed for use in computer applications (Handke 1995).

An innovation in the later work on semantic networks is the move away from human-performed linguistic analysis in order to determine the semantic knowledge that is to be represented in the network. Much of the more recent and current work is concerned with developing means for computers to acquire lexical knowledge through natural language texts (especially machine readable dictionaries) in order to extract relational information for networked models of semantic memory. One of the earliest efforts toward this was Amsler (1980), but a number of methods and source dictionaries have been attempted since

then. Finding hyperonyms for lexical items has proved a relatively easy task (Véronis and Ide 1991; Calzolari and Picchi 1994), since dictionary definitions usually include a hyperonym followed by distinguishing characteristics (**genus** and **differentia**, in lexicographical terms).

Advances in **neural networks** (or **connectionist** models) have aided the development of computer-constructed lexical networks. While traditional networks treat relations among lexical items as declarative knowledge input, neural net programs start as undifferentiated networks of **nodes** (or **processing elements**), among which associations are strengthened or weakened on the basis of training experience (see Rumelhart et al. 1986). These models follow from the interest in spreading activation and apply it in ways that involve the natural evolution of semantic systems, rather than a system structured by the theorist's metalinguistic thinking about semantic relations. Shastri (1988, 1991), for instance, has proposed a connectionist approach to semantic networks, in which hyponymic hierarchies are represented. His main aim is to bring together these IS-A hierarchies with representations of facts and rules about the world to create a reasoning system, and so this is where the testing of the system has been focused. Neff (1991) is concerned more directly with the issue of lexical meaning. Following Labov's (1973) study of the fuzzy meanings of *cup* and *mug*, Neff trained a neural net to develop feature-based representations of the words' meanings in order to apply the words appropriately in new situations. She shows that a connectionist lexicon does not consist of a collection of lexical entries, but is "a web of interconnected nodes that collectively produce activations of lexical items" (1991: 199). This, of course, precludes representing lexical relations as links among lexical items, since those items are not discrete. Neff sees this as a boon, since "lexical relations such as synonymy and opposites are inherent in the connections. Opposites, for example, would have the same patterns of feature-to-word links with the exception of a critical defining feature" (Neff 1991: 201). Thus, Neff's connectionist approach mimics the componentialist approaches discussed in 3.2. However, this does not mean that connectionist models are necessarily componentialist in character, since non-feature-based connectionist models could be developed as well. Trying to develop a connectionist system that recognizes and proposes relations among words would be an interesting and dynamic experimental path to take, but, to my knowledge, no one has attempted it yet.

Finally, computational linguistics has recently seen a strong movement toward more componential approaches to meaning. This movement is particularly well represented by those working with the ACQUILEX lexical knowledge base system (see Copestake et al. 1993, as well as other papers in Briscoe et al. 1993) and Pustejovsky's Generative Lexicon (1991, 1995). These approaches represent meaning using feature specifications in hierarchies of inheritance and default. For the most part, these theorists do not discuss the nature of paradigmatic

relations, but they assume that the nature of the feature-inheritance system allows for the derivation of such relations.

As in anthropology and psychology, the relations among hyperonyms and hyponyms are paid particular attention in most computational approaches, since the superordinate category is “the most accessible property of a concept” (Collins and Quillian 1972: 320). Since these are conceptual relations, or relations among meanings, rather than relations among words, the prominence of taxonomical relations reflects both the computational interest in representing declarative semantic knowledge and the usual bias toward studying concrete, countable noun meanings, which are more likely to occur in hyponymy/hyperonymy relations than the concepts associated with verbs or adjectives. Similarity relations (synonymy and near-synonymy) have also received attention in NLP (especially through the work of Hirst and his students, see chapter 4). This interest is in part due to the practical problem of building natural language generation systems that can choose appropriately between near-synonyms like *potential* and *possible*. Strikingly missing from much of the computational literature is any indication that contrast might be an organizing principle in semantic memory. Semantic networks typically show positive relations between items, such as IS-LIKE or HAS-A, but rarely involve oppositional relations such as IS-NOT.¹¹ One exception to this generalization is the WordNet database, which uses opposition as the primary organizational mechanism for adjectives and a minor relation for verbs and nouns, as is discussed in 3.4.2.

3.1.6 Next steps

This section concerned attention given to semantic relations in several disciplines. Since the aim was historical, the overview was not very critical, and this is just as well, as the same critiques could be made repeatedly across various models in one or many disciplines. The next sections have a critical aim, and thus are divided along theoretical rather than disciplinary lines.

In taking a critical stance, the questions we must ask of each approach are:

- Which entities enter into semantic relations – words, word meanings, or concepts? (Are all three levels differentiated by the theory?)
- What claims of psychological plausibility are made for the model?
- Which comes first, the meanings or the relations? Are semantic relations the result of similarities in (arbitrary) meaning among lexical or conceptual items? Or is word meaning partially or fully constituted of (arbitrary) relations among words?

The last question is partly answered by the placement of an approach in one of the following sections. Section 3.2 covers **componentialist** approaches, in which meanings are explicitly represented by means of sublexical semantic

components. This allows for semantic relations to logically follow from those meanings (although not all componentialist approaches exploit this). Later, 3.4 covers **holist associationist** models, in which words have no internal semantic structure, but only relations to other words through which meaning arises. Between these extremes are the moderate **associationist** approaches in 3.3, which include both definitional information and explicit listings of lexical-semantic relatives in a word's lexical entry.

3.2 Relations as derived: dictionary models

Chapter 1 discussed two metaphors for the lexicon: the dictionary and the thesaurus. The dictionary defines words, usually by breaking down their meanings into smaller parts, while the thesaurus shows us relations among words. The approaches in this section follow the dictionary metaphor. Thus, the semantic information that is mentally represented for a particular word has definable parts and boundaries. The most straightforward (i.e., dictionary-like) version of a dictionary model would build word meanings of sub-lexical components, and this is the most productive means for trying to predict intensional relations. If semantic relations among words can be predicted on the basis of these configurations of semantic components, then the model does not need a built-in thesaurus, and thus semantic relations are the products of meaning, rather than producers of meaning (cf. section 3.4).

3.2.1 *Componential analysis of vocabulary*

Componential (or decompositional¹²) approaches to lexical meaning were popularized in mainstream generative linguistics by Katz and Fodor's widely read article "The structure of a semantic theory" (1963). Such theories break word meanings down into **semantic primitives** or **semantic features** and their **specifications**. For some (e.g., Bierwisch 1982, 1989; Bierwisch and Schreuder 1991), such components constitute the semantic content of entries in the mental lexicon; for others (e.g., Jackendoff 1983 *inter alia*), componentially represented meaning is located in the conceptual realm. Such approaches stay true to the "mental lexicon as dictionary" metaphor, in that both dictionaries and componential models attempt to define lexical items using a limited metalanguage. In the case of a dictionary, the metalanguage is not completely distinguishable from the language, and so lexical items are defined with other lexical items from the language. Because of this, dictionaries are (at some level) circular in their definitions. Componential models of meaning in the mental lexicon either avoid or reduce that circularity by choosing a metalanguage other than the language itself. Such a metalanguage can consist of sub-lexical semantic features (e.g., Katz and Fodor 1963; Bierwisch 1989; Jackendoff 1990; Pustejovsky 1995),¹³

or might utilize a very limited number of lexical items that are deemed to be semantically primitive (Wierzbicka 1972, 1996).

The predictability of semantic relations is often used to argue for semantic components. Fodor (1977) summarizes the argument well:

If the meaning of a lexical item, for example, *father*, were not analyzed into components, a grammar would have to simply list the semantic properties and relations of that item as independent facts: that *father* is synonymous with *male parent*; that it is antonymous with *mother*; that *male father* is redundant; that *deciduous father* is anomalous; that *female father* is contradictory; and so on. This would be descriptively uneconomical and, more importantly, would miss the fact that these properties are NOT independent of each other. There could be no word synonymous with *elephant*, antonymous with *raspberry*, redundant with *oxidized*, contradictory with *sad*, and entailing *archeological*. A componential approach to meaning guarantees this. (1977: 145)

It guarantees semantic relatedness by defining semantic relations in terms of similarity and difference among words' components. For example, the descriptions of *cow* (8) and *bull* (9) (with features in bold and their specifications in plain small caps) constitute the necessary and sufficient conditions under which it is true that an object belongs to one of these categories. *Cow* has two possible senses: (8a) includes any cattle and (8b) is limited to adult female cattle. Both senses are included in *cow*'s lexical entry.

- (8) *cow* (a) [**SPECIES:** BOVINE]
 (b) [**SPECIES:** BOVINE, **AGE:** ADULT, **SEX:** FEMALE]
 (9) *bull* [**SPECIES:** BOVINE, **AGE:** ADULT, **SEX:** MALE]

Some componential approaches economize by including **redundancy rules**. Such rules establish a hierarchy of features, such that if a semantic representation includes feature *y*, then inclusion of feature *x* is entailed. So, for example, since *cow* has a value for **SPECIES**, it inherits the information that cows are animals, that they are objects, and so forth. Note that this redundancy hierarchy involves relations among sub-lexical features, not words.

Synonymy, antonymy/contrast, and hyponymy/hyperonymy can all be defined in terms of the similarities and differences in the feature specifications of a group of words. Synonymy occurs when two words have senses with identical feature specifications. So, sense (8a) of *cow* is synonymous with *cattle* in its sense [BOVINE]. Two words would be completely synonymous if both words had the same number of senses, and there were a one-to-one correspondence of identical senses between the two words.

Antonymy occurs among minimally different pairs of senses. The senses are minimally different in that they have all the same feature specifications but one. So, sense (8b) of *cow* and sense (9) of *bull* are antonymous in that they have the same values for all features except for one, **SEX**. *Bull* is not antonymous with sense (8a) of *cow* because they differ in more than one feature.

A hyponym has all the same features as its hyperonym, but also additional feature(s), which make it narrower in extension than its hyperonym. Thus, any word meaning that has some features plus others inherited through redundancy rules stands to be a hyponym of a word that has just the inherited set of features. For example, *cow*, by virtue of its specification [**SPECIES:** BOVINE], inherits [**FAMILY:** MAMMAL]. *Mammal* is *cow*'s hyperonym on the grounds that it includes [**FAMILY:** MAMMAL], but does not include any information that is either more or different than that in (or inherited by) *cow*.

Since definitions of lexical relations all rely on similarity in words' feature specifications, arbitrary linkages between lexical items are prevented. So returning to Fodor's example, *oxidized* is prevented from being an opposite or hyponym or synonym of *sad* by the fact that they have very little in common.

After a rush of interest in componential models in the 1960s and early 1970s, generative interest in decompositional analysis (and indeed in lexical semantics) fell because of evidence against generative semantics (see Newmeyer 1986) and the demonstration of categorial prototype effects in language use (see 1.3.3 and 3.1.4). Today, a variety of theorists (e.g., Jackendoff 1990; Pustejovsky 1995; Wierzbicka 1996) employ far more sophisticated componential approaches than the simplistic model above. However, this componentialist renaissance involves little explicit discussion of paradigmatic relations, although most of its supporters maintain that componential approaches are superior to holistic approaches *because they predict semantic relations*.¹⁴

Bierwisch's componential work on adjectives (1967, 1989) does deal with antonymy at least, since it is central to the description of gradable adjectives. For Bierwisch (1989), dimensional adjective meanings are expressed by the formula in (10), in which QUANT DIM indicates that the meaning expresses a quantity in a dimension, which is equal to *v* (a contextually determined value) plus or minus *c* (a value that may or may not be specified).

$$(10) \quad (\lambda c) \lambda v \text{ [[QUANT DIM } x] = [v \pm c]]$$

The precise identification of *v* and *c* is not necessary for our purposes; what is relevant is that plus-or-minus sign. Any particular dimensional adjective's semantic representation has either a 'plus' or a 'minus,' and thus the binary nature of gradable antonymy is predicted by the semantic representation of those adjectives. Example (11) shows the semantic representations for *tall* and *short*, which describe the VERTICAL dimension.

- (11) a. *tall*: $(\lambda c) \lambda v \text{ [[QUANT VERT } x] = [v + c]]$
 b. *short*: $(\lambda c) \lambda v \text{ [[QUANT VERT } x] = [v - c]]$

By the Relation by Contrast principle *tall* and *short* are antonyms because they semantically differ in just the most minimal way.

Unlike the above treatments, Wierzbicka's (1996; Goddard and Wierzbicka 1994) semantic metalanguage is based on the language itself, comprised of (what she claims are) universal meanings reflected in the semantic structures of all languages. It is not clear that such a program can account for semantic relations. Wierzbicka's goal is to discover universal semantic primitives, which, in differing configurations, allow for differentiation among similar meanings in different languages (e.g., Wierzbicka 1997). That her priorities are with universal meanings, rather than explaining semantic relations, is underscored by the nature of some of the primitives she posits. Among them are *GOOD* and *BAD* and *BIG* and *SMALL*. While she entertains the possibility that these could be reduced to positive and negative values for a single primitive (e.g., *SIZE*), she rejects it, claiming that "'size' is not a simpler concept than 'big' or 'small,' but a more complex one, and so it is 'size' that has to be defined in terms of 'big' and 'small,' not vice versa" (1996: 109). So, contrary to other componentialists, Wierzbicka sees oppositions in language as "more deeply engrained in human cognition than they would be if they were reducible to some other elements" (1996: 110). But this only accounts for those concepts that are among the few dozen primitives. What of words whose meanings involve a number of primitives? Wierzbicka (1996) gives a few examples of how canonical antonyms are decomposed in her system, in which definitions consist of a list of propositions expressed in primitive terms. In the case of *black/white*, she argues that the two should not be represented in symmetrical form (as is the usual assumption about antonyms in componential analyses), claiming that *white* represents a more complex concept than *black*, since *black* has a universal prototype (the dark of night) and *white* does not. Wierzbicka's analyses of (12) *happy*, (13) *unhappy*, and (14) *sad* also give no clear mechanism for recognizing words that are antonyms.

(12) *happy*

X feels something

sometimes a person thinks something like this:

{something good happened to me; I wanted this;

I don't want anything more now}

because of this a person feels something good

X feels something like this (Wierzbicka 1996: 215)

(13) *unhappy*

X feels something

sometimes a person thinks something like this:

{something bad happened to me; I don't want this;

if I could, I would want to do something because of this}

because of this, this person feels something bad

X feels something like this (Wierzbicka 1996: 180–1)

- (14) *sad*
 X feels something
 sometimes a person thinks something like this:
 {something bad happened; if I didn't know that it happened,
 I would say: I don't want it to happen; I don't say this now
 because I know: I can't do anything}
 because of this, this person feels something bad
 X feels something like this (Wierzbicka 1996: 180)

Happy and *unhappy* have a certain symmetry – where there is 'good' or 'want' in *happy*, there is 'bad' or 'don't want' in *unhappy*, but there is nothing in *sad* that would pick it out as a unique opposite for *happy* among the other emotional terms. The contrast of 'good' and 'bad' feeling is not sufficient, since *upset*, *disappointment*, and *frustration* all involve bad feelings as a result of not having what one wants (Wierzbicka 1996). How particular words come to be antonyms does not seem to be within the scope of Wierzbicka's componential treatment.

On the other hand, hyponymy and meronymy relations are directly represented in Wierzbicka's semantic analyses, with the primitives *KIND-OF* and *PART-OF*. So, for example, the componential analysis of *tiger* includes the line "a kind of animal" (Wierzbicka 1996: 367). Notably, most theorists agree these relations are not so much relations among words as relations among the things the words represent (see chapter 6). So while Wierzbicka accounts for the conceptual-semantic relations among words' extensions, she does not investigate relations among words qua words.

To conclude, componential theories of meaning can be used to predict some semantic relations among lexical items, although they are not necessarily called upon to do so (in the case of Wierzbicka's semantic primitives). Such theories expect that semantic relations are dependent on the meanings of lexical items and that those meanings can be represented as complex individuals. This contrasts with the position discussed in 3.4, in which the meaning of a word is not observable in its internal semantic structure (since it has none), but rather must be dependent on conditions external to the word, particularly in its interrelation with other whole words or concepts.

3.2.2 Summary and commentary

Componential analysis is unlike the associationist theories in the next sections, in that it seeks to explain on semantic grounds why certain sets of words are paradigmatically related and others are not. However, since it is a lexical-semantic method, it can only account for those instances of semantic relations that are based on fixed semantic properties of the words involved. Thus it does not account for things like context-dependent binary opposition of color terms

(e.g., *red/black* in checkers, *red/green* in traffic lights). Even some binary oppositions that seem context independent are difficult to explain in terms of semantic components. *Happy* and *sad* are canonical antonyms, yet there seems to be no reason to distinguish more particularly contrastive semantic components for them – except in order to explain their opposition. Thus, one wonders whether the needed components are [+SAD] for *sad* and [−SAD] for *happy*. This is not a particularly insightful solution (see 3.3.1 for more detailed discussion of this problem).

Traditional componential analyses (assuming lexical modularity) do not account for certain cases of **functional hyponymy**. For example, the *cow* < *animal* relation is accounted for, since *cow* inherits the properties that *animal* has through the redundancy rules, but *cow* < *livestock* is another matter. While computational networks sometimes include components and relations that indicate the functions of items, such features cannot be included in any theory that tries to keep definitional and encyclopedic information separate. The necessary and sufficient conditions for being called *livestock* are being an animal raised for its products, but *cow* cannot simply inherit the features of *livestock*, since being a cow does not entail being raised for products (one could be a wild cow). So, while we have the intuition that *livestock* includes cows, this information is not semantic but pragmatic in nature, and thus does not follow from the componential analysis of the words involved. Componential analysis also says nothing about lexical relations that depend in part on non-semantic information, such as the relation (in US English) between *peanut butter* and *jelly*, which depends on the pragmatic knowledge that these two things go together in a sandwich and the linguistic experience of hearing *peanut butter and jelly*, rather than *peanut butter and jam*.

The definitions of paradigmatic relations within semantic componential analysis are quite similar to the definitions of semantic relations based on Relation by Contrast (chapter 2 and Part II), since they rely on comparison of the words' characteristics. However, the above limitations of componential analysis show that semantic components contribute to only a subset of meaning-related paradigmatic relations. If we accept the assertion that lexical relations relate metalinguistic representations of words (see chapter 2), then the semantic characteristics of words can be part of the information speakers use when relating two words. Componential analyses can therefore complement the metalexic treatment of lexical relations. If two words share a number of semantic components, this does not determine their lexical relations so much as it sets up the appropriate conditions for a relation to be recognized. Thus words' semantic similarity is the most important information available for most paradigmatic semantic relations. But if lexical relations are metalinguistic phenomena, then the criteria for lexical relatedness are not limited to semantic similarity and difference. Instead, semantic information can be supplemented

by morphological, stylistic, encyclopedic, and other conceptual and contextual information.

Is componential analysis supported by psycholinguistic evidence? A full answer to this question cannot be provided here, but plenty of arguments on both sides of the issue have been put forth. Bierwisch and Schreuder (1991) cite three types of evidence suggesting that semantic components are psychologically real. One is that they capture semantic relations, as discussed above. Another is that semantic **atomism** (in contrast to componentialism) requires a “pre-established congruity between concepts and the semantic form of lexical items” (1991: 28). If meaning is not broken down into sub-lexical components, then concepts become essentially equivalent to the semantic content of lexical items, which, Bierwisch and Schreuder argue, trivializes the problem of lexical access. Finally, many studies have tried to show that componential complexity or structure might affect language processing time or recall ability. While some studies have found no processing time differences between componentially complex and simple words (see Fodor et al. 1975; Kintsch 1974), others have found such differences in certain tasks for certain words (Carpenter and Just 1975; Clark 1974). Johnson-Laird (1983: 227ff.) reports a number of experiments in which subjects had better recall of non-target words if they shared more semantic features in common with the target set. Gentner (1981) and Schreuder (1978) have assumed that the semantic structures of verbs encode sub-predicate components, and found that if a verb shares more sub-predicate components with other lexical items in a sentence, those other items (e.g., subject nouns) work better as cues for verb recall. Arguments for and against the componential hypothesis can be compared to the arguments for and against the antithetical holist hypothesis, discussed in 3.4.

3.3 Relations beside meanings: dictionary/thesaurus models

This section deals with approaches to semantic relations that fall between the dictionary models of the last section and the thesaurus models of 3.4. While these theories acknowledge a need for some sense representation for individual lexical items, they also maintain that explicit representation of lexical-semantic relations is necessary. (In general, we can think of these models as dictionaries that define a headword and then list the word’s synonyms, antonyms, and the like.) Intralexical representation of relations is needed either to complete the representation of the word’s meaning or because semantic relations are held to be arbitrary (but often both reasons are cited).

Field theories, in 3.3.1, are usually associated with componential approaches in linguistics and anthropology. However, as discussed, they are not necessarily componential and frequently straddle the componentialist/associationist divide. Section 3.3.2 concerns Cruse’s linguistic approach, which holds that

paradigmatic and syntagmatic relations contribute to meaning. Meaning Text Theory, discussed in 3.3.3, posits dictionary-style definitions in lexical entries, but it also specifies dozens of semantic relations for each word. Finally, 3.3.4 surveys the strengths and weaknesses of these combined dictionary/thesaurus models in accounting for semantic relations.

3.3.1 *Fields and frames*

As mentioned in 3.1.2, much of lexical field theory was devised in an anthropological, or neo-Humboldtian, tradition, in which comparison of the lexical inventories of languages was used for insight into linguistic and cultural differences among language communities. While field theories have a long and involved history, the focus here is more recent (post-1960) versions of field theory and structural semantics (i.e., those that have been contemporary with and possibly influenced by generative linguistics). For reviews of earlier incarnations of field theory, see Öhman 1953 and Coseriu and Geckeler 1981. The more recent linguistic approaches to semantic fields are associationist, but generally eschew semantic holism. Instead, they tend to focus on the relation between semantic fields and componential analyses. However, some theorists still interpret semantic fields as holist enterprises. The philosopher Grandy (1987: 266) holds that “*Prima facie* there is a direct opposition between componential analysis . . . and field theory.” He claims that componential analysis can account for hyponymy and binary opposition, but that “the main function of contrast sets [in semantic fields] in elaborating a portion of a speaker’s knowledge is at best obliquely served by componential analysis” (p. 267). Most linguists who promote semantic fields disagree.

The term **semantic field** in its broadest sense refers to a subset of a language’s vocabulary that makes up some thematic unit. So, we might speak of the sets of English color terms or speech act verbs or tool names as constituting semantic fields. More particularly, *semantic field* refers to a hypothesized structure in which the lexical items associated with a particular semantic area are organized on the basis of a (usually fixed) number of semantic relations. However, a fair amount of terminological ambivalence is to be found. Within and across authors, terms like *word field*, *lexical field*, *semantic field*, and *conceptual field* are generally used unreliably or interchangeably. Trier (1931, 1934) speaks of *Wortfeld* (‘word, or lexical, field’) and *Sinnfeld* (‘sense field’ or ‘conceptual field’). Coseriu (see Coseriu and Geckeler 1981) developed this distinction, noting that a **conceptual field** is not limited to those concepts that are lexicalized. Thus, a **lexical field** is a subset of a conceptual field, involving only those concepts that have words attached to them. Through lexical-semantic change, a single conceptual field may be associated with different lexical fields at different times, since the lexical field is not dependent on external reality, but

<i>cook</i>							
<i>steam</i>	<i>boil₁</i>		<i>fry</i>		<i>broil</i>	<i>roast</i>	<i>bake</i>
	<i>simmer</i>		<i>sauté</i>	<i>deep-fry</i> <i>French-fry</i>	<i>grill</i>	<i>bbq</i>	
	<i>poach</i>	<i>stew</i>					

Figure 3.2 Field representation for selected cooking verbs

instead imposes categorization onto the conceptual field. Others in the German tradition speak of *Bedeutungsfeld* ('semantic field'),¹⁵ and Lehrer (1974 and elsewhere) refers almost exclusively to *semantic fields*. This term emphasizes that the fields relate senses of words, rather than words as wholes. However, those referring to *lexical fields* acknowledge that the fields relate word meanings, not word forms, and so the distinction between the terms is not a terribly meaningful one. I tend toward use of the term *semantic field* here because it is the more prevalent term in the English literature.

Field theory presents the lexicon as internally structured by paradigmatic semantic relations, especially synonymy, contrast, and hyponymy. Figure 3.2 follows the box diagram style in representing the semantic field of American English cooking verbs (adapted from Lehrer 1974: 31).

The field in figure 3.2 represents contrast relations among the items on the horizontal axis and hyponymic relations on the vertical axis. Thus, *steam*, *boil*, *fry*, *broil*, *roast*, and *bake* make up a contrast set and are all hyponyms of *cook*. Synonymy is signaled when more than one item is within the same space in the field, as for *deep-fry* and *French-fry*. Polysemy is indicated by subscripted numbers (so *boil₁* is 'cook in water' and *boil₂* is 'cook in rapidly boiling water'). Shaded areas indicate semantic overlap. For example, *roast* and *bake* can be used to refer to the same process (e.g., *roasting/baking a chicken in the oven*), although in most situations they are not semantically equivalent (e.g., *bake cakes* ≠ *roast cakes*). Blank boxes indicate lexical gaps.

The box diagram presents a visual metaphor in which vocabularies carve out places in a semantic space. Lexical relations are visualized as the boundaries between words, and the tension at these boundaries can be understood as a partially determinant factor in the specific meanings of the words involved. In this view, the location of one word in the field has repercussions for the semantics of another word at its boundary. The box diagram also emphasizes the contrast relations, which are at the heart of the notion of SEMANTIC FIELD. (In fact, *semantic field* and *contrast set* are used nearly synonymously in Grandy 1987.) Unlike semantic fields, computational networks are often illustrated as

tree diagrams, which emphasize the hierarchical relations, but leave the contrast relations to be inferred from the fact that two items have the same mother node. As the box diagrams reveal, semantic field theories pay particular attention to the relations within specific levels in the hierarchy. So, the color terms *red-orange-yellow-green-blue-purple-brown-black-white-pink* form a semantic field (since they constitute a complete set of color terms at a particular level), but *color-red-scarlet* are generally not described as constituting a semantic field.

In the structural semantics tradition (e.g., Pottier 1962; Greimas 1983 [1966]; Coseriu 1977) fields are means by which to determine the underlying semantic features of words and to describe the relations between word meanings in terms of these features. Werner and Fenton (1973: 553) describe lexical field analyses as “the automatic by-product of the correct componential paradigmatic solution” of a vocabulary set. However, lexical fields may also be used in a non-componentialist way, and we see a tendency in some field literature to combine componentialist and associationist assumptions, as is discussed later.

For Coseriu (1967), lexical fields are one kind of lexical structure, with syntagmatic structures and lexical class structures complementing the lexical fields. Coseriu’s claims must be judged against a language’s lexicon, rather than an individual’s mental lexicon. Thus, he is interested in using these structures to describe and explain semantic change (e.g., Coseriu 1964), and he also suggests using structural semantics to determine semantic typologies and universals (Coseriu and Geckeler 1981). But Coseriu and Geckeler (1981: 68–9) also suggest “the possibility of the union of the analytic-structural and the transformational-generative points of view,” which is “not altogether unattainable.” Thus, although his structural semantics is not psychologically oriented, Coseriu seems to have entertained the possibility of its usefulness for a mentalistic approach to semantics.

Lehrer (1974) finds that one can build a semantic field analysis on the basis of a componential analysis, but that the converse is not possible. Looking at a box diagram, one can see that two words contrast, but it is not evident (unless one looks for evidence outside the diagram) why and how those two words contrast. For this, one needs the componential analysis. But as well as using semantic fields as the basis for componential analyses, Kittay and Lehrer also hold that “[s]emantic relations are at least partly constitutive of the meanings of words” (1992: 3). They claim that semantic relations and field structures “seem to be operative in the mental lexicon” (1992: 1), and Lehrer (1974) takes semantic speech errors as evidence in favor of a field-organized mental lexicon. Taking a less mentalistic line, Lehrer (1992) claims that field theory contributes a tool for understanding and comparing the lexical inventories of languages – which are in the world, not in an individual mind.

Since field theory concerns the relationships among words, it can be considered a treatment of lexical, rather than conceptual, organization. While Kittay

<i>body part</i>					
<i>limb</i>				<i>digit</i>	
<i>arm</i>	<i>leg</i>	<i>hand</i>	<i>foot</i>	<i>finger</i>	<i>toe</i>

Figure 3.3 Partial semantic field for body parts

<i>happy</i>	<i>unhappy</i>		
	<i>sad</i>	<i>angry</i>	<i>afraid</i>

Figure 3.4 Semantic field representation of emotion terms

and Lehrer (1992: 3) define a field as a kind of “conceptual domain,” Lehrer (1992) cautions against importing psychological theories of cognition (e.g., prototype theory) into the linguistic analysis of word meanings. Thus, field theory involves treating word meanings as separate from non-linguistic concepts, and thus seems to rely on some version of lexical modularity.

In summary, field theory is a theory (or family of theories) of lexical (rather than conceptual) organization, which can be used to make weak claims about associative meaning (relations partly determine meaning), but it is often used to discover or illustrate componential analyses of lexical meaning.

One problem for field theories is that “field theories are appropriate for analyzing some sets of words – inappropriate for others” (Lehrer 1974: 17). Lehrer cites *even* and *only* as words that are not sensibly represented in semantic fields. However, paradigmatic relations can be found among such words, although they might not be in the types of hierarchical taxonomies that semantic fields are usually represented as. So, for example, *just* can be a synonym of *only*, and *indeed* a synonym of *even*. So semantic fields aid in the consideration of some, but not all, instances of lexical paradigmatic relations.

Lexical gaps are another area where semantic fields do not have much predictive power. The visual metaphor of words in the field reaching out to fill the space would have it seem that semantic fields, like nature, abhor a vacuum. But semantic fields do not necessitate the filling of all lexical gaps. For instance, the semantic field in figure 3.3 has an obvious gap, but this has not resulted in language-internal pressure for a word encompassing ‘hands’ and ‘feet’ to be coined or for *limb* or *digit* to acquire a sense that fills that gap.¹⁶ Thus, the relations among the words are not exerting any pressure on the meanings of these words or the shape of the field.

Another problem with lexical fields is that they do little to indicate the specialness of binarity in contrast relations. In figure 3.4, the binarity of the relation between *happy* and *unhappy* follows from the fact that they are the only two

happy	unhappy		
	sad	angry	afraid

Figure 3.5 Revised semantic field representation of emotion terms

contrasting terms at the top level of the field. If antonymy only occurred in such situations, then we might say that antonymy arises naturally when a contrast set has just two members.¹⁷ However, at the bottom tier, no such explanation is available for the antonymy of *happy/sad*, since this (admittedly abbreviated) level involves four contrasting terms.

Figure 3.4 can be revised in order to force *happy* and *sad* into a binary contrast, as in figure 3.5. This field puts *happy* in three contrasting relationships and *sad* in two. From the top, the contrast sets are: *happy/unhappy*, *happy/sad/angry/afraid*, and *happy/sad*.

While the field in 3.5 describes the semantic relations among these words, it does not explain how *happy* and *sad* in particular came to be canonically opposed (rather than, say, *happy* and *angry*). In an associationist view, *happy* and *sad* are opposites just because the field in 3.5 says so, not because they have more or fewer semantic features in common with each other than with the other members of the field. But if we are to use semantic fields in order to discover semantic components, then figure 3.5 tells us that our analysis is only complete if we can find a feature that differentiates *happy* and *sad* that is irrelevant to *angry* and the other non-*happy*, non-*sad* states. It is unclear that this can be done in a non-trivial manner.

So, we have seen that field theories do not adequately account for the full range of paradigmatic relations among words. While field theory has “proved its worth as a general guide for research in descriptive semantics” (Lyons 1977: 267), its value is precisely in describing and not in explaining.

A related, but rather different, notion to semantic field theory is frame semantics, which has its inspiration in the work of artificial intelligence (including frame, scenario, and script approaches; e.g., Minsky 1975; Schank and Abelson 1977) and field theory. Fillmore (1975 onwards) has done the most to develop it as a linguistic theory of lexical semantics. Frames are cognitive models of situations, and by matching experiences against frames we have already internalized, we are said to make sense of the world. Whereas early field theory (*à la* Trier) hypothesized an unorganized conceptual realm to which lexical fields applied some structure, frame semantics holds the opposite to be true, so that linguistic forms “are seen as indexing semantic or cognitive categories which are themselves recognized as participating in larger conceptual structures” (Fillmore 1987: 34). In this case, words have meanings by being linked

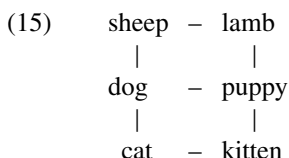
to parts of frames in a number of possible ways: associational, criterial, or functional links (Fillmore 1976). Since Fillmore (1977) argues against the division of lexical and conceptual semantic information, semantic relations among words are mediated by the relations among the concepts they refer to. Thus, while semantic relations are considered central to the understanding of meanings (see Fillmore 1977: 111ff.), they are not intralexical relations in the same sense that relations in semantic fields are intralexical relations – that is, they are not properly part of a modular linguistic knowledge base. Fillmore and Atkins (1992: 77) distinguish their position from field theory by noting that field theories rely on word-word relations, while in frame semantics word-word relations become available by way of “their links to common background frames and indications of the manner in which their meanings highlight particular elements of such frames.” Fillmore (1985: 229) notes that “the devotion to word sets for their own sake” distinguishes field theory from frame semantics, and argues that frame semantics is superior to field theory (assuming a holist-associationist understanding of fields) because it allows language users to understand words without necessarily knowing all the other words in the same field. At the same time, frame semantics acknowledges that the existence of words (and the relations among them) can affect how a frame is conceptualized. Furthermore, frame semantics allows for relations other than the standard ones found in lexical field theories. Since the semantic frame involves more concepts than just those indicated by words in a single syntactic-semantic paradigm, associative relations between items like *ox-yoke* or *food-eat* are accessible in that the concepts they represent are related in the semantic frame, and thus lexical relations might be inferred. Because it does not propose that lexical relations are stored in the lexicon, frame semantics is more compatible with the metalexical view of semantic relations presented in chapter 2.

3.3.2 *Cruse’s contextual relations*

In modern linguistics, Cruse (1986) has represented the position that meanings are results, rather than causes, of the relations among words. As mentioned in 3.1.2, his is a **contextualist** view, in which the meaning of a word “is viewed as being made up, at least in part, of the meanings of other words” (1986: 16). Cruse’s position has become less associationist since his *Lexical Semantics* in 1986, but since that book has endured as one of the principal texts in the field, its position is worth taking seriously.¹⁸ In *Lexical Semantics*, a word’s semantic identity “cannot be exhaustively characterized in terms of any determinate set of [paradigmatic and syntagmatic] relations” (1986: 49); nevertheless, such relations contribute to word-senses and are presented in *Lexical Semantics* as the means through which to investigate lexical meaning. Word-senses are **semantic traits** of other word-senses if they partake in contextual relations

with each other, and these semantic traits may differ in their **status**, that is, the degree of connection between the word-senses. A **critical trait** is one that follows from an entailment relation. To use Cruse's example (1986: 17), the sense 'animal' is a critical trait of the word *dog* because *It's a dog* entails *It's an animal*. **Excluded traits** are those that are negative entailments, for example, *dog* excludes 'fish' because *It's a dog* entails *It's not a fish*. Traits can also have intermediate strengths along a continuum between critical and excluded: expected, possible, and unexpected. Some traits have special status as **canonical** because although they may not be **critical**, the absence of this trait is regarded as a defect. For example, having four legs is not a critical trait of dogs, but it is a canonical trait.

Both syntagmatic and paradigmatic relations are relevant to this view, and among the paradigmatic relations, many kinds are discriminated. These are organized into **lexical configurations**, including hierarchies (illustrated as tree graphs) and **proportional series**, which are composed of rectangular cells, each corner of which is a word-sense node, and which can be read as analogies, as in (15) where *sheep* is to *lamb* as *dog* is to *puppy*.



This diagram illustrates the relations between *sheep-dog-cat* and *lamb-puppy-kitten* as well as those between *sheep-lamb*, *dog-puppy*, and *cat-kitten*. Proportional series can cross part-of-speech categories, such as the series of relations between *long/lengthen*, *wide/widen*, *deep/deepen*. While acknowledging that it looks like the items in these series share meaning components (like **YOUNG** in the right-hand column of [15]), Cruse (1986: 134) claims that the proportion of vocabulary that lends itself to this kind of analysis is quite limited, and therefore the existence of such patterns in proportional series cannot be argument in itself for a componentialist view. He also cautions that, while such fields look like lexical fields (see 3.3.1), they differ in that lexical fields are considered to be linguistic entities in and of themselves, and his diagrams are consequences of sense relations.

Since relations are held partly responsible for meaning, semantic phenomena, such as semantic markedness, are explained by Cruse in terms of semantic relations. For example, Cruse explains distributional facts about gradable adjectives (e.g., whether they can be used in measure phrases) by appealing to the type of antonym relation in which the adjectives are found. Each language arbitrarily assigns its gradable predicates to a particular type of antonymic relation

(equipollent, overlapping, or polar). For the purposes of this chapter, it is relevant that Cruse (1986) treats these relations as arbitrary, although the case is made in chapter 5 that they are not arbitrary at all.

Cruse's aim is to provide a linguistic theory, rather than a psycholinguistic theory, which makes it rather difficult to critique, given the goals of this book. Cruse does not really approach the question of "which comes first, the meanings or the relations?" – instead he uses relations as evidence for meanings. Cruse takes relations as a given and extrapolates meaning from them as a methodological position for the structural study of a language, rather than claiming this as part of a theory of mind.

Cruse acknowledges several limitations in his contextual approach to meaning, including its reliance on an arbitrary boundary between definitional and encyclopedic meaning, its failure to distinguish between the pragmatic and the semantic, and the unlikelihood that such meaning can be formalized. In more recent work (Cruse and Togia 1995), Cruse reframes his approach as a cognitivist model. Since that work has concerned specific relations, it is left for Part II. Cruse (1994) has also asked how prototype theory can be brought to bear on the concept of "lexical relation." That work is discussed in 3.5.2.

3.3.3 *Lexical functions in Meaning Text Theory*

Meaning Text Theory (MTT; Mel'čuk 1988 and elsewhere; see also Wanner 1996, 1997) is a theory of natural language with roots in NLP efforts. In MTT, the lexicon (termed an **Explanatory Combinatorial Dictionary**) is central to all linguistic description. Lexical entries have three **zones**. The **syntactic zone** contains the word's subcategorization patterns. The **semantic zone** includes a definition, which operates on the Decomposition Principle, that the definition of a word must include only words that are semantically simpler. It is thought that consistent application of this principle results in the discovery of semantic primitives (Mel'čuk and Polguère 1987). The **lexical combinatorics** (Mel'čuk and Polguère 1987) or **lexical co-occurrence** (Mel'čuk and Wanner 1996) **zone** includes a full set of the word's paradigmatic and syntagmatic relations, expressed through **lexical functions** (LFs). Lexical functions are tools for representing "restricted lexical co-occurrence" (Mel'čuk and Polguère 1987), and so they represent particular arbitrary information, such as the fact that *stark* is an intensification modifier for *naked*, but not for *nude*. So, the relation between *naked* and *stark* is represented in the lexical co-occurrence zone of the lexical entry for *naked*, using the **Magn** (magnitude) LF, but *stark* does not stand in the **Magn** relation to *nude*, as illustrated in (16). (The LF formulae are quite straightforward to read. For example, applying the **Magn** function to *naked* gives us a list of potential intensifiers for *naked*.)

- (16) **Magn** (*naked*) = *stark, completely, utterly*
Magn (*nude*) = *completely, utterly*

The number of lexical functions has grown to sixty-four in Mel'čuk 1996, so a complete list is not attempted here, but they include twenty-five paradigmatic lexical functions, some of which are divided into further subtypes. The names of the LFs are abbreviations, usually of Latin terms. Some of the more familiar paradigmatic relations are represented by the following LFs:

- Synonym: **Syn** (*telephone*) = *phone*
 Antonym: **Anti** (*high*) = *low*
 Converse: **Conv** (*wife*) = *husband*
 Contrastive: **Contr** (*earth*) = *sky*
 Generic: **Gener** (*carrot*) = *vegetable*
 Result: **Result** (*buy*) = *own*

The paradigmatic LFs are by no means limited to the usual 'nym relations, since many more types of relations can be found that describe lexical paradigms. The following exemplify this.

- 'Unit of': **Sing** (*fleet*) = *ship*
 Aggregate: **Mult** (*ship*) = *fleet*
 'Head of': **Cap** (*tribe*) = *chief*
 Staff: **Equip** (*aircraft*) = *crew*
 Ease/ability: **Able** (*[to] cry*) = *tearful*
 Figurative: **Figur** (*passion*) = *flame*
 Actant: **S₁** (*teach*) = *teacher*; **S₁** (*book*) = *author*

In several of these examples, we can see that *paradigmatic* is not interpreted as requiring that the related words belong to the same grammatical category. The **S₁** relation, for example, is intended to represent the standard name for an actor in a situation, and thus represents a paradigm for actions (often expressed as verbs) or products (usually nouns) and their actors or producers (nouns). However, for some relations (including **Syn**, **Anti**, **Conv**, **Gener**), Mel'čuk (1996) indicates that the value of the LF must be the same part of speech as the lexical entry's headword.

In addition to the sixty-four primitive LFs like those above, complex LFs can be made by combining LFs. So, for example, **S₁** and **Able** can be combined to represent the relation between *cry* and *crybaby* in (17):

- (17) **S₁Able** (*[to] cry*) = *crybaby* (i.e., an actant with the potential to cry)

A word's lexical entry specifies all possible values of all its lexical functions, as well as including semantic (definitional) and syntactic (grammatical category) information. Thus, LFs can be seen as creating a semantic network (Polguère 1997). Mel'čuk cautions repeatedly that LFs are not semantic units – they are not meanings unto themselves and “they do not and should not pursue

semantic precision" (1996: 80). This is made clear by the fact that a word may have multiple values for a single LF, and those values need not be synonymous (and, indeed, often are not). LFs can support non-synonymous values in part because lexical items are assumed to have their own componential semantic structures. Thus, a lexical function can have many different values which each highlight different aspects of the word's meaning (Mel'čuk 1996). For example, different components of a word's definition affect **Anti** values for a word like *boy*. If *boy* is defined as 'a young, male human,' then its antonyms *man* and *girl* would rely on different components of the definition, as in (18).

- (18) **Anti**_[male] (*boy*) = *girl*
 Anti_[adult] (*boy*) = *man*

Semantic components of the words in question are not the only reason for multiple, non-synonymous values for LFs. The LFs themselves do not have strict meanings. For example, **Magn** can indicate either a high value for some property (e.g., **Magn** [*tired*] = *very*) or an intense instance of something (e.g., **Magn** [*stare*] = *hard*). This allows for different types of words, including different syntactic categories of word, to partake in the same limited set of relations. So, while MTT records far more types of relations than other approaches to the lexicon, this is because it attempts to describe a wider range of lexical phenomena, not because it splits more general categories, like antonym, into many different subtypes. Indeed, **Anti** covers not only opposed gradable predicates (as in the Lyons 1977 definition), but also reversives (*fold/unfold*) and complementary antonyms (*dead/alive*).

LFs were developed for use in computer applications (originally, machine translation). Explicit statement of LFs in lexical entries reduces the number of choices a program has in choosing which words to put together in a phrase. MTT has also been particularly adapted for attention to pragmatic, or communicative, elements of text processing, such as highlighting a particular theme in a sentence (Wanner and Bateman 1990; Iordanskaja et al. 1996), and for establishing text cohesion (Lee and Evens 1996). For a computer program, it may be easier to just give values for lexical functions, rather than to try to determine ways in which those relations can be derived from semantic and pragmatic knowledge bases. So, on one hand, we might see paradigmatic LFs as computational short-cuts, which are not necessarily represented in a human mental lexicon. On the other hand, the MTT theorists' given reasons for explicitly stating LFs in the lexicon are not reasons of computational ease, but rather a claim about the nature of language: that LF values are arbitrary. Thus, in spite of the fact that words are componentially defined, LFs are not derived from words' semantic components, in contrast to the approaches in 3.2. In contrast to the approaches in 3.4, the sum of a word's LFs do not constitute its meaning. Rather than affecting

(or being affected by) lexical semantics, LFs are relevant only to the concatenation of words (and meanings) in text.

However, the claim that paradigmatic LFs are arbitrarily specified is often contradicted by the fact that these relations depend upon or are predicted by information in the semantic zone of the lexical entry. For example, the **Anti** (antonym) LF is defined such that the headword and the LF value (its antonym) “differ by a negation of an internal element” of one of the two lexical items (Mel’čuk 1996: 48). (The **Contr**, or contrastive, LF is “superficially similar” to **Anti**, but differs because it does not entail definition-internal negation.) If all words whose definitions negate each other are antonyms (Mel’čuk 1996 is not clear about this), then we have a counterexample to the claim that LFs record arbitrary information.

Not all LF specifications must be arbitrary. However, in order to claim that a lexical co-occurrence zone is necessary for a model of natural language, any particular LF must involve at least some arbitrary specifications in order to justify its position in the lexicon. Mel’čuk and Wanner (1994, 1996) argue that the values of LFs can be partly motivated by the semantic properties of words, since words with LF values in common (or words that are common values of LFs for a set of words) often have semantic characteristics in common. For example, *plea*, *proposal*, *advice*, and *offer* are all nouns that can be the object of *reject*, and each of these nouns describes a verbal suggestion of some sort. So membership in the ‘suggestion’ class of nouns makes it likely that the word will have *reject* as one of the values for **Oper** (the relevant LF). In order efficiently to represent the information that entire classes of words have particular LF values, information can be inherited from the class. The problem in doing this is that full semantic classes rarely act as one. So, instead of instituting a general hierarchy with automatic inheritance of properties from superordinate to subordinate, particular LFs in a subordinate word’s lexical entry are marked for inheritance from the superordinate word’s LF specifications.¹⁹ Interestingly, however, this information is inherited from an item in the word’s definition (its semantic zone) rather than from another LF. So, while the LF **Gener** should identify the hyperonym for any word that has one, inheritance depends on the existence of that hyperonym in the definition of the word. The existence of hyperonyms both in the definition and in the **Gener** specification calls into question whether specifications for **Gener** are indeed arbitrary. So again we have evidence that a paradigmatic relation (in this case, hyperonymy) is not arbitrary (but is instead dependent on componential meaning), and therefore we must question whether paradigmatic LF specifications must be explicitly represented in the lexicon. Since most of the literature on LFs has focused on their role in combining words in text, much more attention has been paid to the syntagmatic relations than to the paradigmatic relations, whose roles in sentence

building are smaller. In the MTT literature, paradigmatic LFs are not used to demonstrate the arbitrariness of LF specifications, so it is less than clear that the arguments for arbitrariness apply to all the LFs, particularly the paradigmatic ones.

To conclude, lexical entries in MTT do have semantic content. But while semantic information in the lexical entry clearly can be used to predict some relations, such as antonymy and hyperonymy, MTT does not exploit this fact. Information in the semantic zone of the lexical entry can influence LF specifications by focusing the LF on a particular aspect of the word's definition (as shown above for antonyms of *boy*), and semantic information can determine inheritance of other LF specifications. If all paradigmatic relations cannot be predicted from information in the semantic zone, then this may be because the definitions are not phrased in ways that are conducive to paradigmatic LF specification, or because not all of the information that makes some paradigmatic relations predictable is semantic information. While some paradigmatic relations may be arbitrary (e.g., they may come about through frequency of co-occurrence, rather than through particular semantic or morphological properties), MTT treats all LF specifications equally – as arbitrary, and therefore lexical, information.

3.3.4 *Summary and commentary*

The models in this section specify both lexical relations and non-relational statements of meaning in the lexicon. The argument for including lexical relations is that they are in some way arbitrary. However, the examples these theorists have proffered in order to demonstrate this arbitrariness do not stand up to scrutiny. As argued in chapter 2, and discussed in more detail in chapter 5, alleged examples of arbitrary antonymy are predictable based on their members' meaning and usage. Mel'čuk's arguments for arbitrariness may be supported for his syntagmatic examples, but in many cases the paradigmatic LFs repeat information that is available in the definition of the word. Having both semantic and relational information in lexical entries is thus redundant, and it contradicts the premise that lexical information must be arbitrary.

Most theorists discussed in this section also claim that lexical relations are in part responsible for lexical meaning. Since the next section concerns models in which lexical relations are entirely responsible for lexical meaning, I save discussion of this point for the end of 3.4.

For the most part, these approaches cannot be said to constitute psycholinguistic theories of meaning. Field theorists sometimes point out psycholinguistic evidence for fields (e.g., Lehrer 1974), but the approach in general is centered on the structure of a language, rather than the structure of the mental

representation of that language. Cruse's approach makes no claims for psycholinguistic reality. MTT, having its roots in computer language processing, might be adopted as a theory of mental representation and process, but, again, these claims are not directly made and tested. So, while some of these approaches promote lexical specification of paradigmatic relations, in doing so they produce descriptions of a language's semantic structure, rather than models of the mental organization of vocabulary.

3.4 Relations as primary: meaning postulates

Unlike the dictionary-like models discussed in 3.2 and 3.3, the thesaurus-style models in this section do not provide definitions of words based on sub-lexical parts, but instead expect that meaning arises through relational constraints on a word. Ross (1992: 158) describes such a state as "Linguistic General Relativity" – the synchronic interdependence of the semantic elements of a language. In various ways, these approaches treat relations as meaning postulates – explicitly stated conditions. As noted in 3.1.1, the term *meaning postulate* has its roots in philosophy of language, and thus not all of the approaches discussed in this section make use of that term. Nevertheless, the approaches discussed here have in common that they do not treat meanings as composed of sub-lexical parts. So, for example, rather than including [female] as part of the meaning of *girl*, a meaning postulate approach states a condition on *girl* that if something is a girl, then it is female. The difference between these two positions can be illustrated by thinking of how they are applied in semantic networks. To "meaning postulants" (to borrow Johnson-Laird's [1983] epithet), the network associates words (*girl* → *female*) or whole concepts (GIRL → FEMALE). To componentialists, a network associates (or shares) features, so that [female] in the definition for *girl* is linked (or identical) to [female] in the definition for *female*.

So, the following approaches treat words as semantically unanalyzable. Meanings are not "in" lexical entries or concepts, but instead are among them. These approaches, like those in 3.3, are **associationist** as they specify semantic relations for words, rather than deriving them through relational principles and semantic information. But unlike those in 3.3, they are also **holist** in nature, since they treat meaning as arising through the relational system of a language. In other words, a word's meaning is dependent on all the words with which it enters into relations (and, by extension, all the words with which those words enter into relations, and so on).

Section 3.4.1 presents arguments for and against a holist, meaning-postulate approach, concentrating on the work of Jerry Fodor, who has embodied this position for the past three decades. Section 3.4.2 concerns WordNet, a

psycho-computational approach, and the final subsection offers a critique of associationist and holist approaches in general.

3.4.1 *Atomism and meaning postulates*

In contrast to theories of meaning involving components or prototypes, **atomistic** approaches to meaning involve no sub-lexical or sub-conceptual semantic components. Knowledge relating to such unanalyzable concepts is stated as propositions, or **meaning postulates**, and these allow us to make inferences about meanings. Such postulates might be learned by experience, but the atomic concept itself exists regardless of what postulates it takes part in. While some (e.g., Lakoff 1972; see also 3.3) have proposed that meaning postulates exist in the mind alongside componential definitions, this section concerns arguments that words are not defined in the mind at all.

While the focus here is on paradigmatic relations, meaning postulates can express any sort of proposition. So, while the focus here is on postulates like “If something is a *robin*, then it is a *bird*” other possible postulates could include “If something is a *robin*, then it eats worms” and “If there is a *robin*, then it is spring.” The entire knowledge base is built out of such propositions.

Fodor and colleagues generally argue *for* meaning postulates by arguing *against* componential meaning. Fodor et al. (1980) maintain that since accurate definitions are impossible to find, they cannot be the basis of meaning in the mind. Fodor et al. (1975) cite experiments in which phrases containing words with implicit negatives are processed and understood faster than phrases with explicit negative marking. For example, *he's a bachelor* is processed faster than *he's not married*. If there is a negative element in the semantic representation of *bachelor*, in that it is mentally represented as [NOT MARRIED], then they hypothesize that the meaning of *bachelor* should take (at least) as long to grasp as an explicit negative (e.g., *not married*) would. Since it does not, they conclude that such words “do not act as though they contain a negative element in their linguistic representation, and therefore [they] are not semantically analyzed at any level of linguistic representation” (1975: 522). They further conclude that meaning postulates are necessary in order to account for entailment relations that depend on lexical items, such as the entailment relation between *Mo is a cat* and *Mo is an animal*. Furthermore, they point out cases in which definitional information seems not to contribute to entailment. For example, *x is red* entails *x is colored*. The only relevant properties here are *red* and *colored*, and there is no semantic component that can be added to those in *colored* to make its hyponym *red*, since “there is no property *F* which is logically independent of the property of being colored and such that *x is F and x is colored* entails *x is red*” (Fodor et al. 1975: 527). Thus, they argue, if it is an analytic truth that

whatever is red is colored, then this is an analytic truth that cannot rest on the definitions of the words involved; it must be explicitly stated as part of our knowledge base.

As further evidence for meaning postulates, Fodor et al. (1975) offer sentence comprehension speed. Since sentences are understood quickly and easily, they argue that it makes sense to assume that the semantic representation of a sentence must be fairly like its syntactic form (i.e., no more complex or different). So, in order to reduce what the language processing system is responsible for processing, Fodor et al. simplify it by giving more of the responsibility to the inferential system. Thus, information that is necessary for inferences is stated explicitly as meaning postulates, and each word is associated with a set of such postulates. (Kintsch 1974 independently makes many of the same arguments.)

Fodor et al. (1975) and Fodor (1977) have argued that meaning postulates are essentially the same thing as the redundancy rules of componential semantics (see 3.2.1). But an important difference between the two is what they are relating. In a componential semantics, the redundancy rules show relations between sub-lexical semantic components – that is, they are intensional relations. For meaning postulates, however, since there is no internal semantics for the words, what is being related is the two words' extensions. To illustrate, the redundancy rule tells us that if a word has the feature *FELINE*, then it has the feature *ANIMAL*, but the meaning postulate tells us that if a thing is a feline, then it is an animal. Thus, it is not accurate to say that meaning postulates encode lexical relations – they do not differentiate between lexical and conceptual semantic relations. In order to represent the difference between the conceptual relation between *HOT* and *COLD* and the lexical relation between *hot* and *cold*, we would need two postulates: (a) if something is hot, then it is not cold, and (b) if a word is *hot*, then it is the opposite of the word *cold*. Thus, we could use meaning postulates to represent the difference between conceptual-semantic and lexical-semantic relations.

While Fodor's earlier work depended on psycholinguistic experiments that argued against componentialism, these experiments can only be used to argue against the particular componential analyses that were assumed in the experiment, if indeed they can be used to argue against that. They may just reveal the incorrectness of some initial hypotheses about how semantic components contribute to sentence processing. Returning to the experiments by Johnson-Laird discussed in 3.2.1, he and his colleagues found that meaning components seem to play a role in lexical representation, since words that share semantic characteristics support each other in recall experiments (Johnson-Laird 1983). Since recall ability was proportional to the number of features the words shared, Johnson-Laird argued that such results dispute the validity of meaning postulates. If meaning is represented through postulates, then the fastest recall should

be for those items that require the fewest meaning postulates to search. Johnson-Laird found that this was not the case.

Laurence and Margolis (1999) identify a number of criticisms of such approaches to concepts and word meanings. First, all atomic concepts must be innate (Fodor 1975), since there is no other means for their acquisition. This intuitively seems unlikely for such complex and culturally specific concepts as *RATATOUILLE* or *SHORTSTOP*. Since all concepts are equally simple in structure, *FOOD* and *MANACOTTI* are not differentiated as more-or-less likely concepts to know, and it is not necessary to know one in order to know the other. Besides these strikes against intuition, Jackendoff (1989) points out that innate non-componential concepts would entail that only a finite number of concepts exists (since the brain is finite). This position is difficult to defend, since people show an unlimited ability to recognize new things. Next is the problem that Laurence and Margolis term “explanatory impotence”: if meanings or concepts are not componential, then we cannot generalize among them, and so processes that rely on conceptual generalization, such as categorization, are unaccounted for. Thus, any generalizations we have seen across cases of antonymy or hyponymy cannot be exploited by an atomic theory. There are also basic problems for the acquisition and development of new word meanings or concepts.

So, an atomic approach to meaning treats semantic relations as arbitrary and unpredictable. In order to make inferences like “if it’s hot, it’s not cold,” we must have in mind a meaning postulate that gets us from the meaning of *hot* to the meaning of *cold*, since the relation between them would not otherwise naturally arise. This is at odds with the position that semantic relations are predictable if we assume that words are defined in the mind.

3.4.2 *WordNet*

Our final example of an approach to semantic relations is WordNet, a lexical database project, founded in 1985 at the Cognitive Science Laboratory at Princeton University. WordNet has emerged as the foremost semantically organized lexical database of English (Sampson 2000), and as such, I use it here to demonstrate some archetypical computational network qualities, as well as discussing its particular merits and problems. WordNet has been used in a wide range of computational studies (as well as serving as a thesaurus application itself). Around the world, researchers are actively pursuing versions of WordNet for other languages (e.g., Vossen 1996). WordNet’s success is in part due to its attempt at building a human-sized computational lexicon, whereas most NLP projects are built and tested with very limited (“toy”²⁰) lexicons, with attendant problems in scaling up to more inclusive lexicons. The WordNet group has found that handling a large lexicon elucidates particular problems and patterns that would go unnoticed in a small-scale lexicon. One way in which WordNet

handles the size of the English lexicon is by treating it as three smaller lexicons (noun, verb, and modifier), each of which operates on its own organizational principles. Since words are related within their own part-of-speech lexicons, the relations represented in WordNet are, for the most part, paradigmatic, rather than syntagmatic.

At the outset, WordNet was conceptualized as an exercise in “psycholexicography” (Miller et al. 1990), and was intended to encode “the vast range of evidence for the synchronic organization of the lexicon that psycholinguists have gathered [in the twentieth] century” (Beckwith et al. 1991: 212). The evidence cited includes word-association data, lexical substitutions in speech errors, and lexical behavior in people with certain types of aphasia (Beckwith et al. 1991). WordNet’s relational structure, then, is intended to include only those semantic relation types that are suggested by psycholinguistic data. However, the relation tokens in WordNet are the product of lexicographical research (Beckwith and Miller 1990), since only a small portion of English vocabulary has been investigated in psycholinguistic experimentation and data collection.

The basic relation in WordNet is synonymy. Within the separate part-of-speech lexicons, words are grouped into **synsets** (i.e., groups of synonyms), as would be found in a thesaurus. If a word has more than one sense, it is represented in more than one synset. The synsets are related to one another by means of other paradigmatic relations. Which relations are involved depends on the words’ part of speech, as is described in greater detail below. The WordNet group acknowledges a division between lexical relations (involving word forms and meanings) and conceptual relations (involving meanings alone) (Miller et al. 1990; Fellbaum 1998b). These distinctions can be made in WordNet by regarding relationships between synsets as conceptual relations, but relations among particular words as lexical relations. However, it is not always clear that this distinction is made (as is discussed in the case of adjectives, below). Synonymy is by default treated as a lexical relation; since the words in a synset map onto a single concept (generally speaking, at least), there cannot be a relation between concepts here. Rather, it is a relation among the words that map to that concept.

Nouns and verbs are represented in hierarchical structures, while adjectives are represented in a non-hierarchical format. These structures are due to the different relations that are represented for the three syntactic categories and to the priorities that are given to the relations in each lexicon. Nouns in WordNet are organized by hyponymy/hyperonymy, antonymy, and meronymy/holonymy (G. Miller 1990, 1998b). Hyponymy and hyperonymy serve as the basic organizing principle for nouns, since all nouns participate in some class-inclusion relation. These are considered to be conceptual relations, rather than lexical relations, relating synsets rather than words. Miller (1998b) notes that such hierarchical representation is based on a classical model of categorization, in

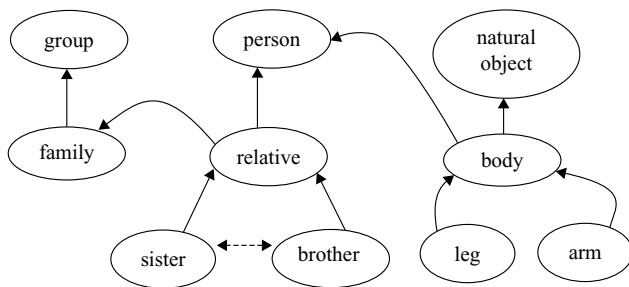


Figure 3.6 Nouns in WordNet

which the hierarchy determines that subordinate items share features with superordinate categories.²¹ Thus, this model is threatened by the prototype evidence against the classical, componential theory of meaning. However, Miller (1998b: 33) observes that “the hierarchical structure of the noun lexicon seems to fit linguistic facts despite lack of a good explanation,” and therefore suggests that prototypical representations of categories and hierarchical representation of the noun lexicon co-exist.

Since hyponymy is a hierarchical relation, the highest level of the noun lexicon consists of “unique beginners,” of which there are twenty-five in the WordNet database, including ANIMAL, COMMUNICATION, LOCATION, RELATION, and SUBSTANCE (Miller 1998b). Figure 3.6 (adapted from Miller 1990: 260) illustrates the organization of the nominal database. Straight, unbroken lines indicate hyponymy; curved lines indicate meronymy; the dashed line indicates antonymy. Arrowheads indicate the directions of relations.

Three types of meronymy are recorded in WordNet: COMPONENT-PART-OF (*leg* < *body*), MEMBER-OF (*relative* < *family*), and STUFF-THAT-WHOLE-IS-MADE-OF (*flesh* < *body*). Meronymy and antonymy are recorded on an as-needed basis – not every noun enters into a meronymy or antonymy relation.

Like nouns, verbs in WordNet are organized hierarchically, with a small number of unique beginners (Fellbaum 1990, 1998a). Verbs are generally related by several types of entailment. (These are discussed in chapter 6.) However, organizing verbs paradigmatically calls into question the psycholinguistic grounding on which WordNet is founded, since in word-association tests verbs are at least as likely to elicit syntagmatic responses as paradigmatic ones (unlike nouns and adjectives). Fellbaum (1998a) cites substitution errors (following Garrett 1992) as the basic psycholinguistic support for paradigmatic organization of the verbal lexicon. Furthermore Chaffin, Fellbaum, and Jenei (1994) tested the WordNet verb structures using word-association tests (WATs) and sorting tasks and found that where they were able to elicit paradigmatic relations, those relations

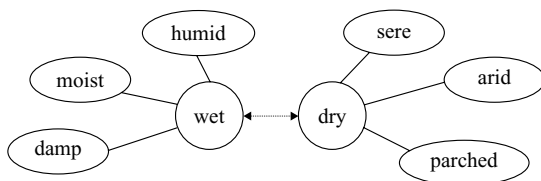


Figure 3.7 Descriptive adjectives in WordNet

followed the patterns represented in WordNet. But these supports for paradigmatic organization of verbs hide the greater evidence that verbs are syntagmatically associated. So while verbs do occur in substitution errors and WAT responses, it is also true that verbs only rarely suffer substitution errors and that verbs more frequently elicit syntagmatic responses in WATs. Thus while substitutions and WAT responses may be taken as evidence for paradigmatic relations among verbs, they do not provide very strong evidence that the verb lexicon is primarily organized by such relations.

WordNet gives different treatments for descriptive adjectives (e.g., *big*, *red*, *edible*), which refer to a property of the things they describe, and relational adjectives (e.g., *electrical*, *corporate*), which are usually derived from nouns and serve to identify subordinate classes in a category. In general, adjectival synsets are arranged in a paradigmatic network based on antonymy (Gross and Miller 1990; K. Miller 1998), but many relational adjectives do not have obvious antonyms, and so they are represented with pointers to the nouns with which they share semantic content (e.g., *dental-tooth*).

WordNet distinguishes **direct** (i.e., lexical) and **indirect** (i.e., conceptual) antonymy (Gross et al. 1989; Gross and Miller 1990), and organizes the adjectival lexicon around **focal** adjectives in synsets. For example, *wet* and *dry* are focal adjectives, related by (direct) antonymy, as illustrated in figure 3.7 (adapted from Gross and Miller 1990: 268), in which plain lines indicate synonymy and the double-headed arrow indicates antonymy.

Damp, *moist*, and *humid* are related to *wet* by synonymy links (thus they make up part of the *WET* synset), and *arid*, *sere*, and *parched* are linked to *dry* as synonyms. *Arid/humid* or *moist/dry* are then indirect antonyms because their opposition is mediated by the direct antonymy between *wet* and *dry*.

When originally conceived, WordNet was intended to represent meaning associatively (G. Miller 1998a). No definitions were to be included in the database, just relational links among words and synsets. It was thought that variations in relational links would be enough to differentiate senses within synsets and synsets from other synsets. This assumption turned out to be wrong, and explanatory glosses were added to distinguish synsets. (I have included WordNet in this section, rather than 3.3, in spite of this change.) According to Miller (1998b), if more types of semantic relations had been included in WordNet,

better differentiation of senses might have been achieved. Many (if not all) of the extra semantic relations would be subtypes of the semantic relations already included in WordNet (e.g., more types of hyponymy). Fellbaum (1998b) states the position against including more relations: that WordNet only represents those relations that are salient for speakers. Nevertheless, WordNet does not account for all salient relations. Fellbaum (1998a) acknowledges what Chaffin has termed the “tennis problem” – that psychologically salient relations, such as the relations between *racquet*, *ball*, and *net*, are not related in WordNet because they are not within the set of WordNet-approved relations. Some researchers are trying to find ways around this problem without adding more relations to WordNet – by deriving “tennis” relations through the semantic information available in the database (Morris and Hirst 1991; Al-Halimi and Kazman 1998).

In spite of the claim that WordNet is based on psycholinguistic evidence, it is difficult to determine how such evidence for relations in WordNet is vetted, since that which is cited does not seem to offer any insights not available from reading a structural semantics description of paradigmatic relations. The relation types represented are those that are well known in the linguistic literature, and, as Fellbaum noted, salient to speakers. Psycholinguistic experimentation that has supported more types of semantic relations mostly happened after WordNet was already underway, but the system has not been updated to incorporate these findings. From the WordNet literature available, it is often difficult to determine the bases on which design decisions in WordNet are made. For example, Miller (1998b) notes that Chaffin et al. (1988) identified eight types of meronymy and Iris et al. (1988) distinguished four types, but he does not indicate how it was determined that WordNet should distinguish only three types. As already mentioned, the instances of lexical relations in WordNet are gleaned from lexicographical, not psycholinguistic, sources. Because of this, some of the actual relational choices in WordNet are unlikely to represent mentally represented information, such as treating *beak* as a hyponym of *jaw* (Miller 1998b, discussed in Sampson 2000).

Another problem for WordNet is its claim that some of the represented relations are lexical rather than conceptual in nature. In the case of canonical versus non-canonical opposition (see 2.1.4, 2.3.1), we can distinguish between relations among words and relations among meanings. However, WordNet claims that certain *types* of relations are lexical and others not, rather than that certain *instances* of relatedness are lexical. This is particularly clear in the organization of the adjectival lexicon, where lexical relations are indicated through direct antonymy (among words), whereas other relations are represented as relating synsets. Broad generalizations are made, for instance, that morphologically related antonyms are automatically lexical antonyms (rather than meaning-based opposites). On this basis, *weighty* and *weightless* make the grade as lexical antonyms, but, as Sampson (2000) points out, these two words are not actually

antonyms, since they are not used to describe the same sorts of things. (*Weightless* refers to experiencing a lack of gravitational pull, as in *weightless travel*, the opposite of which is not *weighty travel*. If anything, its antonym might be *weighted* or *weightful*.)

The lexical fixedness of the antonym relation is also a problem for the same reason that fixed relations in the lexicon are problematic in any theory: in actual language use, the relations are context dependent. For instance, the WordNet model gives *wet* as the direct antonym of *dry*, but whether *wet* is the opposite of *dry* in actual language use is another matter. The opposite of *dry* is not *wet* when describing the freshness of bread, for instance. This problem is in part due to the types of evidence WordNet uses for establishing these as lexical (rather than conceptual) relations – especially word-association experiments, which occur in a “neutral” context. Miller’s use of word-association data as support for WordNet architecture is quite contrary to his earlier position on word-association results:

The stimulus-response bonds between words that seem to be demonstrated in word association tests aren’t the psychological atoms out of which all speech is built. Rather, they’re the consequence of making people use their linguistic competence in an unusual test situation. (Miller 1969: 235)

As is assumed in the above quote, the basic purpose of the mental lexicon is not to provide output for word-association tests; its purpose is to furnish words for grammatical language production and comprehension. Just because we know word oppositions (and this knowledge comes out in our test behavior) does not mean that they structure our mental lexicons. As discussed in chapter 2, such knowledge is knowledge *about* words, not *of* them. Now, it is possible to interpret WordNet as a conceptual-semantic network, in which case it would be representing the opposition of the words *wet* and *dry* as conceptual knowledge about the words, rather than knowledge in the lexicon. But WordNet’s stated goal is to represent the mental lexicon, so this interpretation is not available. Reacting to Murphy and Andrew’s (1993) experiment in which many adjectives were shown to have different antonyms depending on context (e.g., *fresh/stale bread*, *fresh/frozen vegetables*, *fresh/rotten fish*), Fellbaum et al. (1993) and K. Miller (1998) claim that such evidence does not demonstrate that antonymy cannot be hard-wired in the lexicon. Instead, they claim that adjectives have as many senses as they have antonyms. As we saw in chapter 2, however, this position is not sound. Sometimes the opposite of *sweet* is *sour* and sometimes it is *bitter*, but there is no other evidence that there are two senses of *sweet* (‘not-sour’ and ‘not-bitter’).

Another problem for the adjective lexicon in particular, which (unlike the noun and verb lexicons) has no hierarchical organization or unique beginners, is its reliance on the binary relation of antonymy as an organizing principle.

While we saw that field theory has a hard time accounting for binary antonymy within larger contrast sets (e.g., *happy/sad* in *happy/sad/angry*), WordNet has the opposite problem. Since it privileges the binary relation, it has a hard time accounting for larger contrast sets. This is clear in the WordNet account of color vocabulary. In order to present color vocabulary within an antonymic structure, WordNet 1.6 opposes the terms *chromatic* and *achromatic*, and the color names are coded as linking to *chromatic* by the similarity relation (K. Miller 1998). Thus, *chromatic* and *achromatic* become the focal words in color vocabulary. So, in order to account for the lexical relations among color terms while using binary antonymy as an organizational principle, WordNet must treat non-basic vocabulary as if it were basic.

The reliance on binary antonymy in WordNet also creates problems for focal words without antonyms, such as *angry*. In order to cope with such words, a dummy lexical item must be included in the database to fill the spot where the architecture expects an antonym for *angry* (K. Miller 1998). (This node is labeled *not-angry* in WordNet.) Even when WordNet's architecture does not force the introduction of non-word lexical items, such items are sometimes added because of the designers' intuitions. So, for example, the noun database includes an entry for *bad person* so that *offender* and *libertine* can have a common hyperonym that is not shared by words like *lover* and *worker* (Fellbaum 1998a). This is a solution that might be appropriate for a conceptual database, but including non-words in WordNet contradicts its claim to be a model of the mental *lexicon*.

To summarize, while WordNet has been claimed to be a psycholinguistic model, its architects have used psycholinguistic evidence selectively and its architecture limits it severely. Recent works on WordNet (particularly in Fellbaum 1998c) record some regret about some early choices in constructing the database, particularly the inventory of relational types. Other choices critiqued here, however, have retained support in the WordNet group. In spite of some rethinking about how WordNet should have been structured, the basic structures have not changed much since the project's inception. So while WordNet has gained steam as an electronic thesaurus and computational tool, its inventors' intention to model the mental lexicon seems to have been abandoned some time ago. Further discussion of the limitations of WordNet as a non-componential associationist model are saved for the next section.

3.4.3 *Comments on networks and associationism*

In both the meaning postulate approach and the original model for WordNet, paradigmatic relations must be explicitly stated in semantic memory, since the lack of semantic structure for lexical items makes semantic relations impossible to predict. These approaches thus fail to explain some of the phenomena that

a semantic theory is usually charged with explaining – so much so that the WordNet project was forced to abandon its position against definition. In this way, WordNet has become like the models presented in 3.3, in which lexical relations are explicitly recorded in the lexicon or semantic memory, in spite of the fact that they might be predictable from the word definitions recorded there as well. This section concerns whether lexical relations can be explicitly recorded in the lexicon and whether such records of lexical relations are needed in order to explain meaning. Thus, the discussion covers models presented in 3.3 and 3.4, since they all specify semantic relations in lexical-semantic memory.

Are lexical relations integral to the meanings of the words involved? Certainly, this notion has intuitive appeal. In fact, it is presented as uncontroversial in many linguistics textbooks. For instance, Saeed's *Semantics* (1997: 12) claims that "the semantic links between elements in the vocabulary system is an aspect of their meaning." In *Words in the Mind*, Aitchison (1987: 63) seems to use common sense in claiming that "In order to fully understand *warm*, one needs to know how it slots into the range of temperature words such as *cold*, *tepid*, *hot*. This type of information is presented as an intrinsic part of the mental lexicon."²² But as Jordaan (1993: 97) notes, "the conceptual weaknesses in these studies are at least in part the result of an assumption that the known ability of people to draw hierarchical representations in many practicable ways . . . necessarily reflects how knowledge is organized and represented." Aitchison, Saeed, and others jump to the conclusion that our abilities to think and speak about word meanings reflect the representation and organization of the mental lexicon. But (as discussed in chapter 2) in order to reflect upon and define the words, we must rely on conceptual knowledge (including knowledge *about* words). The confusion in Aitchison's statement (and similar associationist sentiments) is between the representation of meaning in the mind and the ability to define words using natural language. Certainly, it is difficult to explain what *hot* means without using other temperature words (especially its antonym, *cold*), to describe *sauté* without reference to *cooking*, *pans*, and the names of various other cooking methods and foods (Kittay and Lehrer 1992: 4), or to define *orange* without reference to *red* and *yellow* (Aitchison 1987: 63). But this is a difficulty related to *communicating* about words, not necessarily a difficulty in mentally representing them.

Relations such as contrast and similarity play roles in ways in which we acquire knowledge about new things. So, for example, if you come across a color, you can compare it to colors you have experienced before and decide to which (if any) of those categories you wish to assign the new experience. But just because the colors are related in our minds does not mean that the words for them are. The relation between the words *red* and *orange* is reducible to the relation between the concepts RED and ORANGE. The words

are related because the colors are related. Thus, the intuitive notion that word meanings depend upon each other is preservable in models of the categorization process.

A delicate balance does exist among the senses of words, and this has such effects as the prevention of complete synonymy and the typical symmetry of antonymy. However, a network like WordNet records this balance, rather than explaining it. If relations are presented as determinants of lexical meaning, then one must assume that the relations represented in such networks are arbitrary (hence lexical) information. The WordNet architects, like semantic field theorists, Cruse and Mel'čuk (in 3.3), have already granted that lexical meaning can be only partly associative, that other arbitrary semantic information is needed for lexical items. The existence of arbitrary non-relational semantic information, however, undermines the argument for arbitrary relations in the lexicon, since, given semantic information, the relations among words can be derived by relational principles.

Instead of relying on a fixed relational structure in the lexicon, pragmatic principles can be invoked to explain why and how words avoid stepping on each other's semantic toes (see the discussions of avoidance of synonymy and symmetry of antonymy in Part II). Thus, we are left with the following facts: Firstly, everyone except the strict holists (3.4.1) agrees that arbitrary, non-relational semantic information must be mentally represented. Secondly, pragmatic principles (such as Clark's [1992, 1993] Conventionality and Contrast principles, Grice's [1975] maxims of Quantity and Relevance, or Horn's [1984] Q and R principles), which are required for other linguistic and communicative purposes, are sufficient for predicting words' semantic effects on each other. Thirdly, Relation by Contrast (as presented in chapter 2) predicts semantic relations among words. These facts make the fixed mental representation of lexical-semantic relations wholly redundant. Redundancy is not necessarily a bad thing in mental representation, but hypothesizing associationist networks as linguistic knowledge (i.e., part of the mental lexicon) is still problematic.

Building a mental lexicon out of lexical relations fails to account for creativity in the use of lexical relations, or context-dependent instances of synonymy, antonymy, and the like – for example, when *blue* is the opposite of *gray* (e.g., in discussing the US Civil War) or where *Susan* is synonymous with *dry-witted* (as when friends of Susan's agree that "That remark was so Susan"). One might try to claim that we can draw a distinction between semantic relations (stored in the lexicon) and extemporaneously created pragmatic relations. In this case, we must have mechanisms for building the same types of relations in and outside the lexicon.

Johnson-Laird (1983) and Johnson-Laird, Herrmann, and Chaffin (1984) note the failure of most network theories to analyze and define the relations

that they represent. As Herrmann, Chaffin, and others have shown (see 3.5), distinctions and connections among semantic relations have consequences for categorization and memory tasks. So, since WordNet represents relations as simple labeled links among words or synsets, it does not represent that some relations (e.g., synonymy and hyponymy) are more similar to each other than to others, nor that all instances of (for example) antonymy are not equally antonymous. While MTT allows for complex lexical functions built out of others, it does not (for example) represent antonymy, converseness, and contrast as similar types of relations. Johnson-Laird et al. are confident that networks could be modified to represent the underlying semantics of relations, but this has not happened so far.

Johnson-Laird et al. (1984) are particularly critical of network theories' failure to explain how reference is achieved. They argue that "[t]he meanings of words can only be properly connected to each other if they are properly connected to the world" (1984: 313). Intensional networks alone cannot allow for the pragmatic aspects of language use and understanding. In sentence processing, ambiguous words cannot be disambiguated without knowledge of the extensions of other words in the utterance. Anomalous uses of words (e.g., metonymic uses such as calling a deli customer *the ham sandwich at table 5*) cannot be retrieved through an intensional network alone. Contrary to the WordNet approach, Johnson-Laird et al. argue that there is "no need to invoke vast sets of meanings for words, but there is a need for access to extensions" (1984: 309). If we are being realistic about the amount of variability and creativity in natural language use, then invoking vast sets of words to account for relational variability is a pointless exercise anyhow – the set of words could not possibly be vast enough. If the problems of ambiguity, creativity, and variability in semantic relations are instead solved through access to words' extensions, then the problems become non-problems, since access to extensions is needed in the first place for actual language use (as opposed to the idealized language models in network theories). It is no coincidence that semantic networks are popular computational approaches to the lexicon. The lack of extensional information accompanies the computer's lack of referential ability (or its lack of a need to have such an ability). To be fair, the componential models of meaning in section 3.2 are also models of intensional meaning, and do not give any explicit account of how meaning-to-world mappings are made. However, semantic theories that present definitions or prototypes are closer to solving the problem – since by comparing a thing in the world to a set of necessary and sufficient conditions (or core and peripheral features, or an ideal exemplar), one should be able to determine whether that thing deserves a particular name.

To conclude, the holistic network approaches are antithetical to the metalexical approach presented in chapter 2. There is merit to the holist position that meanings within a system are only meaningful in relation to each other, but the

same insights are better achieved if word meanings affect the development and application of other meanings through pragmatic principles.

3.5 The conceptual status of lexical relations

So far, this chapter has concerned the roles that lexical relations play in models of lexical meaning, semantic memory, or language processing. In most such approaches, lexical relations are treated as “theoretical primitives” (Chaffin 1992: 253). But the goal in this book is to look deeper into those relations and see how the relations themselves (not just instances of a relation among two words) are mentally represented. In chapter 2, I have argued that lexical relation types can be described as a set of constraints on a general relational principle (RC). We could also describe a relational type as the set of all word sets that match such constraints.

The approaches in the next two subsections ask what kind of conceptual reality semantic relations have. In 3.5.1, the approach is componential – relations are built up out of relational components (Chaffin and Herrmann 1984, 1987; Chaffin 1992). In 3.5.2, the approach is prototype driven – relations are based on an abstract, idealized example (Cruse 1994). For each of these approaches, we must ask the following questions:

Does it account for the full range of relation types?

Is the number of relation types fixed or mutable?

Are the theorized boundaries between relation categories supported by observation and/or experimentation?

3.5.1 *Relation elements*

Chaffin, Herrmann, and colleagues argue that semantic relations are composed of **relation elements** (Stasio et al. 1985; Chaffin and Herrmann 1987; Chaffin 1992) that can be recombined to create different semantic relations. They compare this position to two other hypotheses. The **specific marker hypothesis** holds that there are as many different types of relational links in semantic memory as there are possible relations. The **family marker hypothesis** holds that each relation in semantic memory is labeled with one of a small number of general labels, such as the general types of relation we have seen in models in the previous sections (the *'nys*). Such a system differentiates between, say, contrast relations and meronymy relations, but not between subtypes within these categories, like gradable contraries, directional antonyms, and contradictories in the contrast category. Chaffin and Herrmann’s **relation element hypothesis** distinguishes many more types of relations, while preserving the notion that some specific relations (such as converseness and contradiction) belong together in general categories. While MTT (see 3.3.3) treats some relations as

componential, Chaffin and Herrmann's work decomposes relations into much more primitive primitives.

Chaffin and Herrmann investigated relational elements by asking people to sort examples of related word pairs, making groups of pairs that were similarly related. For example, given *hot-cold*, *dress-frock*, and *sofa-chair*, a subject might sort *sofa-chair* with *hot-cold*, if they perceive both to be contrast relations, but if they think *sofa-chair* exemplifies a similarity relation, they will sort it with *dress-frock*. Having identified thirty-one types of relations in the semantic relations literature, Chaffin and Herrmann (1984) used the sorting task results to put these relations into a tree diagram, indicating the degree to which subjects felt the relations must be distinguished. An a priori analysis of these thirty-one relations divided them into five families: contrast (including antonymy), similarity (including synonymy), class inclusion (including hyponymy), part-whole (meronymy), and case relations (such as agent/instrument and agent/action). The sorting task demonstrated more levels of distinction, both above and below the five-way distinction of the a priori analysis. At the highest level is a general distinction between **contrasting** relations (including antonyms, incompatible terms, and **attribute similars** – e.g., *rake/fork*) and **non-contrasting** relations. The non-contrasting relations divided into what Chaffin and Herrmann called **logical** and **pragmatic** relations. The logical relations include synonymy and class inclusion, and the pragmatic relations include several types of meronymy and case relations. Both the logical and pragmatic categories are further subdivided into inclusion (hyponymy, meronymy) and non-inclusion (synonymy, case relation) categories. Below these, further distinctions are made until there are thirty-one branches to the tree.

Using the hierarchy obtained through the sorting task, Stasio, Herrmann, and Chaffin (1985) proposed a set of relation elements that effectively distinguish among the thirty-one relation types. Their relation elements are not particularly economical for this task, however. In order to distinguish thirty-one relations, Stasio et al. have proposed thirty relation elements. Rather than reproducing all of the elements and relation types here, the discussion below is focused on the subtypes of contrast and part-whole relations. The relations that are relevant to these two relational categories are listed in the appendix, but some are introduced as needed in the discussion below.

The thirty relation elements are meant to classify and distinguish the different types of relations. For instance, contrastive relations utilize **Dim** (Dimension) and **BiP** (Bilateral Position), that is, they bilaterally divide a dimension. Of the non-contrastive relations, the logical relations (similarity and class inclusion) all involve **Int** (Intersection). They are subdivided into the inclusive and non-inclusive relations by **Inc** (Inclusion), which also distinguishes the inclusive pragmatic relation of meronymy from its non-inclusive pragmatic counterpart, case relations. The five case relations discussed in the literature are distinguished

Table 3.1 *Contrast relation elements* (Chaffin and Herrmann 1987)

Relation	Relation Elements	Examples
Pseudo-antonyms	DIM (BIP, Con)	<i>popular/shy, believe/deny</i>
Contradictory	DIM (BIP (Sym), Dich)	<i>alive/dead, male/female</i>
Contrary	DIM (BIP (Sym), Cont)	<i>old/young, smooth/rough</i>
Directional	DIM (BIP, Dich, Spa)	<i>front/back, left/right</i>
Reverse	DIM (BIP, Dich, Vec)	<i>buy/sell, attack/defend</i>
Asymmetric Contrary	DIM (BIP, Cont)	<i>hot/cool, large/tiny</i>
Incompatible	DIM (BIP)	<i>frank/hypocritical, happy/morbid</i>
Attribute Similarity	INT (Over (Att, Dis))	<i>rake-fork, valley-gutter</i>

Table 3.2 *Part-whole relation elements* (Chaffin and Herrmann 1987)

Relation	Relation Elements	Examples
Measure	INC (PARTIVE (Attach, Comp, Prop, Poss))	<i>mile>yard, hour>minute</i>
Ingredient	INC (PARTIVE (Comp, Prop, Poss, Loc))	<i>pizza>cheese, table>wood</i>
Collection	INC (PARTIVE (Homo, Prop, Poss))	<i>forest>tree, fleet>ship</i>
Group	INC (PARTIVE (Homo, Prop, Poss, Soc))	<i>choir>singer, faculty>professor</i>
Functional location	INC (PARTIVE (Attach, Comp, Prop, Poss))	<i>kitchen>stove, house>kitchen</i>
Functional object	INC (PARTIVE (Attach, Comp, Prop, Poss))	<i>car>engine, tree>leaf</i>
Organization	INC (PARTIVE (Attach, Comp, Prop, Poss, Soc))	<i>army>supply corps, college>bursar's office</i>

using **Evt** (Event) and four elements that indicate the various participants in the event. None of these event elements is used in any of the other types of relation, so case relations appear to be a system unto themselves.²³ Relation element analyses of the contrast and part-whole relations are given in tables 3.1 and 3.2. The elements that mark the relations as members of a larger class of relations are given in capital letters (following Chaffin and Herrmann 1987). Chaffin and Herrmann 1987 (improving on Stasio et al. 1985) treat some elements as subordinate to others, as indicated by the bracketing in the tables. So in table 3.1, for example, **BiP** modifies the **Dim** element (bilateral positioning on a dimension) and **Sym** (Symmetrical position) modifies **BiP** (the bilateral positioning is symmetrical). (See the appendix for more detail on the relation elements used in tables 3.1 and 3.2.)

Clearly, attribute similarity is the odd relation out in table 3.1. It is included as a contrast relation (Chaffin and Herrmann 1987; Stasio et al. 1985) because it was sorted together with the contrasting relations by the subjects in Chaffin and Herrmann's 1984 study. But both Chaffin and Herrmann's a priori analysis and the relation element analysis treat attribute similarity as a non-contrasting relation, headed by the **Int** relation, which also heads similarity and class-inclusion relations. So, while Chaffin and Herrmann have relied on the sorting task as evidence for relational elements, some of the specific evidence that could be used to promote particular relational families has been ignored. While the sorting task places attribute similarity in the contrasting family, the relation element analysis makes it a sister to other similarity relations, like synonymy and its closest relative (elementally speaking), necessary attribution (**INT (Over (Att, Poss))**). Like the contrasting family in table 3.1, the class-inclusion and similarity families each include a single odd member that does not fit the family's relation element profile. Thus three points of disagreement arise between Chaffin and Herrmann's (1984) sorting task results and the relation elements inspired by those results.

Table 3.2 shows that not all relations are differentiated through the relation element analyses in Stasio et al. (1985) and Chaffin and Herrmann (1987). While Chaffin and Herrmann (1984) distinguish between functional-object and functional-location relations, the relation element analyses for these two are synonymous. While this would seem to argue that the a priori distinction between functional object and functional location was unnecessary, the failure to distinguish these runs counter to the sorting task results in Chaffin and Herrmann (1984). The subjects in that task not only distinguished between functional-object and functional-location relations, they judged them as not particularly related to each other. Functional-location was judged to be most similar to the organization relation, and functional-object was grouped with the collection and group relations. Functional-object and functional-location are not the only synonymous relations in the relation element analysis. Chaffin and Herrmann (1984, 1987) distinguish five types of subordination in the class inclusion family: perceptual (*animal > horse*), functional (*furniture > chair*), state (*emotion > fear*), activity (*game > chess*), and geographical (*country > Russia*). All five are analyzed as **INT (INC (UNIL))**.²⁴ That is, these relations involve Intersection (semantic inclusion) of the general Inclusion type, in which the inclusion relation is Unilateral (i.e., not mutually inclusive). No other elements are used to differentiate these five relations, although they were hierarchically distinguished in the sorting task.

Tables 3.1 and 3.2 show two ways in which the relation element analysis deviates from the sorting task evidence. In the first case, the sorting task results placed some relations in different relational families than Chaffin and Herrmann's a priori analysis. In the second case, the relation element analysis

has differentiated fewer relation types than the semantic literature or the sorting task. This raises the question of whether these particular analyses are empirically justified.

In some cases, the researchers are justified in ignoring their own results, since closer scrutiny reveals the weaknesses of the sorting task as a basis for the elemental analysis. Chaffin and Herrmann's (1984) sorting task results are valuable in that they demonstrate that people can make far finer distinctions in relation types than is evident in the *-nym* names we give to them. This means that most of the treatments of lexical relations discussed in this chapter are not half as sophisticated in differentiating relation types as naïve language users are. Chaffin and Herrmann (1984) claim that the sorting task results show that people naturally sort word pairs according to relational similarity, rather than by the semantic or form-class similarity among the items in the pairs, but they acknowledge one exception to this. The meronymic place relation (*Asia* > *China*) was sorted by subjects with the hyponymic geographical subordination relation (*country* > *China*), indicating use of semantic rather than relational cues in the sorting task. However this acknowledged exception is not the only evident case of non-relational sorting in their results. Subjects sorted the action subordinate relation with the similarity relations, but Chaffin and Herrmann analyzed it as a class inclusion **INT (INC (UNIL))** relation. Action subordination, as presented in Chaffin and Herrmann (1984), is verb hyponymy: *cook* > *fry*, *clean* > *scrub*, *talk* > *lecture*. All of the other class-inclusion relations, on the other hand, involved nouns. The subjects in the sorting experiment seem to have been affected by form class similarity, since instead of recognizing action subordination as a type of class inclusion, they sorted it into the only non-contrasting family that also included many verbs.²⁵

While in some cases the relational element theorists were justified in overruling the sorting results (because the subjects seem to have been distracted by meaning or part of speech), in other cases, they ignore the results without justification. In particular, Stasio et al. (1985) missed out on the insight provided by their subjects regarding attribute similars (*rake-fork*, *painting-movie*). The subjects classified it as a contrast relation, but Stasio et al., apparently misled by the name they gave to the relation, analyze it as a subtype of similarity. It is not surprising that the subjects considered this a contrasting relation, since all contrast relations are based on some level of similarity (dimensional similarity, among others, in Stasio et al.'s analysis) and since the members of these pairs are incompatible (a thing cannot be a movie and a painting at the same time). Since Stasio et al. (and later Chaffin and Herrmann 1987) ignored this information in favor of their a priori analysis, it is hard to accept the claim that the relation element analyses are psycholinguistically motivated.

What about the identically analyzed relations, then? Is it a problem that as many as five of the thirty-one identified relation types have been analyzed into

the same relational components? The answer is no, it is not a problem, because it again looks like the subjects in the sorting task – and the researchers – were guided by semantic similarities across the word pairs, rather than by relational similarities. Functional object and functional location (both [INC [PARTIVE [Attach, Comp, Prop, Poss]]]) are not different relations; they are the same relation applied to things that have objects as parts and things that have places as parts. The idea that they are different relations comes from the comparison of object-parts and location-parts in a single entity. *Window* is a functional object for *house*, and *kitchen* is a functional location for *house*. So, a house can be divided into different kinds of parts, and so some would argue that this indicates subtypes of meronymy. But in other examples, the two types cannot be distinguished. For example, *car*>*trunk* (or UK *boot*) could arguably be either a case of functional object or functional location.

To avoid needing as many different meronymy relations as different things with parts, we can take a meaning-oriented approach, rather than a relation-oriented one. In the relation-oriented approach, we would have as many different relations as we have different things with parts. The relations would fit to the meanings. But in a meaning-oriented approach, the meanings fit to the relations. A general functional-parts relation is applied to a thing with physical parts or to a thing with spatial parts. The relation is the same, but it can be applied to different kinds of things. Similarly, in hyponymy, for which Stasio et al. (1985) have posited five feature-identical relations, we have a case of the same relation being perceived as different because different meanings are involved. Geographical subordination (*country*>*China*) is not a different kind of relation than perceptual subordination (*animal*>*horse*), it is just the application of the same relation to different sets of meanings.

In fact, Stasio et al. could have gone further in grouping together some of the relation types and thereby would have reduced the number of needed relation elements. For example, the collection (*forest*>*tree*) and functional-object (*car*>*engine*) relations respectively differ from the group (*choir*>*singer*) and organization (*army*>*supply corps*) relations by only the addition of the **Soc** (Social) element in the latter pair. This reflects that the group and organization relations are not truly different relations than the others; they are applications of the collection and functional object relations to social entities like choirs and armies. Thus, the **Soc** element is misplaced in the realm of relational elements; it is a feature of the meanings themselves, not of the relation between them.

Other elements proposed by Stasio et al. (1985) are of questionable value. If the point of a relation element theory is to show that similarities among relations are caused by their sharing certain elements, then it does not help the theory to propose a number of elements that are not shared among the relations. While the original goal was to define thirty-one relations, Stasio et al. have reduced this number to twenty-five by treating some of the relations as identical. So,

we have thirty relation elements to define twenty-five relations (or twenty-nine elements and twenty-three relations, if we drop **Soc** as recommended above). Five of the elements are used in only one relation (if we define *relation* as a particular configuration of relation elements). In many cases, the number of elements might be reduced by changing univalent elements to bivalent features (e.g., Unilateral Position/Bilateral Position, Unilateral Inclusion/Bilateral Inclusion) or by making some of the elements less relation specific. For example, the **Spa** (Spatial opposition) and **Loc** (Locative inclusion) elements both indicate that a relation is spatially oriented. Since the other elements associated with the relation indicate whether it is an opposition or inclusion relation, the additional information of spatial *opposition* or locative *inclusion* is redundantly included in the definitions of these elements. Then again, it might be just as well to do away with the spatial/locative elements altogether, since they do seem to repeat information that is evident in the words' meanings. So, *front/back* is a "directional" opposition because it opposes directional words, not because a **Spa** element is needed to distinguish it from "non-directional" opposition.

The criticisms above all relate to the particular relational elements and relations proposed by Stasio et al. (1985). Chaffin and Herrmann (1987: 229) acknowledge that their set of thirty relations is "not a definitive set," but it serves to demonstrate that it is feasible to decompose semantic relations into relational elements. Chaffin and Herrmann (1984) argue that relational decomposition can encompass the full variety of relations in semantic memory. Stored relations can be represented as bundles of links between words in memory, with each link indicating a different element of the relation, while new relations can be generated using the same or different combinations of relational elements. This second point is one that Chaffin and Herrmann have not exploited, but, if proved, it would offer substantive evidence for relational elements. Testing it would involve starting with a workable set of relation elements and determining whether new configurations of the elements could be devised that would predict relations other than the thirty-one cited by Chaffin and Herrmann. In Stasio et al., for example, contraries and contradictories differ by just one element (**Cont/Dich**), and both include **Sym**. Removing **Sym** from the contrary relation gives the asymmetrical contrary. If **Sym** is removed from the contradictory relation, we should be left with an asymmetrical contradictory relation. Now the question is whether any such relation is found in language use. If yes, then the system is shown to have predictive power. If not, then we are faced with three possibilities: (a) the existing analysis of contraries and contradictories is wrong, (b) relation elements do not have predictive power, and therefore the theory is of questionable utility, or (c) there are constraints on the combination of relational elements that have yet to be determined.

Chaffin and Herrmann (1987) found further support for relational decomposition in other experiments. Judging analogies, like sorting relational pairs,

Table 3.3 *Semantic Relations Test results* (Chaffin and Herrmann 1987: 239)

Word Pairs		Family markers	Specific markers
Condition 1: Heterogeneous set; family and specific components match			
Target	Inside : Outside	Contrast	Directional
Choices	Hammer : Nail	Case	Instrument
	Up : Down	Contrast	Directional
	Wheel : Bike	Part – whole	Functional
Condition 2: Heterogeneous set; family components match			
Target	Top : Bottom	Contrast	Directional
Choices	Office : Desk	Part – whole	Locational
	Vegetable : Apple	Class inclusion	Collateral
	Life : Death	Contrast	Contradictory
Condition 3: Homogeneous set; specific components match			
Target	Front : Back	Contrast	Directional
Choices	Entrance : Exit	Contrast	Directional
	Absence : Presence	Contrast	Contradictory
	Poverty : Wealth	Contrast	Contrary

requires language users to determine the extent to which two word pairs are similarly related. Ross, Herrmann, Vaughan, and Chaffin (1987) devised an analogy test (termed the “Semantic Relations Test”), in which subjects were given one relational pair as a target and asked to judge which of four other pairs had the most similar relation. The choices, as shown in table 3.3 either belong to the same family, in which case ability to match exact subtypes was assessed (e.g., contrary vs. directional), or to different families, in which case the ability to recognize and match relational families was assessed. If the specific marker hypothesis is correct, then subjects should do equally well in matching relational subtypes, whether or not the other choices include members of the same family. If the family marker hypothesis is correct, then subjects should reliably distinguish between contrasts and class-inclusion relations, but not between contraries and contradictories. If the relation element hypothesis is correct, then subjects should be able to select the predicted analogy in each of the tasks (the bold choices in table 3.3). The results, reported in Chaffin and Herrmann (1987), varied a great deal across the relational families. Subjects were poor at distinguishing between subtypes of the contrast family (contrary, contradictory, and directional antonyms), performing at only 35% accuracy, but very good at distinguishing subtypes of class inclusion (superordinate, coordinate, and collateral), answering more than 85% of the items correctly. Chaffin and Herrmann

(1987) note that subjects perform much better at antonym differentiation when given explicit instruction on the matter. But since results for the other four relation families support the relation element hypothesis, Chaffin and Herrmann (1987: 242) conclude that “knowledge of the specific component of contrast relations is lacking in the Hamilton College undergraduate population” (where the experiment was conducted) and that the relation element hypothesis is correct. Considering that the types of contrast relation are far more established in the semantic literature than the types of other paradigmatic relations, this result is somewhat surprising, and may point again to a failure to distinguish between types of relations and types of words in relations. In this case, contraries and contradictories are not different relations, they are examples of the same contrast relation in which the words have gradable or absolute meanings, respectively. (See chapter 5.)

Glucksberg (1987) argues against the relation element hypothesis, since it assumes that relations among words are represented in semantic memory, while they might instead be computed, rather than stored (McCloskey and Glucksberg 1979). While Glucksberg’s position is more in line with the principle-based approach to semantic relations in chapter 2, the relation element treatment cannot be totally ignored, since it may contribute to a discussion of stored (canonical) relations. However, it is less than clear that precise differentiation of relation types is necessary for representation of canonical relations. Lexically speaking, most (if not all) canonical relations are examples of antonymy or contrast – that is, the one relation family for which Ross et al.’s (1987) subjects could not distinguish subtypes in the analogy test. This indicates that such canonical antonym pairs are perceived as opposites, and not specifically as contraries, contradictories, and the like.

The decompositional approach of relation element theory could suggest componential meaning for words like *antonym* and *synonym*. However, it is unlikely that such componential meanings of these terms are used outside of the technical discussions of lexical semantics.

In the end, it seems that the same information that is presented in relation elements can be treated instead as different instantiations of the relational principle Relation by Contrast. For example, symmetrical (*hot/cold*) and asymmetrical (*hot/cool*) opposition are both **DIM (BIP, Cont)** in the relation element theory, but the former also includes the element **Sym**. In the derivational account provided in chapter 2, they are similar to each other in that they are both antonymic instantiations of Relation by Contrast, thus the members of each pair are expected to be as similar as is relevant to the situation, with one relevant difference: incompatible denotation. The symmetrical and asymmetrical pairs differ in the amount of information that is considered relevant to the antonym decision; in the symmetrical case, the two words are similar in more ways than the asymmetrical pair. The asymmetrical pair is thus an example of antonymy

in only those cases where symmetry is deemed irrelevant. So, while Chaffin, Herrmann, and colleagues have shown that relations are complex, they have not proved that relations are stored as bundles of relational links, as they have proposed.

3.5.2 *Relations as prototypes*

Cruse (1994) recognizes a number of problems with the usual logical definitions of lexical relations, in which relations are defined in terms of the entailments or contradictions they engender. First, language users accept as synonyms or antonyms word pairs that do not necessarily fulfill the logical criteria for synonymy or antonymy. This can be seen in thesauri or dictionaries of synonyms. For example, the *American Heritage Dictionary* (4th ed.) entry for *rural* ends with a paragraph entitled “synonyms.” After listing *rural*, *bucolic*, *rustic*, and *pastoral* as synonyms, it goes on to differentiate between the four terms: *rustic* “suggests a lack of sophistication,” *pastoral* “suggests the charm and serenity of the countryside,” and so forth. If we take these differences seriously, *rustic* and *pastoral* fail the mutual entailment test for synonyms; yet they are exactly the types of things that we expect a dictionary to provide as synonyms. Cruse also points out that in analogy tasks, subjects naturally perceive *dog*>*pet* as the same type of relation as *apple*>*fruit*, although the latter is an entailment relation and the former is not. In common examples of the hyponymy relation, we also find examples that are not transitive, as in (19), again contradicting the logical definition of hyponymy (Cruse 1994: 174).

- (19) a. A hang-glider is a glider.
 b. A glider is an airplane.
 c. ? A hang-glider is an airplane.

Another problem for logical definitions is that they cannot account for the differences between “good” and “bad” exemplars of particular relation types (as discussed in 2.1.4). Repeating Cruse’s example, *stallion*>*horse*, *spaniel*>*animal*, and *horse*>*animal* are all logical hyponyms, but the last one is usually considered to be a better example of hyponymy than the first two.

These criticisms of logical definitions naturally extend to relation element definitions of relations as well, since in either case a word pair is linked by a particular relation, or it is not. To get around these problems, Cruse proposes that relations are defined by prototype, rather than by the necessary and sufficient conditions of logical and decompositional approaches.

One means for prototype representations of relation types is defining the relations componentially, but treating the features as probable features of a relation type, rather than necessary and sufficient ones. The more of these features that a word pair has, the more likely that they are categorized as members of

a relational type. The pairs that have the most of these features are the best examples. So, for example, opposites (antonyms) are prototypically (a) diametrically opposed, (b) binary, (c) exhaustive of the superordinate domain, and (d) symmetrical. Furthermore, good lexical opposites should belong to the same register. But Cruse observes that this solution is faulty. If having more of the prototypical features is the criterion for being a member of a relational category, then it is possible that a pair of words could be considered to be antonyms if they had many of the features of antonymy but lacked diametrical opposition. So, for example, a binary exhaustive set of synonyms (say, *deep-fry*=*French-fry* in US English) would be judged as antonymous as a diametrically opposed pair that do not exhaust the superordinate domain (e.g., *sweet/sour*) because they both have three features of antonymy. To get around this problem, Cruse proposes that for each relation there is some core feature or set of features that is a necessary condition for membership in that relation type, but that other features contribute to making the word pair a “better” or “worse” exemplar. While this view of prototypes seems like that proposed by Osherson and Smith (1982) (and other core-periphery proponents; see 3.1.4), Cruse argues that the core definition cannot be an all-or-none logical definition. Instead, he supposes that the core of a relational concept might be an image schema, as pursued in the Cognitive Linguistics tradition (Lakoff 1990). Cruse does not, however, illustrate the image schemata for lexical relations.

As discussed in 2.1.4, prototype effects are evident in lexical relation categories. Since it is possible to treat prototypes as lists of probable (or core and probable) features, prototype and decompositional approaches to lexical relations are not mutually exclusive. The principle-based account advocated in chapter 2 offers a means to conceptualize the prototype organization for these lexical relations. As noted there, particular lexical relation types are identified by the property that must differ in the related words; all other properties are assumed to be the same in all members of a related pair (or larger set). So, for example, synonymous words differ in form, but are assumed to be the same in other respects for the purpose at hand. The core way in which they must be similar is semantically (since this is a semantic relation). But similarity is only necessary to a relevant degree. For a particular word pair in a particular situation, some aspects of the words (certain semantic features, certain senses, their registers) might be deemed irrelevant. In a prototypical example of a relational type, all aspects of the words are relevant. So, for example, *couch*=*sofa* is a better synonym pair than *rustic*=*pastoral*, and symmetrical antonym pairs (*hot/cold*) are more prototypical than asymmetrical ones (*hot/cool*). Thus, the prototype effects seen in semantic relations can be accounted for by Relation by Contrast. It is possible that an image schema approach could account for the same phenomena equally well, but without a specific proposal, it is not clear that it can.

3.6 Summary and next steps

This chapter has only skimmed the surface of the literature and ideas available on semantic relations. In 3.1 we saw a wide range of disciplinary interests in and approaches to semantic relations, some of which overlap considerably. In 3.2 through 3.4, three general ways of thinking about semantic relations were identified: (a) relations are predicted by mentally represented word meanings, or (b) relations are represented alongside mentally represented word meanings, or (c) relations exist in the absence of mentally represented word meanings. The middle way, representing both meanings and relations, is less often presented as a psycholinguistic approach than the other two. I have argued that in mixed associationist-componentialist approaches (in 3.3) the relational information is redundant, thereby flouting the tenet that the lexicon should only contain arbitrary information. Such approaches also cannot account for the full range of semantic relations phenomena, since they do not indicate how context-dependent relations arise, nor how lexically represented canonical relations are overruled in order to allow for such context-dependent relations.

Among those who more actively argue about the nature of meaning and mind, the componentialist or holist approaches are more common. The holist approach, while represented in some European structural linguistics (following Saussure), has tended to be the realm of philosophers, rather than linguists. It depends on the notion that word meanings cannot be broken down into components, and thus holds that relations among words are arbitrary. Unlike the mixed associationist approaches, the semantic relations information is not redundantly represented in the mind, since those relations cannot be derived from atomic meanings. However, as in the mixed associationist approaches, the variability of semantic relations can only be accounted for if all possible relations among words are represented mentally and there is some mechanism for choosing among them in a particular context. As WordNet demonstrates, this involves having as many different lexical entries for words as contrasting semantic relations values. In other words, because *dry* and *blue* each have several different antonyms, there must be several different *dry* and *blue* semantic atoms, each of which is in a set of semantic relations that is incompatible with the others. The amount of variability in such relations makes this unlikely, and it also does not answer the question of how such relations are acquired.

The componentialist approaches are more common in linguistics and psychology (especially if we take *componentialist* to refer broadly to any approach that holds that meanings can be analyzed). They hold that meanings are represented non-atomically in the mind – that meanings are distinguishable because each non-synonymous meaning is composed of a different arrangement of semantic information at a sub-lexical level. The metalexical approach to lexical relations (chapter 2) is consistent with the componential approach to semantic

relations, in that componential analyses allow for judgments of minimal difference, as required by Relation by Contrast. However, componential approaches relate mentally represented semantic information, and this is not sufficient for predicting all relations (since non-semantic information can be involved), nor does it account for phenomena like relation canonicity. So, while componential analysis can contribute insights into the semantic aspects of lexical relations, it can only account for the relation of analyzable word-senses, not for the relation of words *qua* words.

So far, I have been rather vague about what concepts are, while claiming that lexical relations relate concepts of words. The vagueness is purposeful: it is not my intention to be particularly explicit about how concepts are mentally stored, but rather to point out that any theory of concepts must allow for concepts of words and that the theory must allow for concepts to be associated by Relation by Contrast, as described in chapter 2. Since those principles rely on the concept of minimal difference, they are straightforwardly integrated with a classical theory of conceptualization, in which categories have boundaries and members of a single category share some number of componential features. In this case, minimal difference concerns the sameness and difference of these features – and discovery of relations among concepts then leads to hypotheses about what features are necessary to distinguish those categories. A prototype-based account of categorization might at first glance seem to make minimal difference among categories more difficult to calculate. But in the final analysis, any theory that allows for fuzzy concepts should also allow for fuzzy relations, and as the discussion in chapter 2 made clear, relations are not so clear cut as classical theories would have it. But while classical theories of categorization and word meaning are too rigid to allow for the full range of relational and categorical phenomena, clearly we are aware of features of categories in determining relations among them. Thus, categories are analyzable; they are not unanalyzable wholes. The notion of relevance in the Relation by Contrast principle allows for the analysis of items in a semantic relation to be biased by the contextual motivations for that relation.

I have also been vague about what word meanings are, because I believe that the metalexical approach to relations is compatible with a wide range of views on this subject. This issue is discussed in chapter 7. Before that, Part II investigates the major relations: synonymy, antonymy, and hyponymy and meronymy. These chapters provide the details that were glossed over in the previous chapters' general discussion of semantic relations. These details include phenomena, issues, and analyses that are specific to particular relations, and in-depth discussion of the metalexical treatment of these relations.

Part II

Paradigmatic relations, specifically

4 Synonymy and similarity

The rovers will be exact duplicates, but that's where the similarities end.

“NASA plans to send rover twins to Mars in 2003,”

NASA press release, 10 August 2000

Similarity of meaning is “the most important lexical relation” in the WordNet model (Miller and Fellbaum 1991: 202), and, in philosophy, Quine (1961: 22) has identified synonymy (along with analyticity) as “the primary business of the theory of meaning.” This relation raises issues of similarity that remain relevant in the following chapters. In addition, it presents an interesting challenge for the metalexical approach: Can synonymy, a relation among words with *similar* meanings, be defined in terms of *contrast*?

Section 4.1 starts the chapter with a description of synonymy in the metalexical approach. This involves a restatement of Relation by Contrast in order to apply it specifically to word sets that differ in form but are otherwise similar enough to be synonyms. Here the ideas presented in chapter 2 are further developed with reference to the notions of ‘similarity’ and ‘difference.’ The next two sections cover the key concepts in synonym studies, so that they can be reinterpreted from the metalexical perspective. Subtypes and degrees of synonymy are examined in 4.2. While some approaches attempt to reduce the number of relations that can count as synonymy, the approach taken here is inclusive. Section 4.3 reviews alleged (logical or traditional) properties of synonymy, such as transitivity and interchangeability, and some evidence against them. Section 4.4 concerns pragmatic forces working for and against the proliferation of synonyms. In 4.5, the relation of synonymy to other semantic relations is considered. Section 4.6 summarizes the chapter, which concludes that any two words are potential synonyms, but that pragmatic forces ensure that synonyms are particularly similar in meaning and usage.

4.1 A pragmatic approach to synonymy

The metalexical approach allows speakers to know synonyms by two means: either derived via the Relation by Contrast (RC) principle, or as a fixed bit of information that is part of the conceptual representation of a word. These two

types of knowing are discussed in subsections 4.1.1 and 4.1.2, respectively. In both cases, the relation is metalinguistic in nature – a relation between our conceptualizations of words, rather than between their lexical entries. The notion of similarity is discussed further in 4.1.3, which considers the problem of how similar two words must be in order to count as similar enough for synonymy. Finally, in 4.1.4 the notions of similarity and difference are contrasted in order to argue that synonymy should be defined in terms of difference in form, rather than similarity of meaning.

4.1.1 *Defining and deriving synonym relations*

Synonymy differs from the other relations discussed in this book because it is usually defined by specifying what is similar among the words, rather than what is different. Using RC to account for synonymy means treating it as a relation of difference – that is, minimal relevant difference. As defined in chapter 2, RC holds that the members of a relational set have all the same contextually relevant properties but one. In the case of synonymy, the property that differs is form. Other properties of potentially synonymous words may or may not fall into the category of “contextually relevant properties” and thus may or may not be similar. How does RC assure that the appropriate properties (e.g., meaning) are the same? The short answer is that no such thing is assured, but the long answer is that synonyms have the same meaning because similarity among meanings is the most *relevant* way in which words can be similar. Starting with the short answer, RC makes no claims about what is similar among the items in a relational set. The formula in (1) provides the RC definition of synonymy, which works as a categorization principle for synonym sets.

(1) **Relation by Contrast – Synonymy (RC-S)**

A synonym set includes only word-concepts that have all the same contextually relevant properties, but differ in form.

Thus synonymy relies on our knowledge *about* words – if part of what we know about two words is that they have different forms, then they are potential synonyms. RC-S does not mention that the relevant contextual properties must include at least one of the words’ senses. The metalinguistic relations defined by RC-S include words that are similar in meaning just because if two words differ *only* in their form, then it follows that they are similar in their semantic content. RC-S as stated in (1) is not the only means of deriving all the relational sets that are referred to as *synonyms*. Particular subtypes of synonymy can be derived through other variants on RC, as described in 4.2.3.

The RC-S definition of synonymy is employed in the production and comprehension of synonym relations. Deriving synonym relations involves two stages: generating synonym candidates and evaluating the candidates. RC-S provides the evaluation mechanism. Janssen, de Boeck, and vander Steene (1996) have

shown that ability in the generation task correlates with verbal fluency, while ability in the evaluation task is related to language comprehension ability. Thus, both production and comprehension of language are relevant to synonym generation.

Similarly, judging whether two words are synonyms involves a two-stage process: identifying the words (linguistic) and evaluating their similarities (metalinguistic). Hirshman and Master (1997) found that semantic relatedness among stimulus words aids the identification process (through semantic priming), but slows the evaluation process. In other words, if two words have semantic properties in common, it takes longer to determine whether they fit the criteria for synonymy. This fits with the RC approach, since semantically different items can be immediately discounted as synonyms, since they obviously fail the requirement that synonyms differ only in form, but more similar items require more consideration, as one must look deeper for differences and then consider whether they are contextually relevant.

Section 4.1.4 returns to the issue of whether synonymy can effectively be defined without specifying sameness of meaning – explaining the long answer to the question asked above.

4.1.2 *Fixed mental representations of synonymy*

The metalexic approach holds that lexical relations may be stored, as well as derived. In order for a group of word-concepts to count as a synonym set, it must adhere to the definition provided by RC-S, and therefore their synonymy must be derivable on the basis of minimal difference but for form. But being derivable is not necessarily the same thing as being derived. One can imagine situations in which one knows about the synonymy of two words without being able to derive the relation oneself. For instance, say that someone told me that *zorx* and *kklak* are synonymous in a certain dialect of Martian. On this basis, I form concepts of *ZORX* and *KKLAK* that include the fact that each is the other's synonym. Knowing this about the two words affects my beliefs about their meanings. Since I know they are synonyms, I assume that they have the same meaning. Once I learn what *zorx* means, I will be able to complete my semantic picture of *kklak*. (This, of course, only works if my informant was telling me the truth in the first place about the synonymy of the words.) If the synonymy between them was never derivable, then my beliefs about the two words will either self-destruct or interfere with the acquisition of the meanings when I finally come across them.

While it is possible that some instances of synonymy are represented as stored metalinguistic knowledge, it is certainly not necessary that any synonym relations be stored as such. The cases for fixed mental representation usually arise in extraordinary (meta)linguistic circumstances. As an American expatriate in England, I have a metalinguistic consciousness of translational

equivalents among British and American English (*body shop*=*panelbeater*, *zee*=*zed*, *thumbtack*=*drawing pin*). When I think of the word *thumbtack* when speaking to a British person (and I am in an alert enough state), I make a conscious shift to *drawing pin*, and so the relation to *drawing pin* must be a part of my *THUMB TACK* concept.¹ It might be an occupational hazard of lexicography that thesaurus writers have great numbers of synonym relations in their metalinguistic memory. But a typical language user might never have experiences that would cause him to build up such fixed representations of synonym relations. Certainly, using language does not require such knowledge. In order to use language sensibly, we must know the meanings of the words that we use, but we do not have to record the fact *that* meaning *a* overlaps with meaning *b*. That is, overlap in meanings is represented, but the fact that the overlap is represented need not be represented.

Instances of relations become part of our canon of metalinguistic knowledge through reinforcement of the idea that the two words “go together.” Since synonymy is usually “evolved out” of natural languages (see 4.4.1), there is little opportunity for such reinforcement. However, Haagen (1949), in a study of synonymy judgments for adjectives, found that meaning similarity was not identical to (but was highly correlated with) association strength. It is possible (although not necessary) that canonicity has effected the difference between similarity and association strength. Certain pleonastic phrases might provide examples of canonical (near-)synonymy. For example, legalese is rife with synonym-heavy expressions, such as *goods and chattels*, *last will and testament*, and *good repair*, *order*, and *condition* (Ullmann 1962), and Malkiel (1959: 126) lists two dozen similarly synonymous irreversible binomials (*each and every*, *hard and fast*, *ways and means*). If such expressions are common enough in an individual’s experience of language, then the relations among them might be stored as knowledge about those words. On the other hand, they may just be lexicalized as phrases, and the relations among the nouns may go unanalyzed by many English speakers.

Compared to canonical antonyms (see chapter 5) however, there is little evidence for canonical synonym relations. Synonym generation rarely seems automatic, and synonym judgments are slower than judgments for canonical antonyms (Charles et al. 1994). While some synonyms are more accessible than others, such differences are attributable to the familiarity of the words involved (Butter et al. 1992) and the effect of familiarity on the generation and evaluation tasks (Janssen and de Boeck 1997).

4.1.3 What is similar enough? What is different enough?

Some philosophers and psychologists have argued that theories that rely on a notion of similarity are relying on a meaningless notion (Goodman 1952;

Murphy and Medin 1985). In spite of this, the notion is employed again and again because it is an efficient means of describing processes in categorization and conceptualization (Medin et al. 1993). One of the keys to using similarity as a theoretical notion is to accept that similarity is a fluid state, since “there is no unique answer to the question of how similar is one object to another” (Murphy and Medin 1985: 296). Instead, similarity judgments involve a dynamic process, based on dynamic information.

Synonym judgments might be made in a number of procedural contexts, such as asking “what’s a good synonym for *x*?” or trying to paraphrase some text. RC-S constrains these judgments, but they are further constrained by the context of the specific synonym judgment task. Since RC-S requires that two synonyms have relevant similarities with reference to a context, two words that are similar enough to be synonyms in the “neutral” context of (2) might not be similar enough for the particular sentential context in (3), but might be perfectly well suited to another sentential context, as in (4).

- (2) What’s a synonym for *prize*? – *Award*.
- (3) The plaintiff received a hefty award ($\neq$ prize) in the lawsuit.
- (4) Jan won the prize/award for the best drawing.

Words can be more or less similar in two ways. They are more similar (than another pair) if they share more attributes in common (having the same denotation, connotation, register, etc.), or they are more similar because they match more closely on any one of these attributes – all others being equal (or all others being disregarded). The most relevant attribute in almost any context would be denotative meaning. How close do two words have to be in meaning in order to be similar enough to be synonyms? In the examples above, we can see that they do not have to be all that similar in some contexts. While *award* and *prize* have different senses and extensions, for some purposes and contexts they are similar enough to be judged synonymous.

Similarity judgments and context interact in several ways. Since similarity judgments involve comparison, the salience of an item’s attributes is affected by the item it is being compared with. For example, Tversky (1977) asked subjects to pick which of three countries was most similar to a target. When the choices for the target AUSTRIA were HUNGARY, SWEDEN, and POLAND, subjects tended to pick SWEDEN, but when the choices were HUNGARY, SWEDEN, and NORWAY, they favored HUNGARY. Thus when the selection included two central European countries, geographical attributes were not as salient to the decision as when only one central European country was included.

In considering synonyms in “neutral” contexts, this means that judgments of synonymy are affected by the range of choice. If we take, for example, the thesaurus in Microsoft Word 98, for most words it gives a list of fewer than nine

synonyms (more than this would require scrolling down in the window). For semantic areas that are well represented by English vocabulary, the synonyms are very close in meaning to the target (e.g., *couch*: *sofa*, *davenport*, *divan*, *loveseat* . . .), but for less repetitively lexicalized areas, what suffices as a synonym is often semantically less similar, relying on gross attributes rather than specific ones (*glass*: *pane*, *mirror*, *windowpane*, *looking-glass*, *lens* . . .).

In (non-neutral) sentential contexts, specific attributes of a word are highlighted. In looking for synonyms to replace *bust* in (5) and (6), the context determines whether the relevant attribute of a bust is its being a three-dimensional piece of art or its being a likeness of someone.

(5) I have to dust that bust {sculpture, ?portrait} of Wittgenstein.

(6) Rodin chiseled a bust {?sculpture, portrait} of his patron.

The direction of comparison affects similarity judgments as well. For example, Tversky (1977) found that American subjects consider North Korea to be more similar to mainland China than mainland China to North Korea. The influence of direction of comparison is also observable in the Microsoft thesaurus. For example, among the synonyms for *murder*, *blood* is listed (as in *He's out for blood*). But a search for synonyms of *blood* in the same thesaurus does not produce *murder*. When one starts with *blood* and looks for synonyms of it, in the absence of any more specific context, one looks for synonyms of its most salient or most basic (i.e., not metaphorically or otherwise extended) sense. This undermines the notion that synonymy is a symmetrical relation – a point we return to in 4.3.

The criteria for determining similarity among items is always context bound. While I have called thesaurus compilation and non-sentential synonym judgments *neutral contexts*, they are contexts nonetheless, and our expectations of them shapes what we provide or accept as synonyms. In these contexts, we accept that the relevant attributes of the words are their denotative meanings and parts-of-speech, and that these should be as similar as possible. The task of finding a “good” synonym for another word is based on our expectations of what one would want synonyms for (e.g., to replace a word in a sentence). In less neutral contexts, additional demands are placed on potential synonyms, and the demands of the neutral context may be, well, neutralized. For example, the passage in (7) is by a writer who has rejected what seemed to be a “good” synonym in a neutral context (*faith*=*belief*), and replaces it with another synonym that is more suitable to the assumptions underlying the present theological discussion (*faith*=*trust*).

(7) Faith is not the same as belief, even though the two terms are often used interchangeably. Though they are not the same, faith and belief interact on many levels and in many ways. A better synonym for faith

is trust. The opposite of faith is not disbelief but an ironclad contract, enforceable to the letter. (United Christian Ministry Pastoral Training Institute, n.d.)

In the neutral context *trust* might fail as a “good” synonym for *faith* because the objects of trust and faith are believed to be different (you might trust your bank, but probably would not have faith in it), and because *trust* is often used as a verb while *faith* is only a noun. *Belief* succeeds in the neutral context because, like *faith*, it is often used to speak of relationships with the supernatural, and because it is clearly a noun that can fit into the same kinds of linguistic contexts as faith (*a strong faith/belief in God*). But in the more specific context, *trust* is similar enough because we only pay attention to how *trust* is used in theology. In this context, the writer asks us to ignore the differences between *trust* and *faith* by proposing that the two things are similar in all the *relevant* ways, thereby creating an analogy between the kinds of things that you trust (and the way you act when you trust) and the kinds of things that you have faith in (and the way you act when you have faith).

So far, I have been talking about *similarity*, but RC-S states that two synonyms have the *same* properties, not just *similar* properties. There seems to be a conflict here between **identity** and **similarity**, but under RC, one follows from the other. While RC-S requires identity among relevant properties, similarity among synonyms results from the notion of contextual relevance. In other words, while RC-S requires that two items be the same in some regard, the fact that not all properties are under consideration means that the two items will (only) be similar, not identical. RC-S cannot state that two members of a set have *similar* properties, because this gradable term cannot be satisfactorily defined to rule out non-synonyms. For instance, in determining how many seats are available in a room, *loveseat* and *sofa* have the contextually relevant property of being able to seat certain numbers of people. They are similar (but not identical) in that a loveseat seats two and a sofa (usually) seats three. But for the purpose of the context the small difference between two and three is a great difference. We would not want to say in this case that *there are three sofas* is a paraphrase of *there are three loveseats*, because the two sentences say very different things about how many seats are available. Instead, RC-S demands that the contextually relevant properties be *the same*. Since the precise number of seats is relevant, *loveseat* and *sofa* cannot serve as synonyms in this context.

In some cases, the level of specificity of relevant properties affects how similar two words' meanings seem. So, for example, in some contexts *seat* might be treated as a synonym of *chair* because their meanings include that they are ‘places to sit’ – thus they are the same to this extent. The more specific information that differentiates *chair* as denoting a particular kind of place to sit

is irrelevant. This allows for synonyms to sometimes be hyponymous (see 4.5), which again points out the directionality of synonym relations. Thus, we can comfortably substitute *seat* for *chair* in (8), but not *chair* for *seat* in (9). (The arrow indicates an implicational relationship.)

- (8) a. The receptionist indicated a chair where I should wait. →
b. The receptionist indicated a seat where I should wait.
- (9) a. The receptionist indicated a seat where I should wait. →
b. The receptionist indicated a chair where I should wait.

In (8a), the context allows for something that could be described as a *chair* to be described as a *seat*. For the purpose of the context these are the same thing. But for the purpose of the context in (9a), a *seat* cannot be described as a *chair* (unless we know for sure that the indicated seat is a chair), since the receptionist may have indicated a bench.

Finally, having considered the question of what is “similar enough” to be synonymous, we are left to ask whether synonyms need to be “different enough.” All RC-S says is that the forms of synonyms differ. It does not specify *how* different they need to be, but it may be the case that more difference is better. For example, the nouns *end* and *ending* are rather similar in form, but *end* is not necessarily considered to be a better synonym for *ending* than a word with a less similar form, like *conclusion*. If synonyms are *minimally* different, shouldn’t the two words be as similar as possible in form as well as meaning? The answer to this question is no. RC-S states that synonyms differ in form, and this is sufficient to guarantee that the synonyms are different words. All other things being equal, words that are more different in form might seem like better examples of synonymy, since the more different two forms are, the more easily they are recognized as different words. Thus, it seems like cheating to call *end=ending* a good example of synonymy, since they are part of the same word family (see 2.3.5), and many language users would consider them to be forms of the same word. While their similarity in form prevents them from being good examples of synonymy in a neutral context (and *end=conclusion* might be preferred), in some particular context they might provide the best match on semantic grounds or stylistic grounds, and therefore might serve as synonyms. So, for example, when speaking to a four-year-old, one might want to avoid the word *conclusion*, so *end* and *ending* might be the only appropriate substitutable words for the context. In this case “similar enough” involves sharing the same level of difficulty or register, and so the expectations of form difference are lowered – *end* and *ending* are considered to be different words that are synonyms. Issues relating to word form are further explored in 4.4.1.

4.1.4 Specifying difference rather than similarity

RC-S defines synonymy by specifying what is different among a set of synonyms: their form. We can contrast this with any number of definitions of synonymy in the semantic literature, which focus instead on how synonyms are similar, as exemplified in (10).²

- (10) a. [Synonymy is] the identity of intensions and extensions (Werner 1972, quoted in Evens et al. 1980: 149).
- b. [Synonyms] (1) have the same definition, (2) have the same set of syntactic valencies . . . (3) [are] capable of replacing one another in any schemes of syntactic trees (Apresjan 1973: 181).
- c. Synonymy is defined . . . as mutual entailment³ (Kempson 1977: 40).
- d. Words that have the same sense in a given context are **synonyms** (Kreidler 1998: 10).

Logically, the definitions in (10) count *cat=cat* as a case of synonymy, since they mention only similarities, not differences. In (11), the definers do specify difference as well as similarity for synonymy even if this is only to state that there must be two words (which can be interpreted as ‘two *different* words’).

- (11) a. [Synonymy] is the case where two constituents are as similar as possible, where there is no difference in meaning between a sense of one and a sense of the other (Katz 1972: 48).
- b. Synonymy is held to be sameness of meaning of different expressions (Harris 1973: 11).
- c. X is a cognitive synonym⁴ of Y if (i) X and Y are syntactically identical, and (ii) any grammatical declarative sentence S containing X has equivalent truth-conditions to another sentence S¹, which is identical to S except that X is replaced by Y (Cruse 1986: 88).
- d. Two words are synonyms if they can be used interchangeably in all sentence contexts (Jackson 1988: 65).
- e. . . . *synonymy*, or semantic equivalence – that distinct expressions have the same meaning (Chierchia and McConnell-Ginet 1990: 35).
- f. If two words W1 and W2 are synonymous then anything which can be described using W1 (in the relevant meaning) can also be described using W2, and vice versa . . . The point is that at least one of the words must have a meaning whose name is *not* that word itself (Hudson 1995: 3; 4.2.1 returns to this definition).

The above definitions differ in many ways (to be pursued in later sections), but their striking similarity is that they all state that synonymy involves similarity

of meaning. In contrast, RC-S specifies the type of difference and relies on the communicative relevance of meaning to assure that those groups of words related by RC-S are related in meaning. Rather than defining *synonymy* on logical criteria, the RC-S definition reflects the types of sets that count as *synonyms* in real linguistic contexts (such as thesauri), since these rarely conform to definitions that require logical equivalence or mutual entailment. RC-S takes a pragmatic perspective on semantic relations (see chapter 1), providing a means for identifying appropriate synonyms in situations where the context demands logical equivalence – and in those where it does not.

Several objections might be raised to this approach. First, if synonymy is defined as “difference in form,” then how do we prevent synonyms that are very similar in terms of grammatical category, connotations, affect, and register but not similar in denotation? It seems that we should want to prevent such “synonyms,” since, as Sikogukira (1994: 112) notes, “no one ever talks of words as being ‘emotively’ but not ‘cognitively’ [i.e., denotatively] synonymous.” For example, *kitty* and *doggy* are both nouns that may connote ‘fluffy,’ ‘cute,’ and ‘small,’ that communicate a positive disposition toward their referents, and that belong to a childish register. Their denotations differ, but a lot about them is the same. So what keeps them from being “similar enough” to be synonyms? Generally, the context prevents us from considering them similar enough for the purposes at hand, since most communicative purposes make denotative meaning a relevant aspect of the words involved. It is possible, however, to imagine a situation in which the two words are “similar enough,” as in the dialogue in (12), where *doggy* and *kitty* are used for sarcastic effect.

- (12) A: I’m so sick of that Kay and her stupid little doggy that she’s always calling her “little baby-waby” . . .
 B: Little Baby-Waby is a kitty, not a doggy.
 A: *Doggy, kitty*, whatever. It’s all the same to me. It’s a stupid little spoiled beast with a stupid little spoiled mistress.

The phrase *it’s all the same to me* can be used in English as a metadiscursive comment to signal that words with contrasting denotative meaning are similar enough to substitute for one another (and hence are synonyms on the RC-S definition of synonymy). The phrase is intended to communicate something like ‘I know you might protest that I was wrong to use this word, but I’m telling you that it’s good enough for my purposes (because I can’t or don’t want to distinguish between the meanings or extensions of the related words), even if it’s not the word you want me to use.’ So, while the words do not have the same sense, the speaker proposes that it is not the denotative meaning that is relevant to the discourse. If it is not relevant, then it is not required by RC-S to be the same within a synonym set.

RC-S, then, serves as a means to derive **context-dependent synonyms**, rather than **logical synonyms**, and it is able to do so by specifying the way in which a set of synonyms must be different, but relying on context to determine how they must be the same. In other words, RC-S treats synonymy as a pragmatic, rather than a semantic, phenomenon. While definition by contrast may work for the meaning-based relations, it may be the case that certain other lexical relations are easier to define (and more appropriately defined) by means of similarity. The most obvious such case is homonymy, which is impossible to define without stating that two items must have the same form. If we try to define it as requiring only difference in meaning and contextual similarity, then any non-synonyms are arguably homonyms. (Similarly, whether rhyme and alliteration need to be defined as identity relations rather than contrast is not immediately clear.) It is possible that RC is not the best means for describing at least some form relations, and by extension it might be argued that if one type of lexical relation requires that sameness be specified, then we might as well define synonymy on the basis of sameness, as has been done through the centuries. However, there is more variety in the ways in which synonyms are the same than in the ways in which homonyms are the same. While pairs of synonyms always differ in form, an assortment of synonym pairs will not be the same in all the same ways (see 4.2). Thus, the facts of synonymy support an RC approach, even if the facts of homonymy and some other non-semantic relations do not. If RC cannot account for some form relations, then it fails to provide an overarching theory of lexical relations, but does not fail to provide a theory of lexical *semantic* relations (from a pragmatic perspective).

4.2 Aspects of meaning and subtypes of synonymy

This section primarily deals with the question of what gets related in a synonymy relation, but along the way it reviews various approaches to synonyms, including definitions of synonymy and types of synonyms. Types of synonyms can be categorized by how much denotative semantic overlap the two words have, as discussed in 4.2.2. In 4.2.3, types of synonyms are distinguished by what sorts of semantic properties the words share, be they denotative, connotative, affective, dialectal, and so on. RC-S accounts generally for the various types in 4.2.2 and 4.2.3 because it allows for different contexts to require different levels or aspects of semantic overlap, and such contexts are exemplified in those sections. But first, in 4.2.1, this pragmatic and psycholinguistic approach is contrasted with some incompatible approaches by considering whether synonymy relates words or meanings, words or larger expressions, and intensions or extensions.

4.2.1 *Words, sentences, meanings, or things?*

The list of synonym definitions in 4.1.4 demonstrates a wide range of beliefs about what constitutes synonymy, even (or especially) among linguistic semanticists. A first distinction to make is whether synonymy relates just lexical material (words and lexicalized phrases) or also the products of morphology and syntax: derived words, phrases, and sentences. In the philosophical literature, the term *synonymy* is most frequently used to refer to relations among propositions (or sentences), rather than simply among words (e.g., Quine 1960). Others use the term **paraphrase** to distinguish propositional synonymy from lexical synonymy. For the most part here, attention is focused on lexical synonymy, and as such I have represented RC-S as determining relations among word-concepts. However, it could easily be extended to linguistic-expression-concepts, in which case concepts of sentences could be related as well. (One would assume that such concepts would be derived and held in short-term memory, since it is unlikely that we have much need for – or occasion to develop – long-term concepts of particular sentences.) Since this is a book on lexical relations, sentential synonymy is mostly ignored here.

Next we turn to the question of whether synonymy relates words or meanings. The definitions presented in 4.1.4 indicate that the relation holds among words, or more generally among linguistic expressions, but at the same time, some of these sources claim that semantic relations are sense relations (Lyons 1977, *inter alia*) or meaning relations (Allan 1986). If synonymy is a relation among words, then we can describe it as words “having the same (or a similar) sense,” but if we treat synonymy as a relation among senses, then synonymy is a matter of “being the same/similar sense.” The latter runs into problems if we use it to define the relation among absolute synonyms. If there is only one sense, there is no relation to be observed, since by definition a relation must hold between at least two members of a set. Hudson describes the situation as follows (continued from [11f] in 4.1.4):

[A]t least one of the words must have a meaning whose name is *not* that word itself. Take our examples, *bicycle* and *cycle*. If they have the same meaning, there must be just one concept which doubles up as the meaning for both words, so it has just one name. If we call it ‘bicycle’ then we must say that the meaning of *cycle* is ‘bicycle’ (not ‘cycle’); and if we call it ‘cycle,’ then *bicycle* means ‘cycle.’ (Hudson 1995: 3)

While not all synonyms involve such a perfect match of meaning as *bicycle* and *cycle* do (if we ignore other senses of *cycle*), it is precisely this kind of match that we want a definition of synonymy to account for, since prototypical synonyms do match exactly for some sense. If our approach to meaning involves the mapping of lexical items to concepts, then there is no reason to believe that there are two separate but identical concepts to which *bicycle* and *cycle* map.

The synonymy relation is thus (in some cases) a relation between two words that map to the same meaning or concept, rather than a relation between two meanings. The WordNet model explicitly takes the position that synonymy is always a relation among words, while most other cases of semantic relation are relations among meanings (Miller et al. 1990, see 3.4.2).

One reason that synonymy is often defined as a *sense relation* is that synonyms usually involve a match between some, but not all, of a word's senses. The *sense relation* description is convenient, then, because it only considers one sense of a word at a time. However, what is related here is not two senses (because in absolute synonymy a single sense is shared), but two lexical units, that is, instantiations of lexical items, associated with a particular sense (see 1.3.2). So, while two lexical items are unlikely to be semantically identical (since that involves many shared or matching senses), two lexical units can match in meaning because each is only considered with respect to one sense. Since both these creatures happen to be called *words*, it is easy to see why some theorists have avoided claiming that synonymy relates words.⁵ The pragmatic approach taken here is that synonymy is a relation between words *in use* (even if that use is in a neutral context, such as a thesaurus or word-association test). Semantic approaches to synonymy, on the other hand, cannot claim that lexical units or words in use are related in synonymy since they treat meaning and context as separate realms and place synonymy in the meaning realm. But some, such as Lyons (1968: 452), recognize that "more than any other sense relation, [synonymy] is context-dependent."

Another reason for calling synonymy a *sense relation* is to make clear that synonymy involves identity of senses, not identity of extensions. The most famous example of this argument is Frege's (1985 [1892]) discussion of *the morning star* and *the evening star*. Although both refer to Venus, they have different senses. The primacy of sense in synonym relations is illustrated by the truth-conditional non-equivalence of belief sentences in which co-extensive terms have been substituted for each other, as in (13).

- (13) a. Smith believes that four equals four.
 b. Smith believes that four equals the square root of sixteen.

While *four* and *the square root of sixteen* refer to the same number, they offer different ways of describing it, and this makes the two terms too different to substitute for each other in a belief context (since Smith might have weird beliefs about square roots).⁶ Still, reference is relevant to synonymy because it provides a test for potential synonyms in context. Goodman (1952: 69) claims that "Extensional identity is a necessary but not a sufficient condition for sameness of meaning," and this is usually true (although near-synonyms' extensions often differ). Knowledge of words' extensions can

affect processing of synonym judgments. Herrmann (1978) shows that synonym judgments are fastest in cases of extensional identity, rather than extensional similarity.

Identity of senses is not guaranteed by RC-S, but sense similarity follows from what is contextually relevant in judgments of similarity. Sense determines reference and trumps it in some situations, such as statements of belief. But one can certainly imagine contexts in which *synonym* might refer to the relation between items with matching referents and ill-matching senses. For example, I might want to avoid repetition in writing and therefore use different terms to refer to Elizabeth II. I might say “I need a synonym for *queen of England*” and then accept *head of the Church of England* as an alternative. In their definitions of four types of synonymy, Bierwisch and Schreuder (1991: 37) cover this possibility, defining the fourth type as referential identity (as opposed to linguistic-semantic or conceptual identity/equivalence in the other types).

In summary, *synonymy* usually refers to similarity or identity of senses among lexical units, resulting in extensional sameness. However, the term is sometimes applied to semantic identity/similarity in words, and perhaps occasionally extensional identity irrespective of intensional (dis)similarity. All of these are consistent with the RC-S definition of similarity.

4.2.2 *Identity and similarity in denotative meaning*

Without yet introducing the issue of denotative vs. non-denotative aspects of meaning, similarity in denotative meaning can be plotted in two dimensions: how many senses the words have in common, and how similar the common senses are. The resultant types of synonymy are mapped out in table 4.1.

Full synonyms are those that are identical in every sense. Candidates for full synonymy in natural language tend to be words with relatively limited numbers of conventionalized senses, such as *carbamide=urea* or (US) *groundhog=woodchuck*. Since we are only concerned with denotational equivalence, we can include synonyms from different registers *toilet=john* or languages (English) *restaurant* = (French) *restaurant* (Sikogukira 1994). More common are **sense synonyms**, which share one or more senses, but differ in other senses. Those who treat synonymy as a sense relation generally use the

Table 4.1 *Dimensions of synonymy*

	IDENTICAL SENSES (logical synonyms)	SIMILAR SENSES (context-dependent synonyms)
ALL SENSES	full synonyms	?
ONE (+) SENSE	sense synonyms	near-synonyms (plesionyms)

term *synonym* to refer to sense synonymy. An example of sense synonymy is *sofa* and *couch*, which (for most speakers of English) share the sense ‘a long upholstered seat, usually with a back and arms,’ but only the latter of which has other senses like ‘a sofa or bench used as a tool in psychoanalysis’ or ‘a priming coat of paint.’ Together, these two types of synonymy fall under the general cover-term **logical synonyms**.⁷ If words are logical synonyms, this is because their lexical or semantic representations are the same, which results in their being used in the same ways.

In the rightmost column of table 4.1, we have **context-dependent synonym** types. For this column, we find more examples of natural language synonyms, but fewer labeled synonym types. The table shows that there is no particular name for words that are similar, but not necessarily identical, in all their senses. If such things exist, they would also be called *near-synonyms*, like their downstairs neighbors in the table. **Near-synonyms**⁸ have no senses that are exactly the same (that is, their contributions to sentential truth-conditions differ), but each member of a near-synonym pair has a sense that is much like a sense of its counterpart, such that something described by one of the pair can often (or at least sometimes) be described by the other. These include examples like *foggy*≈*misty* and *mob*≈*crowd*. Near-synonyms are what we usually find in thesauri, and are often what is meant when people use the term *synonym*. For example, Apresjan (1973: 175) notes that synonyms are “usually defined as words which designate the same thing but emphasiz[e] different aspects of it, or as words which have the same meaning, but differ in its finer shades.”⁹ In the linguistic-philosophical tradition, theoretical interest has focused on words with identical meanings, and how these might contribute to analytic sentences or sentential relations like entailment and paraphrase. While *synonym* means ‘near-synonym’ in everyday parlance and lexicography, the notion of NEAR-SYNONYM is rather useless in philosophy. But since we are interested here in a pragmatic approach to semantic relations, near-synonymy is of greater interest here than it has been to logicians and formal semanticists. One problem with the notion of NEAR-SYNONYM is that it includes everything from *big*≈*large* to *mature*≈*ripe* to *roast*≈*bake*. While some cases of near-synonymy seem like plausible sense synonyms in neutral contexts, others depend on the context in order to reveal their similarities. Church et al. (1994) focus on **gradient synonyms**, which they liken to Lakoff’s (1987) radial categories. In this view, synonym sets represent prototype-based categories in which the target word is the most prototypical, and the synonyms differ from the prototype in various ways – often because they indicate additional information, as in Church et al.’s (1994: 155) example *bad*≈*shocking* in (14).

- (14) a. Bad, isn’t it?
b. Yes, it’s shocking.

In this case, the term *gradient synonymy* acknowledges that hyponyms can be used as synonyms, as *shocking* is a type of *bad*.

The simplest diagnostic for synonymy is **substitutability** in sentential contexts without changing the sentence's truth-conditions or range of use (for non-propositional sentences). Problems with the notion of substitutability are discussed in 4.3, but in the meantime it makes a reasonable provisional means for judging synonymy. RC-S requires contextually relevant sameness, and substitution offers a means to determine what is relevant to a context. If one word can substitute for the other in an utterance, then they have passed the test of being similar enough for that context.

The set of synonyms for *punish* in the *American Heritage Dictionary* (4th ed.; henceforth AHD) provides an example. For each of the synonyms, AHD gives distinguishing characteristics, which are summarized in (15).

- | | | |
|------|-------------------|---|
| (15) | <i>punish</i> | "is the least specific" of the words |
| | <i>correct</i> | "to punish so that the offender will mend his or her ways" |
| | <i>chastise</i> | "implies corporal punishment or a verbal rebuke as a means of effecting improvement in behavior" |
| | <i>discipline</i> | "stresses punishment inflicted by an authority in order to control or eliminate unacceptable conduct" |
| | <i>castigate</i> | "to censure or criticize severely, often in public" |
| | <i>penalize</i> | "usually implies the forfeiture of money or of privilege or gain because rules or regulations have been broken" |

These differences indicate that the words are near-synonyms. *Punish* (in one of its senses) may be classified as a hyperonym of the other words, since its meaning is less specific than the rest. (So, *chastise*, *discipline*, *penalize*, etc. are types of *punish*.) Nevertheless, by RC-S, *punish* can be a synonym of the other words, since for many purposes it is a reasonable substitute for (and thus similar enough to) any of the others. Among the synonyms of *punish*, AHD's use of the word *imply* in many of these descriptions might suggest that the words differ in connotation, rather than denotation, but this is not the case. **Denotation** refers to the relationship between sense and reference, and the sense of a word is the set of conditions on the word's reference (however that sense may be represented in the mind). Whether or not AHD has captured these conditions sufficiently, the descriptions in (15) indicate ways in which the denotation of one word differs from the denotation of another, perhaps due to different prototype representations of each of the word meanings. So, for example, if an act of punishment involved a sanction but not an intention to change future behavior, an English speaker might prefer *penalize* and reject *discipline*. (We return to the problems of distinguishing denotation and connotation in 4.2.3.)

While some of the (near) synonyms in AHD (*correct*, *chastise*, *discipline*) stress the intention that the punishment affect later behavior, others are particular

about the type of punishment given (*chastise*, *castigate*, *penalize*) or the relative social positions of those involved (*discipline*, perhaps *penalize*). Yet all count as synonyms for the more neutral *punish* (in the neutral context of the dictionary definition) because they all involve the core meaning of 'do something unpleasant to someone because they did something bad.' That the words in (15) describe negative reactions to bad behavior is more relevant to judgments of synonymy among them than whether the agent is an authority figure or whether the punishment is given with the aim of changing behavior. But a puzzle here is to figure out why that is the minimal level for similarity. We could strip the meaning of *punish* down further, deleting the polar adjectives, resulting in something like 'do something to someone because of something they did.' In this case, *reward* and *punish* are potential synonyms, but in real language use they are most often antonyms. Or we could delete the reason for the action, so that the basic meaning is 'do something unpleasant to someone,' in which case a potential synonym is *bully*. While there might be situations in which one feels that a punishment is bullying, *punish* and *bully* do not serve as good synonyms for each other in the neutral dictionary context. So, the question remains, how do we determine the minimal level of denotative similarity that is required in making synonym judgments?

One way to explain this is to claim that denotative meaning works in terms of core and peripheral features. In this case, the core meaning that these words have in common outranks their peripheral features for the purpose of judging synonymy in most contexts. Words with different denotations are synonymous, either because their core meanings match and the periphery is disregarded (as in a thesaurus) or because they both satisfactorily describe a particular situation because they share a core meaning and their peripheral features complement, rather than contradict, each other.

One might counter that the core/periphery distinction is not a legitimate means for differentiating synonym-appropriate levels of meaning in the metalexical approach. Since the metalexical approach holds that synonymy relates concepts of words, then it is not the word's actual semantic representation that is relevant so much as our conceptualization of how that word is used. So, in order for core/periphery distinctions to be relevant, they must be accessible at the word-concept level. It does seem that they are. In defining words, people have fairly regular impressions of what is the core and what is the periphery, so these distinctions obtain at the metalinguistic level. Whether they are real in semantic representation is then a separate question, to which the metalexical approach to semantic relations lends no insight.

The core/periphery distinction has been analyzed as a conceptual/linguistic distinction by Hirst and his colleagues, who have proposed an NLP system for choosing among near-synonyms. In their system, near-synonyms are linked to a single general concept. The lexical entry for each near-synonym contains

lexical choice rules (DiMarco et al. 1993), which they liken to usage notes in dictionaries (DiMarco and Hirst 1995), like those seen above for *punish*. These give the language user the means to choose the most appropriate word for the context at hand. In this case, it is easy to tell which aspects of meaning are relevant to synonymy – only the conceptual meaning is common to all the near-synonyms. Their argument for the use of intralexical information is that it is neither easy nor “natural” to make conceptual distinctions on the fine-grained level necessary for synonym differentiation (DiMarco et al. 1993): “We thus acknowledge the Saussurean notion that meaning at this [near-synonym] level is expressible only in terms of difference” (Hirst 1995: 54). Their approach provides solutions for machine translation and automatic text generation, but Hirst (1995) claims that it is psychologically plausible as well. But because it is concerned with synonym choice in text generation, the approach is not directly relevant to the problem of synonym judgments in human language users. The process of choosing a word for an utterance is a different one from deciding whether two words are synonyms or searching for a synonym for a word, since the first is a linguistic activity and the latter two are metalinguistic activities. The particular mechanisms of this approach are only relevant to the metalinguistic process if they are observable to the language user. The lexical contents are not observable, but the output of the linguistic processes that use those lexical contents are observable, and so could indirectly affect metalinguistic reasoning in the application of RC-S.

4.2.3 *Beyond denotation*

A logical, or semantic, definition of synonymy holds that two words are synonyms if a proposition containing one is mutually entailed by the same proposition containing the other (Kempson 1977), or that synonyms are cases of symmetric hyponymy (Werner in Evens et al. 1980; Palmer 1981). Pragmatic, or context-dependent, cases of synonymy flout this definition. As shown already, the mere overlap in meaning among near-synonyms does not allow them to pass the tests of mutual entailment or symmetric hyponymy – for example, *castigating* is necessarily a kind of *punishing*, but *punishing* is not a kind of *castigating*. So, on a pragmatic understanding of *synonym*, synonyms can differ in denotative meaning, so long as that difference is slight enough that, in context, the two words’ meanings contribute the same context-relevant information.

Whether synonyms are the same or different in their non-denotative and non-form aspects is another matter. For some authors (e.g., Apresjan 1973), synonyms include those words that are similar in denotation, but different in other aspects of meaning, such as connotation, affect, dialect, and register. For others (e.g., Jackson 1988), no synonyms exist because all aspects of

meaning (not just denotation) must be the same in order for two words to be synonyms, and such differences can always be found. Words that match in at least one sense and (in that sense) in every other property except form are termed **complete synonyms** (Lyons 1981).¹⁰ Words that are fully (all senses) and completely (all properties) synonymous are called **absolute synonyms** (Lyons 1995b).

While (core) denotative meaning is almost always relevant in RC-S relations, similarity in other aspects of meaning and use enhances a synonym relation. In neutral contexts, the best examples of synonymy agree in their grammatical category, connotations, affective meaning, dialect, and register as well as denotative meaning. So, for example, the synonyms for *punish* in (15) are all transitive verbs that would be at home in a literary or formal register in any dialect of English. Those that differ more in denotation (e.g., *penalize* $\approx$ *correct*) seem less synonymous than those that share more (e.g., *castigate* $\approx$ *correct*). The dictionary has left out expressions, such as *give hell* or *give what-for*, that are similar in denotation but differ in register and number of words. If we add them to the list, they do not seem to fit into the synonym set quite so well because of those differences.

Enumerating ways in which synonyms might differ is a major preoccupation of writers on the topic (e.g., Collinson 1939; Harris 1973; Palmer 1981). Edmonds (1999) identifies thirty-five ways in which synonyms may differ. These include slight intensional differences (*forest* $\approx$ *woods*) and non-intensional differences that affect a word's appropriateness in a linguistic or social context, such as differences in emotive content (*dad* $\approx$ *daddy*), formality (*drunk* $\approx$ *inebriated*), or selectional restrictions (*pass away* $\approx$ *die*, in which only the latter can be said of plants). Warren (1987) distinguishes synonyms, which overlap in meaning and usage (i.e., are appropriate in some of the same contexts), from **variants**, which share a meaning, but differ in stylistic and expressive characteristics that make them inappropriate to the same contexts. For example, *sodium chloride* and *table salt* denote the same things but are used in different areas of endeavor (chemistry, cooking). Variants, then, are descriptive synonyms that express the same sense for different purposes. This indicates that difference in form is not necessarily the only means of deriving same-meaning relations. For example, if I am looking for a "proper" word for *booze*, then it is not enough to find a different way of saying *booze*: I want a particular kind of different way of saying it. For this purpose, the relevant difference is not form, it is register, and RC can be instantiated as (16) in order to account for such variation.

(16) **Relation by Contrast – Registrational variation (RC-V^R)**

A registrational variant set includes only word-concepts that have all the same contextually relevant properties, but differ in register.

RC-V^R allows *spirits* and *liquor* as registral variants of *booze*, but disqualifies *sauce* or *hooch* (since they are of a similarly low register). Difference in form need not be specified in RC-V^R because the words' phonology and/or orthography are not contextually relevant for the communicative purpose, and thus they are not required to be the same (but since difference in register is specified, it follows that the two words differ in form). Registral variation could include cases where the two items are not different lexical items, but are different pronunciations of them. For instance *wuv* is a cutesy-talk variant of *love*. While *wuv* and *love* may not be different lexical entries (if the labialization of the /l/ follows from general cutesy-talk rules), they are both potentially word-concepts, and therefore eligible for relation by RC-V^R.

The rest of this section discusses some of the non-denotative aspects of words that may or may not differ in synonym and variant relations, but does not provide full RC definitions for every possible variation, since such definitions involve only the substitution of some other non-denotative word property for "form" in the RC-S formula.

Grammatical categories

As seen already in certain definitions of synonymy (Apresjan 1973; Cruse 1986), theorists often assume or state explicitly that synonyms must be of the same syntactic category. While certainly most cases of synonymy follow this rule, other linguists (Hurford and Heasley 1983; Hudson 1995) have questioned whether sameness of grammatical category is necessary. For instance, Hudson (1995: 74) asserts that the noun *dance* and the verb *dance* are synonyms because they both map onto the concept DANCING.

The assumption of matching grammatical categories follows from three interrelated presumptions in traditional approaches: (a) the use of substitutability as a diagnostic tool for synonymy (see 4.3), (b) the treatment of synonymy as a context-independent relation, and (c) the a priori assumption that synonymy is a paradigmatic relation and paradigmatic relations hold among members of the same syntactic category (see 2.1.5). In most cases, substitutable words in a sentence belong to the same general syntactic category, since nouns go in noun slots, verbs in verb slots, and so forth. Some of these "slots," however, are not so category specific. For instance, the predicate position after a copula can be filled by various parts of speech, as in (17).

- (17) a. For most of the journey, the children were sleeping.
 b. For most of the journey, the children were asleep.
 c. For most of the journey, the children were sleepers.

The cases in (17) might be rejected as instances of substitution on the grounds that *asleep* is filling a slot in an adjectival phrase, *sleeping* is part of the verb

phrase, and *sleepers* is part of a noun phrase. But in terms of semantic contribution to a sentence, each of these makes a very similar contribution, and Hurford and Heasley (1983) use the *sleeping=asleep* pair to argue against the same-grammatical-category requirement for synonymy. Using similar examples (*They are cripples/crippled*) for a contrary purpose, Apresjan (1973) argues that substitutability is not a foolproof test of synonymy, since substitution allows for different parts of speech, but synonymy does not.

Another problem for the “same grammatical category” requirement is the question of what counts as a grammatical category. In the lexical relations literature, the linguistic term *grammatical category* is often treated as a synonym of the traditional grammar concept of *part of speech*. However, some more specific subcategories, such as inflectional categories, are relevant to synonym decisions, while others are not. So while *couch* and *sofa*’s are not synonyms because they are inflected differently (and this has semantic repercussions), *glad* and *happy* are usually considered synonyms in spite of the fact that they belong to different grammatical subcategories in most dialects of modern English. While *happy* can occur in prenominal or predicative position, *glad* is restricted to predicative position (**the glad child*). Since this difference means that the two words are not interchangeable in all grammatical contexts, it should prevent their synonymy on Cruse’s or Apresjan’s definitions (see [10] and [11] above). Similarly, while *sleeping* is sometimes an adjective and therefore has the same grammatical category as *asleep*, the two words belong to different subcategories because only one can occur before nouns (*the sleeping/*asleep child*).

In treatments of synonymy where grammatical identity is required, the requirement is often applied at only a superficial (part-of-speech) level. As discussed in chapter 1, one might propose that synonymy relates lemmata (the syntactic/semantic portions of lexical entries) in the lexicon, but it seems that all the syntactic information need not match, just as all the semantic information need not match. The variability in what can or should match among synonyms underscores the need for a pragmatic approach. The metalexical approach allows for synonyms from different parts of speech if grammatical category is not relevant to the context. While it might seem likely that grammatical category would be less relevant in a neutral context, which does not make the semantic demands of a sentential context, it is only irrelevant where changes in grammatical category do not affect perceptions of meaning or substitutability. So, while *happy* and *joy* may share semantic characteristics, their difference in syntactic category means that one is perceived as naming a property and the other a thing. On the other hand, *happy* and *glad* belong to different syntactic subcategories, but both refer to properties and therefore are not noticeably different when approached in a neutral context – so they are semantically similar enough to be synonyms in contexts such as thesauri.

Expressive elements of meaning

While definitions of synonymy often require similarity (or identity) of denotative meaning and part of speech, they frequently allow for (or even expect) differences among non-denotative elements of meaning, or **expressive** meaning. Expressive meaning includes connotation, affect, and other social information that gives denotatively similar words different significance without changing their contributions to a sentence's truth-conditions. Those definitions of synonymy that do not allow for variation in non-denotative meaning essentially define empty or nearly empty sets of synonyms, since some difference in the usage of words can almost always be found.

Connotation (as defined here) involves associations that do not directly affect the conditions on reference, but which may give some slant to the description. For example, *discipline* may connote military precision (for some speakers) or corporal punishment of children (for the same speakers or others). These connotations often arise through experience of the words with reference to particular contexts: people are accustomed to hearing the word *discipline* in military and child-rearing contexts, but they do not prevent the word from being used in other contexts (such as a member of government being disciplined by a committee). So, *discipline* differs from *punish* in connotation, but can be used as a synonym of it. Connotations might also arise through contamination by other of the word's senses, by stereotyping related to the word's sense, or by sound-symbolic means. The prevalence of connotatively different synonyms in English is attested by the existence of a parlor game in which one must express the same truth-conditions in three ways, so that the connotations change from favorable to pejorative, as in (18):

- (18) I'm a renaissance person.
 You're eclectic.
 He's unfocussed.

(DiMarco et al. 1993)

Interpretation of connotations is highly subjective, as they arise from associations that not everyone will experience or notice. For example, given the same prosodic pattern, one might claim that (19) sounds slightly more generous than (20), and thus that *little-small* are not completely synonymous here.

- (19) The employees received a little Christmas bonus.
 (20) The employees received a small Christmas bonus.

If *little* sounds more generous than *small*, it could be because it has a more emotive, positive quality related to its use as an endearment (see discussion in 2.1.7). The *little* bonus is something special, while the *small* bonus is just of a certain size. Here the dividing line between denotation and connotation becomes fuzzy. If *small* sounds 'smaller' than *little* in this instance, then do

the two words have the same senses and refer to the same states? Are they sense synonyms with different connotations, or near-synonyms (whose senses overlap to a great degree, but not completely)? Given the subjective and context-dependent nature of the differences between (19) and (20), most theorists would assign any difference to the realm of expressive meaning. However, if we are to approach meaning psycholinguistically, then the subjective nature of such perceptions may reveal individual variations in the representation of senses – thus the differences are denotative rather than connotative. For this reason, it may not be possible to differentiate conclusively between denotative and expressive meaning, and the notion of denotative sense-synonymy may be on a continuum with denotative-expressive complete synonymy.

Affect (as it is used here) refers to non-denotative meaning related to the speaker's attitude toward the subject at hand. For example, *homosexual*, *gay*, and *queer* have a sense in common, but reflect different attitudes toward the referents that depend on the identity and other attitudes of the speaker (i.e., *queer* has different affect when used referentially by a politically active gay person and when used by a homophobe; see Murphy 1997). Other aspects of **social meaning** include register, dialect, jargon, and other sub-varieties of a language or vocabulary. These interact with affect and connotation. As already discussed, *booze* and *spirits* differ in formality, and this difference may communicate information about the situation (it is familiar or formal), affect (speaker's attitude to the referent, e.g., affection toward liquor), or information about the speaker's social standing (demonstrating appropriate knowledge about the social situation or not).

So, synonym pairs may differ in connotation (*punish=discipline*), affect (*gay=homosexual*), register (*legs=gams*), dialect (*milkshake=frappe*), general use vs. specialized vocabulary (*word=lexeme*), or even language (*dog=perro*), which imparts social meaning in code-switching contexts. In neutral synonym-judgment contexts, similarity across all of these expressive meaning types is preferred so long as it does not involve sacrificing much denotative similarity. In specific contexts, variants on these aspects might be required, and can be derived through RC, as demonstrated for register in (16) above.

In some cases, similarity among non-denotational aspects of meaning and use might override differences in denotation in the search for “good” synonyms. For example, *La-la-land* is a nickname for *Los Angeles*, and *Tinseltown* is a nickname for *Hollywood*. *Hollywood* and *Los Angeles* have different denotations, but their use overlaps in two respects: *Hollywood* is a part of the city of *Los Angeles*, and both are associated with the entertainment industry. Although they do not have the same denotation, *La-la-land* and *Tinseltown* might be considered “better” synonyms of each other than *La-la-land=Los Angeles* or *Tinseltown=Hollywood*, because *La-la-land* and *Tinseltown* match in connotation (‘not a down-to-earth place’) and affect (negative or positive, depending

on the user's attitude to southern California and the entertainment industry), as well as partially matching in denotation.

Collocation, selectional restrictions, and frequency

So far, we have seen various ways in which synonyms can contribute differently to the communicative intent of an utterance – either through denotative or expressive dissimilarities. Other differences might not affect communicative intent, but do demonstrate that synonyms are rarely substitutable. These include collocational, selectional, and frequency differences.

Synonyms are rarely equivalent in their abilities to occur with other words in set phrases. For instance, *Groundhog Day* by the name *Woodchuck Day* just would not be the same thing (DiMarco et al. 1993). The lack of substitutability within *Groundhog Day* follows from the fact that it is an idiom, and thus is not composed of the lexical items *groundhog* and *day*, but is a lexical item unto itself. But **collocational** differences among synonyms are not restricted to words' occurrences in idioms. As corpus linguistics increasingly makes clear, words tend to pattern with limited ranges of other words, either because of arbitrary habit or due to semantic prosody, and words can be synonyms in spite of having different collocational patterns. The example of *thick forest* and *heavy traffic*, discussed in chapter 1, illustrates that the same conceptual meaning (DENSE PATTERNING OF MEMBERS OF A COLLECTION) can be represented by two words (*thick*, *heavy*), but that sharing the same sense does not necessarily make the two words substitutable.

Such patterns of collocation are sometimes described as **selectional restrictions**. Palmer (1981), using the example of *rancid-addled*, notes that although (arguably) they mean the same thing in contexts like *rancid bacon* or *addled eggs*, the selectional (or collocational) restriction on *addled* (in its 'rotten' sense) prevents its substitution in *rancid* phrases (*#addled bacon*). Nevertheless, they are arguably sense synonyms.¹¹

Even if substitutions for a target word are possible, it does not mean that they actually occur in natural language. Using a corpus of size adjective + noun expressions from the World Wide Web, Murphy 1998b shows that four thesauri tend to present as synonyms words that rarely seem to occur in the same noun-phrase environment. For example, *large* and *enormous* occurred in none of the same environments (whereas *big* and *enormous* shared many environments), but *enormous* is presented as a close synonym of both *large* and *big* in thesauri. So while *large* and *enormous* seem like good synonyms in a neutral context, it is not clear that they are used similarly in natural language, and it is furthermore not clear whether differences in use reflect subtle differences in meaning or in non-semantic linguistic habit.

Can a word be denotationally, expressively, and selectionally identical? Geeraerts (1988) offers the nineteenth-century Dutch words *vernielen* and

vernietigen ('to destroy') as a nearly perfect example of synonymy, since they have the same extensions and are found in the same contexts. In spite of this similarity, he argues that because *vernietigen* is more **frequently** used in abstract contexts than *vernietigen* is, they are not **absolute synonyms**.¹²

Illocutional force

Partington (1998) names another type of non-denotative synonymy: **illocutionary synonymy**, in which the illocutionary force of two expressions is the same, even though their denotative meanings might be quite different. This addition to the technical vocabulary is based on Cruse's (1986: 271) discussion of *Ouch!* and *I just felt a sharp pain*, in which he notes that they send the same message, while matching in neither propositional nor expressive content. As another example, Partington gives the pair *You make me sick* and *Will you ever grow up?* Both of these sentences can be intended by the speaker to communicate something like 'your behavior disgusts me.' Since illocutionary synonymy holds between utterances, not words, it is not entirely relevant to the discussion at hand, but it does reflect another pragmatic aspect of synonymy. In an approach to synonymy in which words have to be similar enough for a particular context, "similar enough" entails not changing the illocutionary force of an utterance in which these words are substituted for each other.

4.3 Alleged properties of synonym sets

If one takes a formal approach to semantic relations, then synonym pairs (or larger sets) exhibit a number of logical properties. Since RC-S provides a pragmatic rather than logical definition of synonymy, these logic-based properties are not strictly accounted for. This section introduces those properties (reflexivity, symmetry, transitivity, substitutability, and interchangeability) and demonstrates that these "logical" properties do not necessarily hold in natural language instances of synonymy. It also briefly considers binarity, and whether synonymy, like antonymy, should be considered a binary relation.

4.3.1 *Reflexive, symmetrical, transitive*

Synonym sets are said to be reflexive, symmetrical, and transitive, and have been treated as such in many computational models (Evens et al. 1980). If synonymy is **reflexive**, then any word is its own synonym. However (as seen in [11] in 4.1.4), many definitions of synonymy stipulate that synonyms should be different words, and difference in form is the only context-insensitive stipulation of RC-S. While it is true to say that any word has the same meaning as itself (and that synonyms generally have the same meanings as each other), for our purposes it is not true that any word is its own synonym, since synonymy entails

(in RC-S as well as common understanding of *synonym*) that the target word and synonym have different forms.

Synonyms are said to be **symmetrical** in that words are synonyms *of each other*. While prototypical cases of synonymy are symmetrical, we have already seen (in 4.1.3) that perceptions of similarity are directional, and thus in some cases synonymy appears asymmetrical, such as the thesaurus presentation of *blood* as a synonym for *murder* (but not *murder* as a synonym of *blood*) and in cases in which hyperonyms act as synonyms. So, for example, it might be fine to substitute *punish* for *chastise* in a sentence, but less likely that a substitution of *chastise* for *punish* would result in a true portrayal of the punishment referred to in a particular context.

For a synonym set to be **transitive**, then if word A is a synonym of B and B is a synonym of C, then A is a synonym of C as well. This is not true in natural language, as a thesaurus easily demonstrates. Hardin (reported in Church et al. 1994) ran path-finding software on *The New Collins Thesaurus* (McLeod 1984) and found that the synonym path between any word and its antonym is typically six steps or fewer. In (21), for example, the trail of synonyms leads from *authentic* to *unauthentic*.

- (21) authentic → believable → probable → ostensible → pretended →
spurious → unauthentic

This chain of relations demonstrates (near-)synonymy's intransitivity. While *believable* may be a good synonym for *authentic*, and *probable* is arguably a synonym for *believable*, it is not the case that *pretended*, further up the list, is a good synonym for *authentic*, nor are any of the words to its right. Such synonym-to-antonym chains are common enough that they serve as the basis for a productive word game (see Augarde 1998). This lack of transitivity follows from the lack of perfect semantic match among synonyms. Each synonym differs from its target in subtle ways, but the cumulative effect of those subtle differences allows for a lot of semantic slippage from point A to point C or D or E. Working with a computer model of synonymy and antonymy, Edmundson and Epstein (1972; cited in Evens et al. 1980) proposed that failure of synonym transitivity can be used to test for polysemy. At any point where transitivity has broken down, one concludes that more than one meaning of an intervening word has come into play, as illustrated in (22), where words are represented by capital letters and their senses are represented by lower case.

- (22) A {a} → B {a, b} → C {a, c} → D {c, d}

Words A and D are not synonyms, and the transitivity has broken down because a non-'a' sense of C was carried up the chain, leaving the 'a' sense behind. Using synonym transitivity as a diagnostic for polysemy is equivalent to claiming that if a target word has two synonyms that are not synonyms of each other,

then the target must have two senses. In order for such a diagnostic tool to work, synonymy must only be acknowledged in cases of semantic identity, not semantic similarity (or overlap). In chains of synonyms where we allow semantically similar but not perfectly identical synonyms, semantic slippage is at least as likely as polysemy to be the cause of transitivity failure.

4.3.2 *Substitutable, interchangeable*

Substitutability has already been mentioned as a diagnostic tool for recognizing synonyms.¹³ Substitution is also one of the purposes for which we search for synonyms – in order to replace one word with another in a text without changing the meaning of the text. The term *substitutability* is used in two ways in the literature, either with reference to a specific context (as it has been used here), or with reference to all potential contexts (e.g., Apresyan et al. 1970). The word **interchangeability** can be reserved for this latter context-insensitive kind of substitutability without semantic change (i.e., interchangeability *salva veritate*). Substitutability and interchangeability are generally defined in terms of maintenance of truth-conditions. In other words, only denotative, and not expressive, meaning is considered. Both properties are also generally understood with reference to a single sense of the target word, so the aim is to identify sense synonyms, rather than full or complete synonyms. Lyons (1977: 202), in his definition of synonymy, claims a middle ground between the logical sense-synonymy of context-insensitive interchangeability and the context dependence of single substitutions by stipulating that synonymy entails substitutability “over a certain range of utterances.”

If *substitutability* and *interchangeability* are defined as all communicative and formal aspects of the synonyms being equivalent, then nearly all synonyms fail the test. Expressive, collocational, and selectional differences affect the meaning or markedness of sentences with synonym substitutions. Synonyms that only differ in frequency (e.g., *vernielen*=*vernietigen* – see 4.2.3) arguably fit the substitutability requirement, but such pairs are so rare as to make the notion of SYNONYMY meaningless for natural language.

Using substitutability as a tool for defining synonymy entails using syntactic criteria to determine a relation that is usually described as a *semantic* or *sense relation* (see 4.2.1). This is not a problem for the metalexical account because it treats synonymy as a relation among word-concepts, but for those approaches that claim to relate senses alone, there is an inherent conflict.

In the end, it seems that if synonymy is meant to be a relation among meanings, then substitution is not an appropriate test for it, because it is affected by issues other than sense. If instead synonymy is a relation between word-concepts, then the similarities among synonyms need not be limited to sense. Under the metalexical treatment, substitutability is not strictly a test for synonyms, but the

demands of substitution (as a purpose for which synonyms are needed) can contribute to the contextual requirements of similarity among potential synonyms. Such demands then include syntactic, collocational, and (potentially) expressive similarity. In neutral contexts, one usually searches for synonyms that are perceived as interchangeable with their targets. Such perceptions are almost always false, which again underscores that synonym judgments involve meta-linguistic concepts of words, rather than the words' actual lexical or semantic representations.

4.3.3 *Binary*

Finally, is binarity a property of the synonym relation? As seen above in (11), some definitions of synonymy are phrased in terms of two constituents or expressions (e.g., Katz 1972; Cruse 1986; Hudson 1995). Such phrasings should not be taken too seriously. If one assumes (as many have) that synonymy is transitive, then phrasing the definition in terms of "two words" does not limit the number of synonyms that a word can have. While it is easiest to test for synonymy when only two items are considered at a time, this is a limitation of the testing process, not a limit to the number of synonyms a word can have. However, in any larger set of synonyms, two members of the set might seem closer in meaning or use than the others, and so a perception of synonym binarity may arise from the comparison process involved in finding and testing synonyms. Since few words have all the same properties, the degree of similarity within a large set of synonyms may vary considerably, and so smaller synonym sets seem "more synonymous."

4.4 **Synonymy's effects on vocabulary**

No word is an island. The contents of a language's vocabulary affect how individual words are used. This observation is one of the motivations for supporting an associationist view of intralexical organization:

Within the same language all words used to express related ideas limit each other reciprocally; synonyms like French *redouter* 'dread,' *craindre* 'fear,' and *avoir peur* 'be afraid' have value only through their opposition: if *redouter* did not exist, all its contents would go to its competitors. (Saussure 1959 [1915]: 116)

Saussure assumes here that a language's lexical resources expand to cover a pre-existing conceptual field and that the meanings of the words that cover the field are determined by their relation to each other. Saussure's observation focuses on the language's relation to 'reality' and leaves out the role of language users in maintaining distinctions among near-synonyms. But rather than being simply the result of semantic tensions within a language, the forces at work

in vocabulary management are pragmatic forces, which involve metalinguistic knowledge and Gricean principles of communication, and, by extension, the forces of cognitive and linguistic economy. In this section we look first at the avoidance of synonymy in natural languages, by which synonyms become less alike, and then turn to the possibility that synonyms become more alike by contaminating each other's semantic interpretation. Caught up with the issue of synonym avoidance are the roles of synonymy in language acquisition and language change.

4.4.1 *Avoidance of synonymy*

It is often noted that "languages abhor absolute synonyms just as nature abhors a vacuum" (Cruse 1986: 270). Full or absolute synonymy has been declared an impossibility by numerous authors (e.g., Bloomfield 1933; Quine 1961; Chafe 1971), and Harris (1973: 12–13) goes so far as to say, "If we believe there are instances where two expressions cannot be differentiated in respect of meaning, we must be deceiving ourselves." To account for this, some have fashioned principles that essentially state that "[i]f two ways of saying something differ in their words or their arrangement, they will also differ in meaning" (Bolinger 1977:1). These include Bréal's (1900) Law of Differentiation and E. Clark's Contrast principle, under which one always assumes that a new word involves a different meaning from any other words one already knows (Clark 1987, 1992, 1993; see also Clark and Clark 1979).

Such principles are intended to explain why synonymy is such an unstable phenomenon in language. When a language contains a synonym pair, then either the meaning of one (or both) changes in order to make them less similar, or one of the words drops out of use. A well-worn example of the former situation is the division of labor between 'on the hoof' and 'on the plate' words for animals, such as *cow-beef*, *pig-pork*, *deer-venison*, and so forth (e.g., Jackson 1988). The first word in each pair can be traced back to Anglo-Saxon, but the second only arrived in English after the Norman invasion of 1066. Until that time, people ate cow or pig for dinner, but with the arrival of a new word for the same thing, the meanings of the words specialized. Since the French language was more closely associated with fine dining than English was, speakers tended to see *beef* (or *boeuf*) as the word one uses for cows as food, and to leave the word *cow* for the pastoral setting. While this example (like many others) involves shifts in denotative meaning, in some cases connotation or affect is what differentiates synonyms. In extreme cases, two forms of the same word may acquire different connotations or affect. For example, for American English speakers who have both pronunciations, *vase* as /va:z/ is at home in the phrase *Ming vase* where it refers to something big and valuable, but is not used for little cheap flower containers, as in *bud vase*, where it is /ve:s/.¹⁴ Similar differences can be found

for two orthographic forms, such that American English writers who have both forms tend to use *theatre* for the art form (*modernist theatre*) and *theater* for a type of room (*operating theater*). In these cases, semantic differences emerged because language users resist having two different forms for the same purpose.

Thus, for any set of different word-forms that seem to have the same denotations, it is usually possible to find either a slight denotative difference, a connotative or affective difference, a collocational difference, and/or some group of people who believe that they use the two words differently. (For example, the American Dialect Society discussion list has several members who claim that they semantically distinguish between two colors, *gray* and *grey*, with one or the other being darker.¹⁵) But why are we so loath to admit (and admit to) synonymy in our vocabularies? One reason is that synonymy is uneconomical. Taylor (forthcoming) observes that

Synonymy, like polysemy, represents a deviation from the canonical one form – one meaning relation. But whereas the existence of polysemy arguably enhances the expressive potential of a language (albeit at the risk of ambiguity), synonymy would have to be regarded as an extravagant luxury, even, as dysfunctional, in that limited symbolic resources get squandered on the designation of one and the same semantic unit.

While linguistic-cognitive economy might be part of the motivation for avoiding synonymy, it is not the whole story. If economy were the sole motivator, then language communities would be more likely to abandon one of the words when a pair of synonyms crept into their language, but they seem just as (if not more) likely to invent differences among the words and thereby add more descriptive synonyms and near-synonyms to the language.

A more complete explanation of why synonyms repel each other is made by pairing economic motivations with assumptions about communication and intentionality. Following Grice's Cooperative Principle (1975), we assume that people use language in rational ways that aid others' understanding of their intentions. Following the maxims of that principle, we assume that people try to give a sufficient amount of information (maxim of Quantity) that does not misrepresent what the speaker knows (maxim of Quality) in a concise form that eschews obscure turns of phrase (maxim of Manner) and that stays relevant to issues at hand (maxim of Relation). When a synonym is introduced into discourse, especially if that synonym is a less common member of the synonym set, the listener assumes that there is a reason for the speaker's choice of that synonym rather than another possibility. However, in order to have a rational motivation to choose one synonym over another, one must perceive a difference between them. Since rational language users generally choose their words for their meanings (rather than their sounds), the hearer presumes that the speaker's choice of a particular word was motivated by the word's informational properties, rather than for its form. So, if a friend said *I clacked Jane to let her*

know we'll be late, you'd assume that they're referring to something other than phoning or paging or e-mailing, or that if they are referring to one of those things, they are saying something additional or special about it. So, if *I clacked Jane* means 'I paged Jane,' then it likely adds some information like 'Jane's pager doesn't beep, it goes *clack*.'

Horn (1984, 1993) uses his Q and R principles (a streamlining of Grice's maxims) to account for such "pragmatic divisions of labor" in which two semantically equivalent forms come to have two different uses. So, for example, *pink* and *light red* are understood to refer to different colors because if the speaker meant *pink*, he would have said *pink*. Clark and Clark (1979) refer to this phenomenon as "preemption by synonymy" and demonstrate its relevance to verbs that are zero-derived from nouns. For example, if we say *Joy cheffed up a storm* instead of *Joy cooked up a storm*, we assume that the verb *chef* means something different than *cook* and that there is therefore a reason to not use the conventional verb in this case.

In the process of language acquisition, E. Clark (1987, 1988, 1990, 1993) has shown that children's early word meanings change as their vocabulary gets larger because children, like adult speakers (Clark 1992, 1993), are always avoiding synonymy and assuming contrast in word meanings.¹⁶ Thus, the number of possible meanings for unfamiliar words is reduced, since the child assumes that a new word's meaning is one that is not expressed by familiar words. Because children are always trying to have different forms for different meanings, their overgeneralizations (e.g., using *dog* for all animals) and mis-mappings (e.g., using *juice* for 'bottle') only last until the conventional words for those meanings enter their vocabularies and provide synonymous competition for the earlier form-meaning mappings. Extreme cases of early synonym avoidance can be seen in some children who are exposed to two languages and go through a short initial period of avoiding cross-language synonymy (Taeschner 1983). So, while such a child has been exposed to English *milk* and French *lait*, the child has only one of these items in her active vocabulary, or if she uses both words, then she has different meanings for them (perhaps *milk* is in a bottle but *lait* is in a cup). In such cases, the child has not yet realized that the words in the two languages are part of different systems and therefore not in semantic competition with each other. Perhaps due to children's avoidance of this relation, synonymy appears later in their metalinguistic behavior than other relations. Using word-association and false recognition tasks, Heidenheimer (1978) found that six-year-olds had mastered antonymy, but could not perform as well with synonyms until two years later.

However, differences in form do not always signal differences in meaning. Ullmann (1962: 141) argued that complete synonymy can be found in technical jargon and "may even persist for an indefinite period." His examples include *caecitis=typhlitis* and *spirants=fricatives*. Such examples may in fact signal

some social differences (such as currency in recent developments in the field, regional preferences, or expert versus amateur). Nevertheless, Ullmann is correct that the vocabulary of science and natural categorization does allow some synonymy, even if it is often short-lived.

In more common vocabulary, the *-one* and *-body* pronouns have been claimed to be fully synonymous (Jespersen 1914; Bierwisch and Schreuder 1991). For most speakers of English, the sentences in (23) have no discernible semantic difference.

- (23) a. Someone ate my lunch.
b. Somebody ate my lunch.

This is not full synonymy, however, since the *-body* forms alone can be used in another set of senses, as shown in (24).

- (24) I want to be a somebody (#someone), not a nobody (#no one).

What is notable here is that the *-body* and *-one* words seem perfectly synonymous in their pronoun use, but where they are used as nouns, only one will do. This raises the suspicion that closed classes (such as pronoun) tolerate synonymy better than open classes (such as noun). Since *someone* and *somebody* are synonymous in (23) but not in (24), one is tempted to view these as cases of complete sense synonymy rather than full synonymy. But Bolinger (1976) provided many examples that showed substitution failures for *-body* and *-one* pronominal forms, such as the example from Thackeray in (25), indicating that the sense synonymy is not such an exact match as had been supposed.

- (25) She vowed that it was a delightful ball; that there was everybody that every one knew . . . [# . . . there was every one that everybody knew]

Bolinger concludes that the *-one* forms are marked for closeness to the speaker, while the *-body* forms are unmarked for closeness, and therefore can be used in a greater range of contexts than the *-one* forms. Whether or not this particular semantic analysis is correct, the substitution failure for the two sets indicates that something more than stylistic differences distinguishes these nearly-synonymous forms.

Another set of candidates for complete synonymy can be found in a few examples of free variation in pronunciation, including the two pronunciations of *either* (/i:ðɹ/ vs. /ajðɹ/) and its rhyming partner *neither*.¹⁷ Unlike some variations in pronunciation (I say /təme:to/, and you say /təma:to/), the two pronunciations of *either* can co-exist in the same speech community and in the same speaker (e.g., in northeastern US dialects; see Coye 1994). But unlike the case of *vase* above, this variation within some speakers does not lead us to assume that the choice to say /i:ðɹ/ signals something different than /ajðɹ/. Again, perhaps English speakers tolerate this lack of semantic differentiation

among differing forms because they belong to a closed grammatical class, to which new items and meanings are not readily added.

Besides pragmatic, communicative forces against synonymy, full synonymy is further made unlikely by words' idiosyncratic paths through time and language. If two words start out as full synonyms (say, because they have only one sense among them), they stop being absolutely the same as soon as one of them becomes polysemous and the other one does not gain the same extra meaning. At a trivial level, no two words have all the same senses because each word has the potential for a self-referential sense, as in '*Sofa*' has two syllables. Plainly, *couch* cannot be substituted for *sofa* in this case because *sofa* here refers to a certain word form. But ignoring such marked uses of words, it is still very unlikely that two words have all the same senses. Even if *couch* once was fully synonymous with *sofa*, it no longer is because it has acquired a psychoanalytic sense, as in (26).

(26) Anna takes her problems to the couch (#sofa) each Tuesday.

Even if we consider relations among single senses of words, polysemy reduces the chance of absolute substitutability, since the non-synonymous senses may influence the synonymous senses through connotation (see 4.2.3). So, for example, *glasses* and *spectacles* might differ slightly in connotation since one echoes a material sense and the other an experiential sense.

Considering that synonymy is so rare and so unstable where it does exist, do languages have any use for synonyms? Miller and Johnson-Laird (1976: 266) note that "[o]ne can conceive of a language that would make no use of synonymy," while contrastive and hierarchical relations seem semantically necessary. While synonymy might not be needed in a language, it can be useful. Chapter 2 noted synonymy's role in textual coherence. However, synonyms are more valuable in conversation or texts if they are not exactly the same. Recall the report in (27), which was introduced in chapter 2:

(27) Furman University's new alumni **house** made its way across a construction site . . . [T]he 150-year-old **structure** has been located four miles from campus . . . [T]he two-story **building** slowly made its way along . . . [T]he 11-room **mansion** . . . arrived on the campus intact. ("Old mansion makes a big move to Furman University campus," *Chronicle of Higher Education*, 2 April 1999)

The near-synonyms here are similar enough that they clearly refer to the same thing (in this particular context), but they are different enough that each not only avoids repetition, but also contributes something particular to the message. After the reference is established with *house*, *structure* focuses the reader's attention on its physical shape (rather than its function), *building* helps to fill in that shape and give a vivid picture of something massive moving down the street,

and *mansion* gives an idea of the building's style and size. This use of near-synonyms solves the communicative problem of how to get as much information into as economical a form as possible,¹⁸ and this could explain why semantic differentiation of synonyms (rather than word extinction) is such a common occurrence. The more near-synonyms a language has, the more meanings it expresses lexically, and the more nuances it can communicate concisely. Again, this allows for contrast among synonyms, so that one can insist on distinctions like: *I may be an alcoholic, but I'm no drunk*. Ullmann (1962) identifies several more uses for synonyms within texts. These include repetition of an idea for emotive emphasis (*I want you out now, immediately, and post haste!*) and comic repetition, both of which are evident in Monty Python's pet store sketch, in which a parrot is described by an irate customer as *passed on, expired, gone to meet its maker, late, stiff, bereft of life, rest[ing] in peace, pushing up daisies, hopped the twig, and shuffled off this mortal coil*. Emotive, comedic, poetic, and legal language all exploit synonymy, either because the different words communicate slightly different information, or because they communicate the same information in a different form. So while pragmatic forces work against absolute synonymy, other varieties of synonymy are useful enough to thrive.

4.4.2 *Sense contagion among synonyms?*

While synonyms seem to semantically repel each other, driving their meanings further apart in order to avoid absolute synonymy, they might also make words more alike. If two words are perceived as synonyms in one sense, then it stands to reason they might subsequently be substituted for each other in previously non-synonymous senses. However, there is little evidence for this. In instances where words are synonymous in several senses, it is because words with the same meaning have the same opportunities for polysemous extension, not just because one word follows the other into a new meaning.

For instance, *big* shares a 'great size' sense with words like *huge* and *enormous*, but also has a sense 'important.' Other size synonyms can be used in this 'important' sense as well, as in (28).

(28) I have a(n) big/huge/enormous decision to make.

But such similar patterning among synonyms is unlikely to have its source in the relations among the words involved. That is, the reasoning involved in determining whether *huge* can mean 'important' need not involve our knowledge of the word *big*. We know that *huge* can mean 'important' because we know that *huge* means 'of great size' and that things with great size are likely to be important (i.e., the additional sense for *huge* arises in the same way as the additional sense for *big*). We understand the 'important' sense of *huge* by virtue of knowing its size sense, not by virtue of knowing its relation to *big*.

If synonyms spread their many senses to each other, then full synonymy would be the default, rather than an unusual situation in natural language. In this case, we would expect to see full synonymy in semantically unmotivated cases of polysemy as well as in the semantically motivated ones like ‘great size’ = ‘importance’ in *big* and *huge*. For instance, the use of *mouse* for a computer input device is an idiosyncratic development, and one does not see that sense in *mouse*’s (near-)synonyms, such as *rodent*, *vole*, or *Mus musculus*. If the knowledge that two words are synonyms can be used to extend one of the words’ uses, such usage is quite self- and language-conscious. For example, if a person referred to his feet as his *canines* or his *pooches* (on analogy with the slang use of *dogs* to refer to feet), the meaning would not be readily apparent without ample contextual cues, and it would be taken to be a form of humorous language play, rather than unremarkable polysemous extension.

Thus, semantic contagion among polysemous synonyms is not a natural part of semantic change unless the underlying causes of one word’s polysemy apply as well to the other word, making it polysemous in the same ways.

4.5 Synonymy and other relations

Since most synonyms are not logical sense synonyms, but are near-synonyms, they do involve some sort of semantic contrast. This, and the fact that other paradigmatic relations incidentally involve difference in form (and thus qualify as potential synonyms by RC-S), means that near-synonyms can also be classified as examples of other paradigmatic semantic relations.

As already mentioned, hyperonyms and hyponyms are often treated as synonyms (as in *punish* $\geq$ *discipline*). Other near-synonyms, however, do not fit this general-specific mold, but are instead co-hyponyms of the same hyperonym. So, for example, *castigate* and *chastise* may be near-synonyms for a particular context, but this does not mean that *castigate* refers to a kind of chastisement or vice versa. Instead, they describe overlapping areas of the same superordinate concept PUNISHMENT. For this reason, Persson (1990: 136) proposes that lexical synonymy is a “special case of hyponymy,” in which semantically similar words fall under the same general concept, but have a “‘fuzzy’ co-hyponymous interrelationship.” Persson notes that most theories take co-hyponymy to be a relation of semantic contrast. So while antonyms are co-hyponyms that have mutually exclusive senses, near-synonyms are often co-hyponyms with overlapping senses.

The boundary between synonymy and antonymy is not always so clear. In Chaffin and Herrmann’s (1984) relational sorting task (see 3.5.1), they had expected that subjects would group **attribute similars** with synonyms. On their reasoning, *rake-fork* or *movie-photograph* are like synonym pairs in that there are similarities among the described items: rakes and forks have tines,

and movies and photographs are visual representations created with a camera. On the contrary, the subjects reasoned that the attribute similars belonged with antonyms. According to RC-S, the subjects must not have considered *rake-fork* to be similar enough to serve as synonyms. In the neutral context of the sorting task, the most salient and contextually relevant features of the words are their prototypical usage and reference. Since these do not overlap (they may have attributes in common, but a prototypical fork is very different from a prototypical rake), the pair fails to share all the same contextually relevant properties but form. In another context, however, these attribute similars might fare well as synonyms. As discussed in chapter 5, the line between antonymy and synonymy is a fuzzy, context-sensitive one.

4.6 Summary

According to the RC-S approach, any pair of words is potentially synonymous. What actually counts as synonymous is constrained by the demands of communicative language use and the context in which this language use occurs. This contrasts sharply with traditional philosophical-semantic approaches to synonymy, in which words are only synonymous if they share all or most of their meaning. The contrasts between these approaches are not surprising, considering their attention to different kinds of language. The current approach is concerned with natural language as a means for human communication, whereas the philosophical-semantic tradition has been concerned with the language system in and of itself and the logically possible relations among its components. But while identity of denotative meaning is a logically possible relation, it is an anathema to natural language. Words that are used and recognized as synonyms in natural language are usually quite different in their denotative (and/or expressive) meaning. RC-S allows for these differences so long as they are limited to contextually irrelevant aspects of meaning. Contextual irrelevance is largely tied to denotative similarity. While it has been noted (in 4.2.1) that synonymy is usually understood to be similarity among senses rather than among extensions, synonyms do need to be co-referential within a context. Thus, near or graded synonyms contribute different information to a discourse but are considered ‘similar enough’ to be synonyms on the grounds that their sense similarity alerts us to the fact that the words are co-referential even though they mean different things.

5 Antonymy and contrast

*What's the opposite of actor?
The answer's very simple: tractor.
I said that just because it rhymes,
As lazy poets do at times.*

Richard Wilbur, *Opposites* (1973)

Antonymy (referring to binary opposition generally) is arguably the archetypical lexical semantic relation. Unlike synonymy, everyone agrees that antonymy exists, and it is robustly evident in natural language. Unlike hyponymy and meronymy, it can be as much a relation among words as it is a relation among concepts or denotata. Being such a good example of a lexical semantic relation, antonymy is also the focus of much of the debate as to whether semantic relations are stored or derived and whether they are intralexically or metalexically represented. This chapter is focused on that debate and on why contrast involving semantic incompatibility¹ is so central a semantic relation. Section 5.1 presents the metalexical approach to antonymy and incompatible contrast sets, in which antonyms may be metalexically stored, but only count as antonyms if they are also derivable by Relation by Contrast. In 5.2 properties of antonymy that have been proposed in the linguistic literature, including symmetry, markedness, and binarity, are reviewed, then 5.3 covers antonym subtypes and how RC accounts for them. Section 5.4 concerns the roles of antonymy and non-binary semantic contrast in natural language in discourse, semantic or lexical change, language acquisition, and across cultures. Section 5.5 provides a summary. Since antonymy was the focus of some discussions in Part I, some examples and issues are revisited only briefly in this chapter. Sections 2.1 and 2.3 in particular cover territory relevant to this chapter.

5.1 The metalexical approach to semantic opposition and contrast

5.1.1 *Defining and deriving antonyms and contrast sets*

A Relation-by-Contrast definition should be easy to formulate for antonyms and contrast sets, since contrast is the name of the game. However, formulating

such a definition is less than straightforward, since one must determine exactly which properties contrast within antonym or contrast sets. If we presume that ANTONYMY is the opposite of SYNONYMY, then the similarities of synonyms (their meanings) should be the dissimilarities in antonyms. In this case, we would fashion a version of RC that states that a semantic contrast relation holds between words that have all the same relevant properties except for their meanings. However, such an instantiation of RC would give us homonyms from the same grammatical category (same form and syntactic properties, different meaning) like [financial] *bank* and [river] *bank*, which are hardly typical cases of antonymy. As Lyons (1977: 286) notes, “[o]ppositions are drawn along some dimension of similarity.” More specifically, oppositions are usually drawn on the basis of semantic similarity. But what must be similar in an opposition, and what must be different?

Because the issue of what is similar and what is different varies by context, the mechanics of RC resolve the similarities and differences. Thus, the following instantiation of RC specifies only that one relevant property of the words is contrasted.

(1) **Relation by Contrast-Lexical Contrast (RC-LC)**

A lexical contrast set includes only word-concepts that have all the same contextually relevant properties but one.

Such a general definition is in keeping with the notion that semantic contrast is the most basic or general of the semantic relations. The only difference between the definitions of RC-LC and RC as originally presented in chapter 2 is that RC-LC specifies a relation within sets of word-concepts, while RC can relate sets of anything. The definition of RC-LC is so general that it subsumes synonymy, homonymy, hyponymy, and any other relation among word-concepts that one can imagine. Just as for RC-Synonymy (in chapter 4), then, RC-LC relies on pragmatic forces to determine the aspects of similarity in a contrast set. Unlike RC-S, RC-LC also relies on those forces to determine what differs among the contrasted items.

This approach may seem counterintuitive. If antonymy is the most robust of the semantic relations, one might argue that it should be the most specifically defined. However, the relevant literature lacks evidence for such specifics. Instead, antonymy and/or incompatibility tend to be “defined” by diagnostic tests (e.g., Kay 1971: 873; Cruse 1986: 93; Lyons 1995b: 128), which require that sentential minimal pairs involving antonymous predicates are mutually contradictory. Thus, the italicized pairs in (2) are incompatible.

- (2) a. The bread is *fresh*. The bread is *stale*.
 b. The Queen of England is *female*. The Queen of England is *male*.

Such diagnostics may identify incompatible pairs, but they fail to distinguish between pairs that simply have incompatible reference (*cat/mineral*) and those whose contrast seems more antonymous (*cat/dog*). Furthermore, such tests reflect *semantic* incompatibility, but do not measure the *lexical* contrast of canonical antonymy, by which *alive/dead* are “good” antonyms, but the morphologically dissimilar *alive/expired* are not.

Where criteria for antonymy or contrast sets have been proposed, they are usually defined in terms of componential semantic analysis, such that contrast sets (including antonyms) are words that share a set of semantic features, but contrast in one feature or feature specification. So, for example, *red/yellow/blue* form a contrast set because they share features that indicate they are primary, basic-level colors, but fail to share feature specifications for HUE. Aside from the problems inherent to compositional semantic representation, such criteria for antonymy are problematic. Since the criteria rely on semantic features, they predict that if a word’s antonym has a synonym, then that word has two equivalent antonyms. But this prediction rarely holds. This criticism has been most vigorously made by those encouraging an associationist model of the lexicon, and has been subject to considerable counterargument. As discussed in 2.1.7, the favorite example of associationists involves the basic size adjectives. Since *large/little* are not perceived to have as good an antonymic fit as *big/little*, some (Gross et al. [1989], *inter alia*) have argued that antonymy is a relation between words rather than meanings. But, as others (Murphy [1995], *inter alia*) have pointed out, serious semantic and usage analysis of these words reveals a principled basis for preferring *big* as an antonym for *little* (again, see 2.1.7). But in spite of the bad choice of example, the associationists have a point. If we consider the synonym pair *edematous=swollen*, for example, it seems clear that *swollen* is the better antonym for *unswollen*, even though the synonyms are (for many contexts) semantically indistinguishable. The simplest explanation for the preference of *swollen/unswollen* is that these items share their stems and registers, while *unswollen/edematous* do not. Thus, in at least some cases, a definition of antonyms on the basis of semantic components fails, since the form of words (not just their semantic content) can contribute to their contrast relations. Furthermore, as we saw in 2.1.5, words without intensional content (proper names) may be said to have opposites on the basis of their formal or social properties. Thus, the criteria for antonymy must be general enough to allow for the influence of non-semantic as well as semantic factors.

RC-LC makes no specific reference to meaning. Instead it relies on the salience and relevance of meaning in the communicative use of language in order to assess lexical relations. Thus (as discussed in chapter 4), meaning similarities are prioritized in the “similar contextually relevant properties” criterion, and meaning difference is prioritized in the “one contextually relevant

difference" criterion. While RC-LC is general enough to account for any and all lexical relations (I return to this point later), the relevance and salience of meaning guarantees that the most prototypical examples of contrast relations involve items that differ on one point of meaning.

What do we lose by defining antonymy and semantic contrast with such a vague and context-dependent principle as RC-LC? Obviously we lose specificity. Let us compare Cruse's (1994) prototype approach to opposition. According to it, the "goodness" of an opposed pair depends on its having the following properties: diametric opposition, binarity, exhaustiveness of the superordinate domain, and symmetry. By such a definition, complementary antonyms like *alive/dead* better fit the definition than examples like *blue/red* or *warm/cold*. Nevertheless, in contexts in which an inclusive stance toward the prototype is allowed, the latter examples could count as opposites because they are "close enough" to the prototype in various ways.

However, nothing is really gained by including such specific properties in a definition of antonymy, even a prototype-based one, since most of them fall out from the demands of RC-LC. The best examples of minimal difference are those that are diametrically opposed and symmetrical, since otherwise more than minimal difference is involved. Being exhaustive of the superordinate domain guarantees that there are no other competitors for antonym status. The remaining property, binarity, is its own problem (to be discussed in 5.2.1), but again, identification of minimal difference is easiest (and thus more likely to count as "good" antonymy) in binary cases, where a single difference is made salient by the lack of competing potential antonyms.

What do we gain by a general definition of lexical contrast? Such a definition allows for the whole gamut of opposites, from *black/white* and *hot/cold* to *sweet/sour*, *blue/red*, *gin/tonic*, and *fork/spoon*. It also allows for prototype effects in judging examples of lexical contrast as "good" or "not-so-good" cases of these relations. The "good" antonyms are those that contrast on a single most relevant property and that match on their other relevant properties. The "best" antonyms are those that go beyond matching on the most obviously relevant property and extend their similarities to as many properties as possible while maintaining a single relevant difference. So, for example, *maximize/minimize* was judged the most antonymous pair by subjects in Herrmann et al.'s 1986 study (see 2.1.4) because the two words have a symmetrical semantic relation as well as extremely similar form. So, *maximize/minimize* is judged a slightly better case of antonymy than *large/small* or *adore/despise* because the two words are maximally similar.

To take this claim to its logical conclusion, the best examples of opposition should be those in which the semantic difference is absolutely minimal *and* the form of the words is identical, since this would contribute another aspect of similarity. Such words that are their own opposites are sometimes termed

Janus words.² English includes examples such as *temper* ('to harden'/'to soften'), *cleave* ('to stick together'/'to force apart'), and *sanction* ('to approve'/'to censure'), plus a slew of denominal verbs for putting in or taking out things (e.g., *to string a bean* vs. *to string a violin*, Clark and Clark 1979). However, their failure to be considered "good antonyms" is not surprising for two reasons. First, their semantic differences are rarely minimal (in spite of the simple sense glosses given above). For example, *temper* can be used for softening comments or processing metal to make it hard, but not for hardening comments or processing metal to make it soft. Second, RC-LC contrasts word-concepts, and most people would have no reason to have separate word-concepts for the various senses of the word (after all, we speak of them being "the same word"). Thus, *temper* and *temper* would not be available as potential examples of incompatibility, since they are not perceived as different things. Once it is pointed out that *temper* is its own opposite, we may construct *TEMPER*₁ and *TEMPER*₂ concepts for the purpose of contrasting them, but otherwise the two are considered as one and are therefore not salient examples of antonymy.

In contrast to the artificial task in Herrmann et al.'s experiment, we usually judge the "goodness" of antonym fit when looking for the best antonym for a particular word, which involves comparing pairs of antonyms with a member in common. In neutral contexts, a word has more than one potential "good" antonym if a larger contrast set is available (*sweet/sour* vs. *sweet/bitter*), or if a group of synonyms are semantically opposed to the target word (*big/little* vs. *big/small*), or if different facets of the target word can be opposed (*girl/boy* vs. *girl/woman*). Antonym choice in neutral contexts is particularly interesting for words with more than one taxonomic sister in a semantic field that does not involve a bidirectional scale. Emotion³ and taste adjectives provide interesting case studies, since *happy/sad* and *sweet/sour* seem "more antonymous" in English than *happy/angry* or *sweet/bitter*. Focusing on taste, Charles, Reed, and Derryberry (1994) claim that the antonymic connection between *sweet* and *bitter* is mediated by *sour* (*sweet/[sour]-bitter*), thus making the *sweet/sour* contrast primary and linking sourness to bitterness by near-synonymy. But the 'goodness' of antonym fit in the case of *sweet/sour* probably has more to do with context-specific experience than context-neutral similarity between *sweet/sour* but not *sweet/bitter*. In particular contexts, sweet can have any number of antonyms, including *salty* (in discussing snack foods), *bitter* (chocolate), *hot* (peppers), *dry* (wine) and so forth. Cross-linguistically, the opposite of 'sweet' is culture-dependent. In Japanese the opposite of *amai* 'sweet' is *karai* 'pungent' (i.e., spicy-hot and/or salty), and in Korean, Ponapean, and other languages, 'sweet' contrasts with 'bitter' (Backhouse 1994). These cross-linguistic differences either arise through the experience of the words in linguistic contexts (such as the English phrase *sweet-and-sour* and the Japanese compound *amaikarai*) and/or through differences in the experience of taste (due to different

dietary habits). For instance, the use of dairy products which go from sweet (fresh) to sour (spoiled) might affect the perception of *sweet-sour* as forming a continuum, while the use of fruits that go from bitter to sweet as they ripen would make the *bitter-sweet* continuum salient. The opposed terms are perceived to be on the same scale (a flavor ranges from sweet to sour, or sweet to bitter) for some contexts (e.g., judging the ripeness of fruit) and the more common those contexts are, the more likely the labels for these flavors are to co-occur, giving rise to the experiential reinforcement necessary for the opposition to gain canonical status.

Across specific contexts, the range of antonyms for any particular word is far greater than in a neutral context, since contextual cues may override semantic cues and canonical pairings. For instance, in a neutral context, *smooth/rough* seems an ideal antonym pair, but in context, the opposite for *smooth* depends on what *smooth* is describing – non-smooth paper is *rough*, a non-smooth journey is *bumpy*, non-smooth cake batter is *lumpy*, and something else that is not smooth might be *grainy* or *ridged* or *sticky* or *difficult*. For many of these, we might say that the opposite is associated with a particular sense of *smooth*, in which case semantic considerations are at least as important as pragmatic; all the context needs to do is point out which sense is relevant. But the opposite of *smooth* could also be a very unrelated adjective, like *red*, if red things and smooth things are in complementary distribution in some context. Let's say we have a stock of treated canvas fabric. It comes in five colors, red, blue, yellow, pink, and green. The blue, yellow, pink, and green varieties are coated with a slick waterproofing agent, while the red type is very coarse. In assessing the appropriateness of these canvases for a project, I ask you *Do you want red or smooth?* Here *red* and *smooth* occupy the same type of linguistic context in which we find other cases of binary opposition (see 5.4.2). The only difference here is that the opposition between *red/smooth* is dependent upon contextual knowledge in a way that the opposition between *rough/smooth* is not. If we are unlikely, in our metalinguistic discourse, to claim that *red* and *smooth* are antonyms, it is only because we are happier reserving the term *antonym* for context-neutral, and especially canonical, pairs.

The mechanics of RC-LC are further discussed throughout the chapter, but first we return to the issue of RC-LC's generality. Why, if RC-LC is so general, are antonymy and contrast sets the most prototypical relations, rather than other meaning relations, for example hyponymy/hyperonymy? Several factors conspire to favor antonymy (or disfavor hyponymy). First, according to RC-LC, the related words differ in only one property, but hyponyms tend to have much more information associated with them than their hyperonyms. For example, *furniture* is anything somewhat large but movable that makes a room or living/working area useful to people. But *chair* is far more specific, and therefore several more semantic criteria are needed to identify chairs (they are for sitting,

they have backs, they seat one person, etc.). So, *furniture* and *chair* are not minimally different as compared to items on the same taxonomic level. Within the basic level, we can compare *chair* to other furniture names and find single differences that could be relevant in particular situations, giving rise to different antonyms depending upon which difference is relevant:

- function: *chair/table* (furniture for sitting on/for sitting at)
- structure: *chair/stool* (seat with/without a back)
- capacity: *chair/sofa* (seat-with-back for one/many)

While we can succinctly state the minimal differences between *chair* and its opposites, as in the parentheses above, if we try to state the minimal difference between *furniture* and *chair*, we run into the problem that *furniture* does not have a unique hyponym on any single criterion. For example, if we tried to characterize the difference between *furniture* and *chair* as 'furniture' vs. 'furniture for sitting,' then we have equally described the *stool* < *furniture* and *bench* < *furniture* relations. This highlights both the asymmetry and multiplicity of hyponymy relations, whereas opposite relations are typically symmetrical (but see 5.2.2) and often unique (for any particular relevant minimal difference), making them more consistent and salient associations and thus more central to our notion of a LEXICAL RELATION prototype.

Issues of form provide another set of reasons why hyponymy is a less prototypical relation than antonymy. Hyponyms and their hyperonyms tend to differ in length (*chair* < *furniture*), morphological complexity (*bluebird* < *bird*, *pen* < *writing implement*), frequency and commonality (basic level words being the most frequent and well known; Rosch et al. 1976; Rosch 1978), whereas within a taxonomic level, antonyms or contrast sets are often similar in formal properties, being similarly complex and common (e.g., *large/small*) or being a stem and its negation (*moral/amoral*). If we are relating concepts of words, then form is potentially relevant, and therefore opposites, which are likely to share formal properties, will be better examples (and thus closer to the prototype) than hyponyms and their hyperonyms.

We could revise this argument for other lexical relations. Antonymy is more prototypical than synonymy because it focuses on the salient issue of meaning difference and because language is more conducive to cases of perfect (or near-perfect) antonymy than perfect synonymy. Homonymy is a less-good example of a lexical relation since the word-concepts it relates are not always clearly distinguishable to language users and because the differences in (ever-relevant) meaning are too gross to be considered "minimal." And so forth. Perhaps antonymy's central position among the lexical relations is part of the reason why canonical antonyms are far more common than canonical hyponyms or synonyms or homonyms, as discussed in the next subsection. The specialness of antonymy and contrast is underscored by Chaffin and Herrmann's (1984) finding that the distinction between contrasting and

non-contrasting semantic relations is the most general distinction made by language users.

5.1.2 *Canonical antonymy and contrast*

Because canonical lexical relations are usually antonyms, canonical antonymy has already been discussed in some depth (see 2.1.4, 2.3.1). The evidence for canonical relations includes the frequency and strength of associations between certain pairs (e.g., *black/white*, *tall/short*, *good/bad*) in free word-association tasks and in text, where certain antonyms have been found to co-occur at extremely high rates. Recent works have shown significant differences in the rate of textual co-occurrence of canonical and non-canonical antonyms.⁴ For example, Willners (2001) found that canonical and non-canonical antonyms both co-occurred at greater than chance rates in the Stockholm-Umeå corpus of Swedish text. But while non-canonical antonyms co-occurred 1.45 times more often than expected, the canonical antonyms from the same semantic fields co-occurred at 3.12 times the expected rate. Expanding upon the work of Charles and Miller (1989) and Justeson and Katz (1991, 1992) (see 2.3.1 and 5.4.4), Willners suggests that adjectives are learned as canonical antonyms when they occur together more frequently than other antonym pairs from the same semantic scale. Nevertheless, some of the pairs that Willners expected to co-occur in the corpus did not, such as *full/tom* ('full'/'empty'), raising the question of whether antonyms might join the canon with only rare co-occurrence in text.

Jones (2002) notes that noun or verb antonym pairs co-occur as frequently as adjectival pairs and develops a list of co-occurrence criteria for strongly canonical (in his terms, "good") antonyms. These criteria include that (a) the two words' rate of co-occurrence is much higher than the expected (chance) rate, (b) the observed rate of co-occurrence is at least 6.6 times the expected rate, and (c) the pair has a high rate of fidelity – that is, the occurrence of one should very often involve co-occurrence with its antonym. In his study of fifty-six antonym pairs in the British *Independent* newspaper, six pairs met all these criteria: *good/bad*, *female/male*, *high/low*, *peace/war*, *poor/rich*, and *public/private*. In actual antonym learning the criteria may not be equally weighted, and high performance in one criterion might make up for low performance in another.

The metalexical approach holds that such criteria for canonical status complement the RC-based derivation patterns for antonyms. Thus, canonical antonym pairings not only co-occur, but must be minimally different and maximally similar in ways relevant to the contexts in which they co-occur.

This raises the question of whether 'non-opposite' same-part-of-speech pairs that co-occur (in antonym-like patterns) are antonyms in the metalexical approach. In cases like *peanut butter/jelly* (in American English) and *gin/tonic* (the "favorite binary opposition" of characters in J. Winterson's novel

Gut Symmetries [1998]), the strength of the association between the words is no doubt due to the frequency of their co-occurrence in *x and y* phrases. In their general senses, the words in these pairs do not have immediate hyperonyms in common, which is what we usually expect to find in antonyms and contrast sets. Nevertheless, their linguistic co-occurrence reflects the co-occurrence of their referents, and thus they are sisters in their own conceptual fields: gin and tonic are the two components in a gin and tonic drink, peanut butter and jelly are the two fillings in a peanut butter and jelly sandwich. So while the relations between the words are established by their use in fixed phrases, the items they denote are related as well, and this is recognizable through RC. Since these items are most often paired as irreversible binomials (Malkiel 1959), their relation is not symmetric.

For Deese (1965) and many since, antonymy is only indicated if two contrasting items reciprocally trigger each other in word-association tasks. When asked the opposite of *peanut butter*, American English speakers are likely to say *jelly*, but when asked the opposite of *jelly*, they might well say *jam*. Compare the pair *cat/dog*, which seems more properly antonymous (in the inclusive sense of the word). While they are each part of a larger contrast set that offers many other potential antonyms, they often co-occur in varying contexts and our conceptual knowledge about their referents allows for a 'minimal difference' interpretation under RC-LC. Unlike for *gin and tonic*, both *cat(s) and dog(s)* and *dog(s) and cat(s)* occur regularly in the British National Corpus (forty-two and fifty-six occurrences, respectively). The words also co-occur in a variety of set phrases, as in (3).

- (3) *raining cats and dogs*
 fight like cats and dogs
 cats and dogs or dogs and cats (= 'speculative securities')

And they are replaceable in other phrases and compounds:

- (4) *a cat/dog person*
 dog/cat food

The juxtaposition of *cat/dog* in both fixed expressions and creative language use encourages us to view them as a stored canonical pair rather than as a lexicalized conventional phrase. The fact that the two can be deemed 'minimally different,' based on what we know about cats and dogs, encourages us to view them as canonical opposites. They are different in that they have incompatible reference, but similar in that they are basic-level terms for four-legged, furry animals that are commonly kept as house pets and that are tame enough and of an appropriate size to remain uncaged and interact with people. These similarities are what makes *dog* the more usual opposite for *cat* than *mouse* (which differs in size, tameness, pet status), even though *cat-mouse* are experientially reinforced

through their own set of expressions (*play cat and mouse with; when the cat's away, the mouse will play*).⁵

Cases of non-binary canonical contrast are more rare and their associations do not seem as strong as those in binary pairs. *Animal/vegetable/mineral* is one triple that does seem canonical (for some English speakers), since it is introduced and reinforced through the Twenty Questions game. Other triples like *solid/liquid/gas* or *red/yellow/blue* might be learned as canonical contrast sets, but the very fact that there are three of them makes them less likely than binary sets to co-occur as a set. For example, in the British National Corpus, *solid/liquid/gas* co-occur 12 times, but pairings of two (but not three) of these words occur 133 times, with *solid/liquid* (73) and *liquid/gas* (62) accounting for most of these. Thus, the strength of the associations among members of the contrast set is not equally distributed, and so associations among pairs in the set are likely to be stored as canonical antonyms (instead of or in addition to the larger contrast set).

Thinking of candidates for canonicity that include more than three members is more difficult. The prismatic colors, *red/orange/yellow/green/blue/indigo/violet* are one such set, but their use is limited to technical discussions. In non-technical discussions, *indigo* is deleted and the status of *violet* is less definite, as it is often replaced by *purple* – leading to the suspicion that the six-way distinction among rainbow colors in English is semantically driven, rather than canonically stored.

How do we determine whether a pair, triple, or larger set is canonically opposed? We must differentiate here between the antonym canon of a language and the antonym canon in an individual. Antonyms or contrast sets are parts of the language's canon if they have been and continue to be recognized as fixed paradigmatic relations. On that basis, we might say that there is a canon and that *big/little*, *cruel/kind*, and *derivational/inflectional* are all equally members of it. The community canon would include the opposed pairs that are acknowledged as antonyms in thesauruses and dictionaries of antonyms (e.g., Room 1988). We are more interested here in the mental status of these canonical sets, and, in that vein, canonicity in the individual is not an equivalent achievement for all canonical sets. Learning that words belong to canonical sets (and then representing that relation in their word-concepts) depends on experiential reinforcement, and every set will be reinforced to different degrees, in different contexts, at different points in one's development, and so forth. So, while I may know that *cruel/kind* are lexically opposed (and represent this at or between *CRUEL* and *KIND*), this may be less definite and/or less prominent knowledge than that *big/little* are lexically opposed. What is relevant here is not so much the relative frequency of the words in these pairs,⁶ but the relative frequency of their co-occurrence and other reinforcement of their status as antonyms. So, while *inflectional* and *derivational* are hardly common words, they are good

examples of clearly canonical antonyms in my idiolect. Because I have experienced them together and later used them together repeatedly in learning and teaching morphology, their status as antonyms is well reinforced and strongly represented for me.

In 2.1.4, a connection between prototypicality and canonicity was noted. The connection is only that the “best” examples of the antonym relation are those that are canonical – prototypicality is not a prerequisite to canonicity. *Cat/dog* are canonical antonyms, but they are not prototypical ones, since they do not represent extremes or neat bisections of a taxonomic level, and since encyclopedic and contextual knowledge is needed to establish their relation through RC-LC. But prototypical antonyms are likely to be canonical ones since such neat contrasts as *love/hate* or *big/little* or *black/white* are useful in discourse (see 5.4.2), and therefore likely to be reinforced.

Other models, for example WordNet (see Gross and Miller 1990; K. Miller 1998), differentiate **direct** (or lexical) and **indirect** (or conceptual) antonyms (see figure 3.7 in 3.4.2). These categories distinguish words that are linked together in lexical representation and words whose relation is derived through other knowledge – that is, knowledge of the words’ contrasting meanings, or, in the case of WordNet, knowledge of their synonymy to words that are direct antonyms. In the current approach, the direct/indirect distinction is reinterpreted as canonical/non-canonical – that is, antonyms that have established links in their associated word-concepts versus those that must be derived anew through RC-LC. Whereas some authors assume that direct antonymy must be represented in the lexicon, the metalexical approach assumes that it must be represented, but as part of metalinguistic rather than linguistic knowledge. Experimental evidence for the distinction between direct and indirect antonymy then also supports the distinction between canonical and unstored (derived) antonymy, since such experiments are unable to distinguish between intralexical and metalexical representations’ effects on lexical behavior. Such evidence, as we have seen, includes the strength and prevalence of canonical antonyms in word association (Palermo and Jenkins 1964), the superior priming effects among direct antonyms (Becker 1980), and the superior speed in identifying antonymy among direct antonyms (Herrmann et al. 1979; Charles et al. 1994).

Charles, Reed, and Derryberry (1994) also found that indirect antonym reaction times were affected by the semantic distance with the pair (as would be predicted by RC-LC, since more considerations for similarity and difference would come into play), but reaction times for direct antonym relations were not. They conclude that direct antonym responses are so fast because (a) the associative links between them are strengthened through co-occurrence and repeated use, and (b) intralexical information (including direct antonym links) is available early in reaction-time tasks, and so the information that direct antonyms

are opposed is available faster than the conceptual associations required to tell that indirect antonyms are linked. The first reason has already been accepted here, but the second is problematic for the metalexical approach, since it assumes that the associative links between canonical antonyms are represented intralexically. However, the same explanation can be reasonably adapted within the metalexical approach. Since in these experiments the subjects were considering words *qua* words, the first stop in conceptual access are the appropriate metalexical concepts. When faced, for example, with the pair *hot-cold* and asked to decide whether they are antonymous, lexical access allows us to identify the words, but once identified, we search for metalinguistic information about those words (since we know we are doing a word-oriented task). Our metalinguistic knowledge tells us loudly and clearly that this pair is canonically opposed. This process is faster than if the subject has to consider a pair like *frigid-steamy*, in which the antonymic link has not been experientially reinforced and thus made automatic. In this case, the subject has to look deeper in order to compare the meanings and decide whether they minimally differ.

This leaves the question of why antonyms (and perhaps larger contrast sets) give rise to canonical relations, whereas synonymy, hyponymy, and others seem not to. Frequency of co-occurrence is a major factor, and type of co-occurrence is another. Since antonymy is a binary relation, when we want to use a word with its antonym, our choice is limited, whereas for synonymy or hyponymy, the choice is great. If we want to use an antonym with *fat*, our choice is limited to a specific concept and the synonyms that represent it (*thin*, *skinny*, *slender*). The choice is further reduced, however, by the binary nature of antonymy and the mechanics of RC-LC. If we are looking for a single best antonym, then the differences among the synonymous candidates become relevant, until only one candidate for antonymy remains. For *fat*, we are likely to go with *thin*, since it is of similar register, morphological simplicity, and connotative neutrality (*slender* having positive and *skinny* negative connotations).⁷ So, *fat* and *thin* are very likely to co-occur, if we have reasons for using antonyms in close proximity (and we do – see 5.4.2). While we have reasons to use synonyms together (such as emphasis and avoidance of repetition), the lack of perfect synonyms means that the same synonyms are unlikely to be appropriate across contexts. So, while I might alternate use of *house* and *building* in a conversation about zoning laws, I would alternate *house* and *home* in talking about where I live. Similarly, hyperonyms and hyponyms co-occur, but which hyponym occurs with the hyperonym is variable by context. *Parrot* might co-occur with *bird* in *Parrots are talking birds*, but *bird* may co-occur with *chicken* in other contexts. In this case, we experience a unidirectional association, *parrot* with *bird* (since talking about parrots entails talking about birds), but not necessarily *bird* with *parrot* (rather than another hyponym). The relative symmetry of antonymy allows more opportunity for their reinforcement.

5.2 Properties of antonyms and contrast sets

While synonymy has been claimed to be reflexive, symmetric, and transitive (see chapter 4), antonymy has been claimed to be irreflexive, symmetric, and intransitive (Evens et al. 1980). Antonyms are irreflexive in that a lexical unit cannot be an antonym of itself.⁸ While antonyms are logically symmetric (if A is the opposite of B, then B is the opposite of A), they do not necessarily have symmetric distribution or recognition, as discussed in 5.2.2. Transitivity does not hold among binary antonym pairs. For example, *tall* is the opposite of *short* and *short* is the opposite of *long*, but this does not make *tall* the opposite of *long*. Under very strict circumstances, transitivity may hold in larger contrast sets (if *red* contrasts with *yellow*, and *yellow* contrasts with *green*, then *red* contrasts with *green*), but only if the contrast set includes no synonymous or overlapping members.

The rest of this section concerns two properties that are particular to antonymy: binarity and markedness. Both have been claimed to be necessary characteristics of antonyms. For binarity, 5.2.1 covers how this property interacts with the non-binary principle RC-LC. For markedness relations, the claim that they are intralexically specified is investigated and refuted in 5.2.2.

5.2.1 Binarity: *Opposition versus contrast*

Antonym relations are defined by their binarity. While larger contrast sets are numerous, there is something special about the one-on-one opposition of antonymy, and any binary set can seem oppositional. As McNeill (1997: 199) has noted, “thinking in terms of differences, and creating fields of opposition in order to have the differences be meaningful, is a general capacity of human thinking and not just contrasts embodied in the lexical system.” Lexical opposition reflects deeper cognitive processes – far deeper than can be explored here. The task here is to identify types of binary antonyms and consider why binarity is peculiar to semantic contrast, as opposed to other lexical relations.

RC says nothing about binarity, since it does not specify the size of contrast sets. Earlier versions of this approach (Murphy 1995, 2000) included two principles: Relation by Contrast and Relation by Opposition (RO). RO was exactly like RC except that it limited contrast sets to two members. It has been abandoned here because the addition of a binary version of RC does nothing to explain binarity – it only describes it. In its current incarnation, the metalexic-al approach assumes binarity to be an overarching cognitive concern, which might be caused by non-linguistic factors such as a preference for limiting the number of items in a computation. Underlying or outside forces press for binary opposition of words, and RC-LC gives the means for determining which item will be the preferred opposite under binary conditions.

Since binarity is so intrinsic to contrast, it might be tempting to reinstate Relation by Opposition and make it the basic relational principle. If this were the case, larger contrast sets would be achieved by repeated application of RO to pairs within the set. If the set is transitive, then it constitutes a taxonomical level. For instance, instead of the contrast set *solid/liquid/gas*, we would have {*solid/liquid*, *liquid/gas*, *gas/solid*}. Certainly, for any relation, we sometimes behave as if their origins are pair-based. For instance, one might say “*Sofa* and *divan* are synonyms of *couch*” (*sofa=couch* and *divan=couch*), rather than saying “*Sofa*, *couch*, and *divan* are synonyms” (*sofa=couch=divan*). But RC is preferred over RO here because it accounts for larger contrast sets while allowing for binary contrast sets as well. Again, it is worth assuming that the preference for binarity runs deeper than the relational principle, and so the relational principle is affected by binarity rather than vice versa.

Binarity in lexical contrast can arise in a number of ways: the simplest is binarity by coincidence. If it just so happens that only two items belong to a contrast set, then they are, by default, antonymous. For instance, humans have only two types of limbs, so *arm* and *leg* automatically contrast by virtue of being the only members of the category HUMAN LIMB. Other lexical relations are unlikely to coincidentally fall into binary pairs. For the asymmetrical relations (hyponymy, meronymy), there is no point in having a one-on-one relation. If a word has only one hyponym or meronym, then it would likely be synonymous with its hyperonym or holonym, and thus both unnecessary and not clearly a hyponym or meronym. While two perfect synonyms may accidentally occur, pragmatic forces work against their survival as perfect synonyms. The fuzziness of the category NEAR-SYNONYM means that near-synonym sets are not limited to any particular number.

Contrast sets that are coincidentally binary are not considered to be prototypically opposite by Cruse (2000c), who maintains that opposites are ideally *inherently* binary – that is, binary by some logical necessity. Such is the case for our second type of binarity, scalar opposition, in which more or less of some property is measured. Scalar opposites describe opposite directions on a one-dimensional scale. Since a single dimension only allows for two directions, binary opposition arises naturally, as in *tall/short*, *wide/narrow*, and *warm/cool*. (See Bierwisch 1989 and Murphy 1995 for more explicit discussion.)

The inherently binary nature of negation (*yes/no*) allows for the third type of binary contrast. For morphologically rich languages, opposite words can be created through negative morphology, as in *blue/non-blue*, *logical/illogical*, *safe/unsafe*. These oppositions are well accounted for by RC, since the words are intensely similar in that they share the semantic and phonetic material of the stem. Section 5.4.1 discusses morphological antonyms further.

The last type of binarity is binarity for binarity’s sake. In such cases, at least three items are available for contrast, but two among them are privileged as

antonyms. We have seen several such examples, including taste (*sweet/sour*), emotion (*happy/sad*), and color (*red/green*, *red/blue*, etc.) adjectives. RC-LC accounts for the privileging of certain pairs through its requirements of maximal similarity and minimal difference. So, while *happy* contrasts with *sad* and *angry* and *surprised* and *frightened*, it seems to have the most in common with *sad*, since (among other reasons) *happy* and *sad* reflect states with reversed facial expressions (smile/frown) and postures (up/down).⁹ While *happy/angry* is a useful contrast for some contexts, in a neutral context *happy* and *sad* have these obvious characteristics in common, and thus are favored as opposites. If, in a neutral or particular context, more than one potential antonym is similar on all relevant properties, then more properties become relevant in order to further whittle down the number of possible antonyms to one. The shape of this whittled product may vary by person and context, so that RC-LC can provide more than one “correct” answer to the question *What is the opposite of X?* We have seen this before with color oppositions: the opposite of *blue* might be *red* (because they are both flag colors), or *orange* (because they lie opposite each other on the color wheel), or *gray* (because they are both sky colors).

Chaffin and Herrmann’s (1987) findings on “attribute similars” (see 3.5.1) confirm that the (ir)relevance of similarities and differences is affected by limiting the set of contrasted items to two. In sorting word pairs according to relation type, subjects regularly grouped attribute similars, like *rake/fork* and *movie/painting*, with antonyms, rather than with Chaffin and Herrmann’s predicted group, the synonyms. Thus where binarity is contextually imposed, it is more natural to focus on minimal difference, rather than on general similarity. This is in line with Gentner and Markman’s (1994) findings that similarities among compared items give stark contrast to their differences. In the current account, similarity in antonymy provides a background to the focus on difference. So while *rake* is hardly the sort of thing that one would usually offer as an opposite for *fork*, within the artificial setting of the experiment (in which every item is part of a binary set), they are minimally different in that they are referentially incompatible but otherwise similar.

This analysis is borne out by an experiment by Medin, Goldstone, and Gentner (1993). They found that subjects ranked *black* and *white* as “not very similar” when presented as a pair; but if presented in a triad with *red*, then *black* and *white* were judged to be similar. In the former conditions, the subjects looked for minimal difference within the pair, and the difference was highlighted by the lack of distractors. In the second condition, *black* and *white* are similar by virtue of having minimal difference with each other and more difference with *red*. Perceptions of difference, then, are heightened by binarity, which contributes to an explanation of why binarity is particular to the antonym relation. It also accounts for why pairs that are “accidentally” binary (*arm/leg*) seem

like opposites even though they may not satisfy criteria for logical antonymy (see 5.3).

5.2.2 Symmetry and markedness

While the antonym relation is reciprocal, the members of an antonym pair may not show symmetrical distribution in linguistic contexts or in speakers' behaviors. This can be seen in word-association tasks, where word A might elicit its antonym B, but B might not elicit A to the same degree. For example, *table*'s most common response, *chair*, was given by 83.3% of subjects in the Minnesota norms (Jenkins 1970), but *chair* elicited *table* in only 49% of the subjects. Some of this asymmetry is due to asymmetry between the things that the words describe. For example, *table* elicits *chair* because one usually uses a chair when one uses a table. *Chair* is less likely to elicit *table* because chairs often occur without tables, as in lounges and waiting rooms.

Some theorists (e.g., Justeson and Katz 1991) have capitalized upon the tendency for antonyms to co-occur in (especially symmetrical) constructions in order to account for the acquisition of the knowledge that two words are antonyms. Fellbaum (1995) identifies a number of such constructions, as in (5), and Jones (2002) identifies many more.

- (5)
- | | | |
|----|----------------------|--|
| a. | <i>x and y</i> : | private (public) and public (private) corporations |
| b. | <i>from x to y</i> : | From back (front) to front (back) |
| c. | <i>x or y</i> : | all languages, living (dead) or dead (living) |

In these constructions *x* and *y* are symmetrically placed, and to some extent they are reversible. If they cannot be reversed, it may be because the phrase is lexicalized as an irreversible binomial, or it may be that one of the terms is semantically **marked** in relation to the other (and thus occurs second).

Markedness is a major source of distributional asymmetry in antonymic relations.¹⁰ Some (Vendler 1963; Givón 1970; Ljung 1974; Handke 1995) have gone so far as to define antonymy (or, more specifically, gradable contrariety – see 5.3.1) as a relation between marked and unmarked items. Markedness distinctions feature heavily among gradable adjectives, where marked (*young*, *short*, *bad*) and unmarked (*old*, *long*, *good*) adjectives are subject to distributional asymmetries. Lehrer (1985) finds that 80% of common gradable antonym pairs have a markedness distinction.

While different theorists use different criteria for determining which member of a pair is marked and which unmarked, the most common criterion is that the unmarked item be used neutrally, that is, without such specific semantic content as the marked item. Lehrer (1985: 400) lists the most common ways in which neutralization occurs for antonymous adjectives:

- I. The unmarked member is neutralized in questions (*How tall/#short is he?*)
- II. The unmarked member is neutralized in nominalizations (*warmth/#coolth*)
- III. Only the unmarked member appears in measure phrases (*three feet tall/#short*)
- IV. If one member consists of an affix added to the antonym, the affix form is marked (*happy/unhappy*)
- V. Only the unmarked member occurs with ratios (*twice as old/#young*)
- VI. The unmarked member is evaluatively positive – the marked, evaluatively negative (*good/bad*)
- VII. The unmarked member denotes more of a quantity (*big/little*)
- VIII. If there are asymmetrical entailments, the unmarked member is less likely to be **biased** or **committed** (*X is better than Y: X may be good or bad. X is worse than Y: X must be bad [not good]*)

No single unmarked adjective must occur in all of these neutralized distributions, but whichever member of a pair displays the most unmarked characteristics is the unmarked member. Not every unmarked item, then, has the same set of these properties.

Theorists differ as to whether markedness theory explains or merely describes these distributional differences. Some (e.g., Cruse 1986; Lehrer 1985) have presented arguments that markedness is (at least sometimes) lexically idiosyncratic,¹¹ while others (e.g., Bartsch and Vennemann 1972; Rusiecki 1985) have simply treated markedness as a lexical feature without making any motivating arguments. Representing markedness as a lexical feature is tantamount to representing antonymy in the lexicon, since words are not marked or unmarked in and of themselves, but are (un)marked in relation to another. For example, it is not sufficient to say that *tall* is an unmarked term – instead it is unmarked with respect to *short*. Thus, a linguistic item might be marked with respect to a certain other item, but unmarked with respect to yet another. So, in order to lexically represent the markedness characteristics of *tall* and *short*, the two words must be lexically associated.

One problem with the proposal to represent markedness (and, indirectly, antonymy) in the lexicon is that markedness is context dependent, as is evident in the semantic realm of natural (as opposed to grammatical) gender. For example, while the masculine gender is commonly claimed to be unmarked and the feminine marked in English (e.g., Leech 1974; Moulton 1981), it is the feminine that is unmarked and the masculine marked when referring to occupations that are typically held by women. So, for example, *nurse*, *prostitute*, and *secretary* are unmarked for feminine gender, as demonstrated by the frequency (and, some might say, necessity) of marking the masculine explicitly, as in *male*

nurse. Intralexical representation of *male* as unmarked and *female* as marked would fail to adequately predict their distribution in different contexts.

Although we speak of words as being marked or unmarked, and although the evidence for markedness is to be found in linguistic data, there is no reason to believe that the asymmetries noted in markedness theory are represented in linguistic knowledge, just as there is no reason to believe that binarity is a lexical or linguistic property. If words are semantically in marked/unmarked contrast, it is because the concepts or referents they represent are not in an absolutely symmetrical relation. For example, among the measurement adjectives, all the ones for greater quantities (in height, width, size, etc.) are unmarked, and the ones for lesser quantities are marked. The asymmetrical distribution of these antonym pairs is predictable from the nature of the measurement scales they describe. Whether something is *tall* or *short* depends on whether its height is in the *tall* or *short* direction of the scale with reference to the contextually determined neutral point (N). But while *tall* describes the direction that goes away from the zero point (i.e., heightlessness), *short* describes the direction that goes toward the zero point, as shown in (6).

- (6) HEIGHT SCALE

$$\begin{array}{ccc} & & \text{tall} > \\ < \text{short} & & \\ 0 \text{ ————— } (N) & \text{————— } & \infty \end{array}$$

Thus, their meanings are symmetrical to the extent that both describe directions in relation to a neutral point (for sentences like *I am tall*), but they are asymmetrical in contexts that require measurement from the zero point rather than the neutral point, as in (7).

- (7) a. How tall/#short is it?
 b. It is six feet tall/#short.¹²

In these cases, *short* is unacceptable because a measurement cannot start from the end of the scale that goes on to infinity (because there is no end on that side). Since these scales are part of our conceptual knowledge about how measurement works, the markedness status of the associated adjectives has a deeper source than lexical information. The conceptual (rather than lexical) basis of this markedness is underscored by the universality of these relations. No language has a word for SHORT (as a relative value) that is not marked in relation to the word for TALL (Wirth 1983). Similarly, positively evaluated attributes are generally unmarked (as noted in Lehrer's criteria), leading some to a Pollyanna Hypothesis (Boucher and Osgood 1969; Osgood and Houssain 1983) that transcends language boundaries. Non-universal markedness relations have their sources in culture-specific conceptual asymmetries. The variable relation between MALE and FEMALE is one such example.

Representing markedness relations in the lexicon (e.g., as [$\pm$ MARKED]) has been motivated by the need to account for antonyms' asymmetrical distributions in linguistic contexts. However, not only can those distributions be predicted by the semantic structures of the individual words in the antonym set (as for *tall/short* above), but adding marked/unmarked labels to lexical entries does not provide much predictive power for the distributional patterns of any particular predicate. For example, *tall* is unmarked with respect to *short*, and is found in measure phrases like *three feet tall*. But *heavy* is unmarked with respect to *light*, and it is not found in measure phrases (*#three tons heavy*). Nevertheless, both are treated simply as [+MARKED] in some approaches. To cope with the variation, Lehrer (1985: 422–3) hypothesizes that lexical entries contain even more specific information about the distributions of antonymous adjectives: "A lexical entry for each word with an antonym . . . would state whether and when neutralization of the opposition occurs just in those cases where the possibility of neutralization does not follow from general principles." But another approach is to hypothesize that all of these distributional patterns follow from general cognitive principles and conceptual representations. By this approach, we assume that if the distributional pattern seems not to be explained by the relevant conceptual representations and pragmatic factors, then we just do not yet have a correct or deep enough understanding of how those concepts are structured. In fact, it is fairly straightforward to predict the asymmetrical distributions of antonymous adjectives without relying on intralexical features (Murphy 1994; Kennedy 1999).

Finally, defining or explaining antonymy in terms of markedness features ignores the fact that not all antonymic pairs have asymmetric distribution. For example, while *warm* is unmarked with respect to *cool* because it can be nominalized as *warmth*,¹³ neither *hot* nor *cold* is more neutralizable than the other: both can be nominalized (*heat, cold*) and they have symmetrical distribution in *how* questions, measure phrases, and so forth.¹⁴ Treating antonymy as markedness relations represented in the lexicon would in this case be linguistically unnecessary and indefensible.

To summarize and conclude, while the antonym relation is logically symmetric, word-association evidence indicates that specific antonym relations may be mentally stored in a directional way. For canonical antonyms, this could be represented as the directional link from *TABLE* to *CHAIR* being stronger than the directional link from *CHAIR* to *TABLE*.

The asymmetric distribution of marked/unmarked pairs indicates their asymmetric semantic structure or their unequal cultural status. While some have tried to exploit markedness relations as a means for defining antonymy and representing it in the lexicon, such efforts fall flat because (a) markedness behavior in linguistic contexts is predictable from conceptual information and therefore inappropriate for inclusion in the lexicon, (b) the simple intralexical designation

[±MARKED] is not sufficient to account for the variety of marked/unmarked distributional phenomena, and (c) not all antonymous pairs display distributional asymmetries. On the other hand, the fact that many antonym pairs do display asymmetric distribution puts lie to the traditional notion that the words in a paradigmatic relation (particularly members of semantic contrast sets) must be replaceable, one for the other, in all contexts.

5.3 Types of antonymy (and contrast)

Much of the print spent on lexical opposition in the last century has focused on defining and differentiating subtypes of opposites. Taxonomies of opposition vary in the number of subtypes they identify, and those subtypes may have subtypes again. To some extent, semanticists have been forced to differentiate many oppositional types because their definitions of antonymy have been logical in nature, and not all opposite pairs enter into the same logical relations. So, for example, the opposition of *parent/child* contributes to the entailment relation between *Nancy is John's parent* and *John is Nancy's child*, whereas the opposition between *brother/sister* does not force an entailment between *David is Bill's brother* and *Bill is David's sister*.

However, logical definitions have little value in accounting for speakers' judgments of antonymy and contrast. While understanding the nature of these subtypes is relevant to the understanding of certain kinds of entailment, it is not particularly relevant to understanding lexical relations as metalinguistic concepts. As Cruse (1994) notes, the intuitively real relation of oppositeness (as a general category) does not lend itself to a logical definition at all. In pursuing a non-logical, prototype-based definition of opposition, Cruse concludes that a prototype category for OPPOSITE is useful, since "the overall category is one about which native speakers have clear intuitions," but that the subtypes are better suited to logical definitions (1994: 178). This is in keeping with Chaffin and Herrmann's (1984) findings that while naïve subjects perceive antonymy (and contrast generally) as very different from all other relations, they do not readily differentiate among subtypes of antonymy.

In 5.3.1 through 5.3.3 some of the major categories of logical opposition are identified, noting their status vis-à-vis the metalexical approach, as well as general problems for antonym taxonomy. Lyons' (1977) and Cruse's (1986) taxonomies of antonyms are certainly the most cited in the English-speaking linguistic world, so their categories and definitions are represented as "the standard." While antonym types are well discussed in the literature, few have attempted any taxonomy of non-binary semantic contrast relations. Some of the opposite types may also be general contrast types, and this is noted in the relevant sections.

Among approaches that assume intralexical representation of antonymy, some (e.g., Cruse 1986) have argued (and others have assumed) that such

intralexical links must be identified according to antonymic type or subtype in order to make correct predictions about the distribution and entailments available to any antonym pair. As argued below, such intralexical specification is unnecessary and counterproductive.

5.3.1 Classical antonymy: Gradable contraries

As noted already, many theorists, following (especially) Lyons 1977, restrict use of the term *antonym* to the subset of antonyms that are gradable and contrary. Certainly, gradable contraries (like *big/little*, *good/bad*, *loud/soft*) seem particularly representative of the phenomenon of binary lexical contrast.

A predicate counts as **gradable** if it describes a property (or state or action, etc.) that can hold to a greater or lesser degree. Gradable words are uniquely able to take degree modifiers (such as *very* or *slightly*) and to occur in comparative and superlative constructions (see Sapir 1944; Bolinger 1967; Paradis 1997). So, we can see in (8) that adjectives like *long* and *productive* are gradable, while in (9) adjectives like *inflectional* and *extinct* are usually not. (I return to the unusual cases in 5.3.2.)

- (8) a. That morpheme is very long and very productive.
b. This morpheme is longer and more productive than that one.
- (9) a. #That morpheme is very inflectional and very extinct.
b. #This morpheme is more inflectional/extinct than that one.

Gradable opposites are typically in **contrary** opposition, which means that the assertion of one entails the negation of the other.¹⁵ In other words, *p* and *q* are in contrary opposition iff if *X* is *p*, then it is not *q* (Lyons 1977). The key characteristic of contrariety is that the entailment can be made from an assertion of *p* to a denial of *q*, as shown in (10), but not from a denial of *p* to an assertion of *q*, as in (11).

- (10) The morpheme is long. → The morpheme is not short.
- (11) The morpheme is not long. ⇏ The morpheme is short.

The entailment in (11) fails because the morpheme in question might be neither long nor short, but average in length. So, gradable contraries “do not strictly bisect a domain” (Cruse 1986: 204). *Antonymy* in the narrow sense is particularly focused on contrasts that are symmetrically placed on a scale, such as *hot/cold*, rather than those that are contrary but not symmetrically placed, such as *hot/cool*, or *warm/frigid*. Lehrer and Lehrer (1982) refer to symmetrical gradable contraries as **perfect antonyms**.

Gradable contrariety in relatively adjective-heavy languages like English is typically associated with adjectival contrast. Sapir (1944) and Bolinger (1967, 1972), however, argued that gradability is a semantic phenomenon, which

therefore cannot be restricted to particular grammatical classes. Certainly, non-adjectival languages (such as Chinese) represent the same contrasts through stative verbs (e.g., *gao* 'to [be] tall,' *hǎo* 'to [be] good'). Certain verbs in English, such as *love/hate*, show the hallmarks of gradable contrariety as well: degree modification, comparison, and entailment of a contradiction from affirmative propositions only, as demonstrated in (12).

- (12) a. I love/hate him very much.
 b. I love/hate him more than you do.
 c. I love him. → I don't hate him.
 I don't love him. → I hate him.

It is more difficult to find nouns that might be gradable contraries. The obvious place to look is at nouns that describe states or properties, especially those that are derived from gradable adjectives or verbs, such as *heat/cold*. *Heat*, like *hot*, can obtain to varying degrees (as made clear by modifiers like *extreme* or *mild*), and, like *hot/cold*, *heat/cold* does not bisect the temperature domain. But contrary relations among property-describing nouns are far less common than those among adjectives in English because nominalization of these concepts is subject to markedness asymmetries. For example, *height* has no lexicalized opposite (although it may have derived ones like *shortness*). Turning to nouns that are not derived from gradable adjectives, Larry Horn (personal communication) suggests some gradable contrary nominal pairs, such as the epithets *hero/coward*, *genius/dolt*, and *giant/shrimp*. As with other gradable contraries, a semantic "middle ground" is left undescribed by these pairs. However, these pairs are rarely canonical. If we compare *tall/short* and the nouns *giant/shrimp*, we see that the former are far more decisively each other's antonym. *Giant* might as well be contrasted with synonyms of *shrimp*, like *shorty* or *peewee*. Since the epithets associated with height are (a) less frequently used than the basic height adjectives and (b) not as reliably associated with a single opposite, it stands to reason that contrary adjectives are more likely to enter the antonym canon.

Thus, it is not surprising that gradable adjectives provide some of the best examples of antonymy, given their semantic structure and RC-LC. These are words that describe the same continuum in a symmetrical way. The properties that gradable adjectives describe are relatively simple, and therefore there are not as many semantic relations available to them, so they are more straightforwardly antonymous. The things and actions that nouns and verbs describe are complex, and there is much to know about them, and much about them that can be similar or different to other things or actions (and the nouns and verbs that describe them). The basic gradable adjectives are also in starkest contrast because they rarely have near enough synonyms to compete for the antonym position.

(13) *white* ← x ————— *gray* → *black*
 (14) *green* ← y ————— *gray*
 gray → *red*

Polar antonyms, illustrated in (15), have one member that can occur in a *how* question and one member that cannot.

- (15) a. How long is that string? [impartial]
b. #How short is that string?¹⁶
c. This string is longer than that one, but it's still short.
d. This string is shorter than that one, but it's still long.

The **overlapping antonym** subtype, in (16), involves more asymmetry in distribution and interpretation.

- (16) a. How good is that book? [impartial]
b. How bad is that book? [committed]
c. This book is better than that one, but it's still bad.
d. #? This book is worse than that one, but it's still good.

In *how* questions, one member of the pair receives an impartial reading and the other a committed reading – that is, a reading that presupposes an answer to

the question. So, (16a) does not presuppose that the book is good, but (16b) presupposes that it is bad. In comparative constructions (16c-d), one of the members of an overlapping pair can be interpreted like those in the polar class, and the other one cannot (according to Cruse's judgments).

Equipollent antonyms, as in (17), are symmetrical in their distribution and interpretation.

- (17) a. How hot is the casserole? [committed]
 b. How cold is the casserole? [committed]
 c. # This casserole is hotter than that one, but it's still cold.
 d. # This casserole is colder than that one, but it's still hot.

Both are committed in *how* questions (i.e., presupposing that the casserole is hot or cold), and neither comparative is acceptable.

Cruse (1986) supposes that these distributional patterns cannot be strictly semantic (or conceptual) in nature, since so-called translational equivalents among different languages sometimes occur in different patterns of distribution and interpretation. For instance, he claims that while English *good* and *bad* are in the overlapping pattern, German *gut* and *schlecht* are polar antonyms, and while French *chaud* and *froid* are polar antonyms, English *hot* and *cold* are in equipollent distribution. Since these words are semantically similar, Cruse concludes that the assignment of antonym pairs to distributional subtypes is arbitrary and therefore must be specified in the lexicon. Such an argument makes sense if you are supposing that antonymy is intralexically represented and that the meanings of antonymous adjectives emerge from their associations (as in the thesaurus models, chapter 3). However, the fact that oppositional concepts can be represented by different subtypes of antonyms does not prove that antonym subtypes must be intralexically represented. If we assume that word meanings are individually definable, then the cause of cross-linguistic variation in antonym types is not arbitrary intralexical features, but instead differences in the meanings that are represented in any particular language. This is not the place in which to present all the details of gradable predicate semantics (see Bierwisch 1989 and Murphy 1995), but the distribution of the individual predicates (and hence their distribution in relation to one another) is dependent upon (a) facts about the dimensions or properties that the predicates are describing, and (b) lexicalization differences among the languages. To take, briefly, the example of *chaud/froid* versus *hot/cold*, the two sets are not semantically comparable. *Hot* and *cold* describe vectors that do not run the whole length of the temperature scale, as in (18), where the bold portions of the scale are the *hot/cold* areas and *warm/cold* apply to the whole scale.¹⁷ In contrast, *chaud/froid*, in (19), are more comparable to English *warm/cool* in their semantic structure.¹⁸

- (19) < *froid* *chaud* >
 ←————— {N} —————→

Hot/cold must be translated as *chaud/froid* because things that are in the *hot* part of the scale per English lexicalization are in the *chaud* part of the scale according to the way French lexicalizes the concepts.¹⁹ Thus, the differences between the distribution of *chaud/froid* and *hot/cold* are not due to arbitrary facts about the type of opposition they are intralexically assigned to, but rather due to language-specific lexicalization of the individual concepts involved.

In sum, the subtypes of gradable contrariety are not so much different types of opposition as they are opposition applied to different types of semantic structures. The same can be said for gradable contrariety in general: gradable predicates are not arbitrarily assigned to the CONTRARY category of opposition, but the fact that they describe directions on a scale causes them to be contrarily opposed. Intralexical specification of contrary relations or a separate principle for predicting contrariety is not necessary because the semantic properties of the words themselves predict what sort of distributional and interpretative patterns they fall into and RC-LC opposes words without reference to such patterns. As shown in the next subsection, contrary and non-contrary antonym types overlap.

Turning briefly to non-binary contrast: are contrary relations limited to binary sets? Contrast sets may comprise several gradable adjectives, as in the cases of *sweet/sour/salty/bitter* and *happy/sad/angry*. Taken in pairs, members of these sets give contrary antonym pairs, such as *happy/sad* and *sweet/bitter*. Unlike the “true” contraries like *long/short*, which describe directions on a one-dimensional scale, these are antonyms of Ogden’s *red/green* type, represented on different scales (see [14] above), and therefore are not logically limited to binary contrast.

Starting with emotions and tastes, the members of these contrast sets can be argued to be in a logically contrary relation if we contrast one with a disjunctive list of the other members of the set, as in (20).

- (20) Mary is not happy that she's won. $\rightarrow$
Mary is sad or angry or (etc.) that she's won.

The failure of the entailment in (20) indicates that there is some emotional middle ground that Mary could inhabit in which she is uncommitted in her feelings about winning. Similarly, the set of taste terms (*sweet*, *sour*, *salty*, *bitter*) could be considered a contrary contrast set, in that if an ingredient is sweet, it is not sour, salty, or bitter,²⁰ and being not-sweet does not entail having

any of the contrasting tastes, since something could have a neutral taste (or be tasteless). Thus, contrast sets involving contrary relations do exist.

Returning to the color set, while *red/green* may be considered antonymous because they mirror each other on the color wheel, both *red* and *green* also contrast with the other basic color terms of English, and particularly with the other basic terms for chromatic colors – *orange*, *yellow*, *blue*, and *purple* as in (21):

- (21) a. This spot is red. →
 This spot is not orange, yellow, green, blue, or purple.
 b. This spot is not red. ⇝
 This spot is orange, yellow, green, blue, or purple.

If each hue is on a scale from itself to gray (as in Ogden's treatment), then gray serves as the "middle ground" required for the contrary relation. However, the entailment in (21a) is not quite true, since the colors, in addition to being on a scale to gray, are also on a continuum with their neighbors in the spectrum. Something that is red might also be something that is orange (if it is an orange-red color). A contrast set of non-overlapping colors, such as the primary colors (*red*, *yellow*, *blue*) is not subject to this problem.

The color set shows that contrast sets with gradable members need not have absolutely incompatible members. Lyons (1977) gives the example *excellent/good/fair/poor/bad/atrocious*. In this case, the members are co-hyponyms, as in other contrast sets, but the boundaries between them bleed one into the other, as do the color categories. While these items contrast, there may be things that can be described somewhere between *red* and *orange* or *bad* and *atrocious*. But this between-ness is not a middle ground in the sense of a logical definition of contrariety, since being between *bad* and *atrocious* is not the same as being neither *bad* nor *atrocious*. What we have here, then, are contrast sets involving gradable items that do not fall into logically contrary relations. As shown in 5.3.2, gradable non-contraries are not uncommon.

5.3.2 Complementary antonymy and contrast

Ogden (1967 [1932]: 58) differentiates between contrary and **complementary antonymy**²¹ by noting that "[o]pposites . . . may be either the two extremes of a scale or the two sides of a cut." Lyons (1977) again defines the type on the basis of entailment relations among the members of an antonym pair: if X is *p*, then X is not *q* and if X is not *q*, then X is *p*. We can see this relation in the examples in (22):

- (22) a. The monster is alive. → The monster is not dead.
 The monster is not alive. → The monster is dead.

- b. The photo is in color. → The photo is not black-and-white.
The photo is not in color. → The photo is black-and-white.
- c. The integer is odd. → The integer is not even.
The integer is not odd. → The integer is even.

While this formula is particularly easy to use in testing adjectives, complementaries also include nouns (*human/non-human*) and verbs (*stay/go*). There is no particular reason, however, that we must limit the definition of complementarity to binary sets. For contrast sets whose members clearly and entirely divide the domain into smaller categories, the entailment relation between members of that set holds if the *p* or *q* of the definition includes a disjunctive set. For instance, *spade/heart/diamond/club* is a complementary contrast set, as indicated by the entailments in (23).

- (23) If the ace is a spade, then it is not a heart, diamond, or club.
If the ace is not a spade, then it is a heart, diamond, or club.

Identifying complementary antonyms and contrast sets in language is made difficult by the fact that complementaries can sometimes be used as contraries, and contraries sometimes are used as complementaries. To use Palmer's (1981) examples, we might say that someone is *more dead than alive* or *very married*, so that these usually ungradable adjectives are gradable in these contexts, thus not allowing for the clear segmentation of the field assumed in the definition of complementarity.

Furthermore, some pairs are gradable, as shown in (24), but denial of one is usually taken to be the assertion of the other, as shown in (25).

- (24) a. Ari is very (dis)honest. Ari is more (dis)honest than Bea.
b. The door was more open/shut than I wanted it to be.
- (25) a. Ari is not honest. → Ari is dishonest.
Ari is not dishonest. → Ari is honest.
b. The door is not open. → The door is shut.
The door is not shut. → The door is open.

Cruse (1986) categorizes these as **gradable complementaries**. In many cases, one of the gradable complementaries is more gradable than the other. For example, *open* can be graded in many ways (*wide open*, *slightly open*, *more open than before*, *moderately open*), while *shut* is less accepting of such modification (*shut tight*, but ?*slightly shut*, ?*moderately shut* – Cruse 1986: 203). On the other hand, both members of the pairs *honest/dishonest* and *clean/dirty* are gradable. But while Cruse considers these gradable complementaries, he notes that they are not truly complementary in that they do not perfectly bisect the domain, as in (26), where a middle ground is asserted.

- (26) a. The kitchen is neither clean nor dirty.
 b. Ari is neither honest nor dishonest.

Cruse solves this problem by maintaining that such words must have two senses, one in complementary opposition and the other in contrary opposition to its antonym. While multiple senses of these words may be necessary, intralexical specification of their relations is not. Instead, we can assume that the differences among antonyms' entailment relations are due to differences in the semantic structures of the individual words. Those that can be either complementary or contrary describe states that can be conceptualized as all-or-nothing or scalar. The **privative** nature of *clean/dirty* and *honest/dishonest* allows for the two interpretations. In privative opposition, one term of the pair is defined by the absence of something and the other is defined by its presence. For example, *cleanliness* is absence of filth, and *honesty* is the absence of lies. But absence or presence can be either relative or absolute states. When *clean* meaning 'absolutely free of filth' is contrasted with *dirty* (which involves presence of filth), a complementary opposition results because there are only two possible states to describe: having filth, or not having filth. But if *clean* is used to mean 'relatively free of filth' (relative to some social-contextual standard), then it is opposed to a sense of *dirty* meaning 'relatively full of filth,' and results in a contrary opposition. In other cases, the adjectives are naturally complementary or contrary, but usage as the other indicates a different sense of the adjective. For example *dead/alive* describe complementary states, but if we use them as gradables (*very dead/alive*), the nature of their antonymy changes to contrariety.

5.3.3 *Converse, reverse, and directional antonyms*

Taxonomies of antonymy always include contrariety and complementarity, although they may be divided into smaller subcategories. Categorization of other types of antonyms is more irregular across lexicologists. This section provides a quick survey of the most commonly cited types. These are particularly binary in nature, and can, as ever, be divided into subtypes.

Converse opposition is one of Lyons' (1977) major types, and he characterizes it as follows: if X is *p* to Y, then Y is *q* to X, and if Y is *q* to X, then X is *p* to Y.²² These include examples like *parent/child*, *buy/sell*, *give/receive*, and *above/below*. By Lyons' definition, comparative forms of gradable adjectives (*older/younger*) are also converses, since if X is older than Y, Y is younger than X. Many theorists (e.g., Ogden, Cruse) consider converse opposition to be a subtype of **directional opposition**. Unlike other subtypes of directional opposition (discussed below), converses have some claim to being their own type in the taxonomy. Converses are, in a sense, the purest examples of directional opposition, since they are the linguistic equivalent of mirror images – viewing

the same relation from different sides. Ogden (1967 [1932]) notes that mirror images (or **enantiomorphs**) have no degrees between them, as in a scale, nor do they bisect a domain. Thus, they are neither contraries nor complementaries.

RC-LC predicts the relation of converses because they are maximally similar (describing the same relation or relational event) and minimally, but relevantly, different (describing the relation from different angles). Examples like *father/daughter* or *parent/son* are not as good examples of converseness because their members contrast on more than one property (gender), while *mother/daughter* and *father/son* are better context-neutral antonyms because they match in gender as well. However, these latter examples are not logical converses, since being a mother does not entail having a daughter, but having a child (who may be male or female). Jones (2002) notes other “borderline” cases of converseness, such as *doctor/patient* and *teach/learn*, in which the former member does not necessitate the co-existence of the latter – there can be idle doctors without patients and plenty of teaching without learning.

Lyons (1977) contrasts converseness with **directional opposition**, in which *p* and *q* are directionally opposed iff they are in opposite directions with respect to a place *P*.²³ These include items like *north/south*, *zenith/nadir*, and *come/go*, but there is a problem in treating directional opposition as an equal member in a taxonomy including contraries, complementaries, and converses, since members of these categories can be directionally opposed as well. *North/south* are not only directional antonyms, but also converse and contrary antonyms, as shown in (27) and (28), respectively.

(27) Malta is south of Sweden. ↔ Sweden is north of Malta.

(28) Brighton is in the south. → Brighton is not in the north.
Brighton is not in the north. → Brighton is in the south.

Furthermore, Ogden (1967 [1932]) notes that some directional antonyms, like *inside/outside* behave as gradable complementaries. Since these spatial or directional antonyms fall into more general categories of antonymy that have already been identified, the **DIRECTIONAL** category only confuses the taxonomy. Furthermore, antonyms that describe directions in space do not differ from other antonyms at a deeper level of description. Many (if not most) of the converses and contraries that do not overtly describe spatial directions could be considered directional as well. Contraries involve predicates that describe directions on a scale, and converseness involves the two sides of a relationship (and thus the relationship from two directions).

Cruse (1986) gives more subtypes of directional opposition, which, like converseness, set themselves apart from other antonym types. **Reversive opposition** involves the undoing of some action, state, or quality. Common examples in English are morphologically related (*do/undo*, *establishment/*

disestablishment), but other examples include *color/bleach* and *build/demolish*. Like converses, these can be considered mirror images, since the activity or change of state described by one member of the pair is the backward performance of the other. Again, by RC-LC, reversives are similar to one another in that the same entities are involved in an event that relates the entities on the same basis, and different in that the endpoints of these events are reversed. Cruse (1986) treats these as a subtype of directional opposition, and further divides them into **independent reversives** (*raise/lower*) and **restitutives**, which involve the return to an earlier state (*kill/resurrect*). **Counterparts** (*hill/valley*) are another directional type that Cruse (1986) names, but which might be an instantiation of contrariety.

In spite of the fact that directional antonyms overlap with all the other antonym types, Varley (1991) presents some evidence that directionals and converses are processed differently from complementaries and contraries. In her study, normal, aphasic, and right-hemisphere-damaged subjects all did worse at providing opposites for stimulus words in canonical converse or directional relations than for those in contrary or complementary relations. However, such evidence does not lead to the conclusion that converse and directional opposition is represented differently in the mind, since other explanations are readily available. Firstly, the point of contrast in converse oppositions is more complex than that of other opposition types, since the aspect that is contrasted is relational. For example, we might schematize the contrast in the complementary set *dead/alive* as [+/- LIFE] or [ALIVE: PAST/PRESENT]. In this case one slot in the semantic description of the opposites is different for the two words. The relational nature of converses, on the other hand, involves an exchange, rather than a change, in the words' semantic material: whereas *buy* describes a relation with X as an agent and Y as a patient, *sell* is its opposite because it describes the same event but with those roles switched: Y is the agent and X is the patient. This is still, under RC, a minimal difference, but it could very well be more difficult to compute. Another reason for subjects' poor performance in giving converse and directional opposites was their apparent preference for contraries and complementaries. For some subjects, the stimulus *lead* did not evoke the converse *follow*, but instead *clear off* or *halt*, which indicate actions that a leader could do instead of leading. Varley concluded that subjects were distracted from potential converse and directional opposites by the presence of the more prototypical contrary types in the task.²⁴

5.3.4 *Unclassified and complex oppositions*

While antonym taxonomies are fraught with overlapping categories, they have the opposite problem as well: some antonyms do not belong to any of the categories. A number of (seemingly directional) antonym pairs remain uncovered

by the above taxonomy, such as *nut/bolt* and *glove/hand*, which are not logically converse, nor are they in the scalar relation of Cruse's counterparts. Similarly, some verbal opposite pairs are not adequately covered by these categories. *Ask/answer* looks converse-like, but asking and answering are two different acts, not two perspectives on the same act. *Start/finish* looks vaguely contrary-like, in that there is a middle ground between the two extremes, but they do not stand in a contrary logical relation at all. Again, the metalexical approach deals with these simply by noting their context-relevant similarities and differences. *Nut/bolt* and *ask/answer* are the same in that they describe the two members of a pair that go together, but different in that they are not the same item in that pair. (In this way, they might be said to be contextually determined complementaries.) *Start/finish* are the same in that they describe temporal extremes of an event and different in that they describe the opposite extremes.

Gender opposites like *male/female* and *boy/girl* present their own problems for taxonomies. Lyons (1977) counts *male/female* as complementary, but we might object that they are not logically complementary, since a person (or animal) may be hermaphroditic, and thus *not male* does not entail *female*. This raises the question of whether some items might be considered "culturally complementary," and indicates again the pragmatic rather than logical basis for opposition.

Cruse (1986: 225) considers gender oppositions to be **complex**, in that they "do not satisfactorily reduce to any specific simpler opposition, but embody a number of different elementary notions." Complex opposition is a much-needed addition to the taxonomy, and a bit of a challenge to RC's presumption of *minimal* difference among opposites. Using *Heaven/Hell* as an example, Cruse notes that that opposition embodies others, including *good/bad*, *up/down*, and *bliss/torment* (and others, like *light/dark* and *good/evil*, are easily added). If so many differences are relevant in contrasting *Heaven/Hell*, how can their opposition involve *minimal* difference?

Assuming that the semantic field is JUDEO-CHRISTIAN AFTERLIFE LOCALES, the field allows at most (if you are Catholic) two options to choose from when selecting an opposite for *Heaven: Hell* or *Purgatory*. Heaven and Hell, unlike Purgatory, have much in common: they are where one spends eternity, they reflect a definitive judgment on a person's life, they have imagined physical locations, and each is the home of a supernatural lord and countless souls. Nevertheless, this is probably an oversimplification of the problem. The fact is, *Heaven/Hell* are similar because they have the same types of properties (such as judgment, location, inhabitants), but opposite instantiations of those property-types. Each has a lord, but they are opposite lords (god/devil). Each has a location, but they are opposite locations (up/down). Thus, their similarities beget differences, and so it could be said that *Heaven* and *Hell* are as different as they are similar.²⁵

Such differences-within-similarities are often favored over straight similarities in choosing opposites. Let us consider a larger contrast set: *winter/spring/summer/autumn*. Of these, *winter/summer* are most strongly contrasted as an opposite pair, and we can again see differences within similarities. They both involve extreme temperatures, but one is hot and the other is cold. They both (officially) start with solstices, but one involves long days/short nights and the other long nights/short days. If opposition favored greatest similarities, then we should expect *winter/autumn* to be better opposites than *winter/summer*, since both are cool and dark. But instead, we prefer the two that differ in symmetrical ways.

The lesson to be learned from this is that similarity, as determined for RC-LC, runs deep in a complex antonym pair. Rather than the superficial similarity of contiguous temperatures (*winter/autumn*), we prefer the pair that is similar in extremity of temperature. It matters less what the temperature is, than what type of temperature it is. This deeper similarity makes the contrast between *summer* and *winter* symmetric, diametrical, and truly incompatible (whereas autumn and winter arguably overlap). So, *winter* and *summer* are more similar in types of attributes than either is to *autumn* or *spring*.

While we can reflect upon the complexity of pairs like *Heaven/Hell* and *winter/summer*, this does not mean that they are being complexly contrasted in any given context. RC-LC only requires relevant similarity and difference, so in a Protestant sermon it might only be relevant that *Heaven* and *Hell* are both afterlife sites but one is for the saved and the other for the sinners. In this case, *Heaven/Hell* are treated no differently than any other simple antonym pair. In neutral (and other) contexts, however, the potential complexity of the opposition is appreciated. *Heaven* and *Hell* are considered “more” opposite if one can find additional facets in which they are diametrically opposed.

Returning to gender opposition, Cruse does not explain in what way *male/female* are complex opposites, but one expects that he presumes constituent contrasts like *penis/vagina*, *testicles/ovaries*, *masculine/feminine*. One is left to wonder whether the complexity is not the other way around: that *male/female* is basic and the other oppositions follow from that (after all, a means for expressing the minimal difference between *penis/vagina* is MALE/FEMALE SEX ORGAN). One might propose that gender opposites like *woman/man* reflect constituent oppositions such as *feminine/masculine*, *soft/hard*, *weak/strong*, and *emotional/rational*, but this is instead a case of a simple opposition (ADULT MALE PERSON/ADULT FEMALE PERSON) inspiring oppositional stereotypes (which may give the appearance of a complex opposition). For the RC approach, treatment of *male/female* and other gender opposites is very simple: like all other antonyms they are maximally similar but for one crucial difference. In this case, the difference is sex, and there is nothing particularly complex about the opposites themselves.

5.3.5 Summary

A complete logical taxonomy of opposite relations does not exist, both because some opposites do not fit into the categories proposed and because those categories sometimes overlap, as in the cases of gradable complementaries (which have some properties of contraries) and of directional antonyms (which may belong to any number of other categories). While some have assumed that such taxonomies are psychologically real in that antonymic relations and their subtypes are represented intralexically, the RC approach holds that the types of antonyms do not reflect different coding of pairs in the lexicon, but instead reflect application of a single relational principle to different kinds of words. Although a complete taxonomy has not been developed, the labels for antonym subtypes, such as *contrary* and *converse*, can be very useful in describing the semantic consequences of opposing certain types of word meanings.

5.4 Lexical-semantic contrast in natural language

5.4.1 Morphologically related and unrelated antonyms

Lyons (1977) and K. Miller (1998) have claimed that while the most common canonical opposites are morphologically distinct words, most antonyms in English and many other languages have a morphological base in common. (Ironically, the opposite of *morphologically related antonyms* is **opaque antonyms** [Gross et al. 1989], although *morphologically unrelated* suffices as well.) The productivity both of morphology and of antonym association via RC-LC makes Lyons and Miller's claim hard to verify.

English provides many opportunities for morphological opposition. *Non-* creates complementary antonyms for nouns and adjectives (*blue/non-blue*, *happy/non-happy*), which perfectly bisect the domain, while *un-* and *iN-* (like most negating affixes in most languages, Zimmer 1964) often result in contrary oppositions among adjectives and adverbs (*happy/unhappy*, *responsible/irresponsible* – see Zimmer 1964; Horn 1989 for details). *Un-*, *dis-*, and *de-* can make reversive antonyms of verbs (*untie*, *disengage*, *decriminalize*). Other less productive negative morphemes include *contra-* (*indicate/contraindicate*), *a(n)-* (*moral/amoral*), and so forth. Furthermore, sometimes positive and negative morphemes contrast, as in *pro-union/anti-union* or *useful/useless*.

This great morphological capacity for the creation of antonyms raises the question of why languages bother with opaque antonyms – after all, the opaque antonyms are synonymous with derived antonyms, and languages are supposed to avoid synonymy. As Lyons (1977) notes, there is no logical reason for languages to have opaque antonym pairs if they have the means to create opposites through morphological derivation, yet people often ignore possible

morphologically derived antonyms when looking for the opposite of a word without a canonical antonym. For example, in the course of my research, I have asked scores of people *What is the opposite of cow?* Not one has answered *non-cow* (or *anticow* or *uncow* or *contracow*). Instead, they offer other simple nouns like *horse*, *bull*, or *calf*, or claim that *cow* has no opposite. If the search for antonyms in such an artificial context is a metalinguistic task involving word-concepts, then this result is not surprising. The subject's attention is to word-concepts, and unestablished words, like *non-cow* or *non-blue*, are unlikely to be represented as word-concepts, since they may not have been experienced before. Subjects are also likely to perceive the task as a request for a conventionally established word. For well-established (canonical) pairs like *logical/illogical*, morphologically related words are salient choices, but for others, people resist coining new words.

As in experiments, natural language use seems to favor conventional words, and there are many ways to avoid the use of neologisms like *non-blue* or *uncontrasting*, such as negation by a free morpheme (*not blue*, *not contrasting*) or use of positive descriptions (*the red or green ones*, *the ones that are alike*). This is not to say that neologistic morphological negation is rare, but that the abundance of other means for describing contrast limits its use, and the general preference for conventional lexemes limits its usefulness.

Languages support opaque antonyms for reasons beyond speakers' shyness about making up new words, of course. Opaque antonym pairs are particularly common for very frequent and semantically basic meanings, such as *high/low*, *big/small*, *good/bad*, and so forth. By Zipf's Principle of Least Effort (1949), we expect the most frequently used concepts to be encoded by shorter and simpler words, and so it is valuable to have a simple antonym to *married* (*single*), even though a morphologically complex antonym (*unmarried*) is available.²⁶ Some items with morphologically simple antonyms, like *high/low*, do not allow morphologically derived antonyms in English (**unhigh*, **unlow*), which might be explained in terms of avoidance of synonymy. However, many words are recognized as having both opaque and (perhaps several) morphologically related antonyms, so the matter is likely more complex (see Zimmer 1964).

Since different negative morphemes signal different kinds of opposition, such as contrariety, complementarity, and reversal, a single word might have more than one morphologically derived antonym (e.g., *unfeminine* vs. *non-feminine*²⁷). Morphologically unrelated antonyms may also give different information than their morphologically related counterparts. Using Lyons' example, *friendly* has two antonyms, *unfriendly* and *hostile*. The two antonyms are hardly equivalent, though, since *unfriendly* describes a wider range of ways of not being friendly (such as being aloof) whereas *hostile* is fairly specific. In this case, FRIENDLY-UNFRIENDLY is a "true" scale indicating more or less of a property, and FRIENDLY-HOSTILE is of Ogden's *red/green* type, indicating two scales for incompatible properties. Even where morphologically derived

and opaque antonyms are quite synonymous, their meanings can be differentiated. Returning to the opposites of *married*, in some contexts widows might count as *single* but not quite *unmarried*. As for other near-synonyms (see 4.4), a word's "co-antonyms" can differentiate fine levels of description.

5.4.2 *Discourse functions of antonymy*

The meaning differences among antonyms allow them to perform contrastive functions in discourse, and these are often associated with syntactic frames in which the antonyms co-occur. While several investigators have identified such syntactic frames and some of their uses (e.g., Mettinger 1994; Fellbaum 1995), Jones (2002) presents a deep, systematic study of these by categorizing the textual co-occurrences of fifty-six canonical antonym pairs (nouns, verbs, adjectives, and adverbs) in a large British newspaper corpus. He identifies eight such functions, and two of these (the coordinated and ancillary functions) predominate, each accounting for over one third of the antonym co-occurrences.

The **coordinated function** (or, as Jones calls it, *coordinated antonymy*) indicates the "inclusiveness or exhaustiveness of a scale" (Jones 2002: 61), as exemplified in (29). (Examples are abbreviated from Jones 2002.)

- (29) a. He took **success** and **failure** in his stride.
 b. [T]he chief constable purged the lot – the **good** with the **bad**.
 c. [T]he Albion manager would neither **confirm** nor **deny** Goodman's impending departure.

The **ancillary function** accounts for as many of Jones' data as the coordinated function. Ancillary antonyms contribute to a larger contrast in the discourse, following or interspersed with another set of antonyms. The ancillary pair serves to highlight the difference between the members of the other pair. As shown in (30), if the other pair is not usually perceived as antonymous, then the ancillary pair (in bold) serves to enforce the contrast in the other pair (in italics).

- (30) a. It is meeting **public** *need*, not **private** *greed*.
 b. *Kennedy* **dead** is more interesting than *Clinton* **alive**.

If both pairs are inherently contrastive, the presence of the ancillary pair makes the other pair seem even more dichotomous, as in (31).

- (31) [U]nemployment may rise more **quickly** *now*, but more **slowly** *later*.

If both pairs are clearly antonymous, then the identification of the ancillary pair is debatable, as in (32). Nevertheless, Jones classifies them as ancillary.

- (32) [E]**xtroverts** are most motivated by **reward** while **introverts** respond more to **punishment**.

Jones (2002) labels the other six functions as “minor classes,” and includes an additional **residual** class for the 3.5% of co-occurrences in the corpus that defied categorization into any other class. Some of these categories might be better classified as subcategories of more prominent functions, as Jones acknowledges.²⁸ Nevertheless, their repeated and recognizable use in the corpus attests to the robustness of some of the larger minor classes, which are exemplified in (33) through (36), with definitions or indications of their typical syntactic frames as necessary.

- (33) COMPARATIVE: *more X than Y, X rather than Y*
Sometimes I feel more **masculine** than **feminine**.
- (34) DISTINGUISHED: notes the antonyms’ inherent dissimilarity
This blurred the distinction between **fact** and **fiction**.
- (35) TRANSITIONAL: notes change of state or location
Even **hard** currency has turned **soft**.
- (36) NEGATED: one antonym is negated to emphasize the other
[T]he public has cause for **pessimism**, not **optimism**.

All the functional classes are associated with particular syntactic frames, but not every case of, say, the coordinated function involves one of the recognized frames. Awareness of these frames and their functions gives us a means for recognizing context-dependent cases of antonymy. So, while Jones has used canonical antonyms to demonstrate the existence of these functions, other pairs, including non-canonical opposites and words that are not antonymous in neutral conditions, function as antonyms when in these frames. For example, *soup* and *nuts* act as antonyms in the transitional phrase *from soup to nuts*, as do *London* and *Newark* in the phrase *from London to Newark*. That is, within a particular discourse (or part thereof), *London* and *Newark* are antonyms in that they form a binary contrast set. The speaker highlights their membership in that binary contrast set by presenting them in a frame that contrasts them.

Jones’ work makes a great contribution toward the present pragmatic approach to antonymy, since I have claimed that any two words can be opposed antonymically in a natural language context, but had not to this point given any particular explanation of what that entails. Jones’ taxonomy of antonym functions and collateral syntactic frames provides a means to identify situational or context-bound antonymy and thus works in concert with the other aspects of the metalexical approach. As listeners (or readers), when we notice the hallmarks of antonymic contrast in discourse, we understand that the words involved must, for the purposes of the utterance or discourse, be relatable under RC-LC – similar but for one relevant difference. Since the syntactic (or discursive) frame indicates that the words are antonymous for present purposes, our attention is drawn to their similarities as well as their contrast. At the other

side of the interaction, the speaker (or writer) puts words into antonymic frames because they have already ascertained that the two words are contrastable under RC-LC. Let us take, for example, the opposition of *need/greed* from (30) above (*public need, not private greed*). While we would not usually consider these words to be antonyms, the writer has recognized maximal similarity with minimal difference between them, and his or her ancillary use of the canonical antonyms *public/private* encourages readers to recognize it as well. And we do – in this context we see that both NEED and GREED are reasons for people wanting things, but one is a good (or legitimate) reason and the other a bad (or illegitimate) one. The use of rhyming words to represent the contrasting concepts heightens the sense of sameness among the two and thus puts their contrast into sharper focus. The fact that rhyming is relevant to this analysis underscores that this is not just conceptual-semantic opposition, but opposition of *words*.

In addition to helping us recognize context-dependent antonymy, repeated experience of any pair in a variety of these frames and functions establishes and reinforces their canonical status (as discussed in 5.2.1).

5.4.3 *Antonymy and semantic change*

As already noted, synonyms repel each other, such that words with the same meaning tend to develop their own niches of meaning or usage. Thus, languages move toward more specific lexicalized meanings as they gain synonyms. The issue now is whether antonymy or lexical contrast likewise has any effect on a speech community's lexical inventory. This raises several questions, taken in turn below. Do languages breed lexical-semantic contrast, as a mirror effect of their avoiding lexical-semantic sameness? Do they particularly encourage binary contrasts? Does being in a contrast relation effect any particular developments in the meanings of the words involved?

Saussurean structuralism is of course based on the idea that “dans la langue, il n'y a que des différences.” In terms of semantics, this is frequently understood to mean that meanings must stand in contrast to each other in order to be meaningful, and the semantic field approaches and other non-definitional theories of meaning (see 3.3, 3.4) take this notion seriously at the lexical level – words must contrast with other words in order to be meaningful. Componential theories also rely on the notion of contrast, often binary contrast, at the sub-lexical level of feature specifications, but less often attempt claims for how such contrast affects lexical development in language.

Although motivated by different assumptions than the structuralists', pragmatic approaches, such as Clark's Principle of Contrast, require that “every two forms contrast in meaning” (Clark 1992: 172). But the semantic contrast predicted by these approaches need not be at the level of minimal semantic difference resulting in incompatibility, as we see in antonymy. As chapter 4 showed,

the differentiation of synonyms often involves only slight, and often non-denotational, contrasts. These involve referential overlap (as for *bugs* $\approx$ *insects*) and thus are not the kinds of contrasts that mark “good” antonyms. In other words, the pragmatic pressures against synonymy do not amount to pressures for antonymy.

It is tempting to think that languages tend toward the symmetrical contrasts of typical antonymy, but there is little evidence of this happening outside a few lexical-semantic categories. The demand for lexicalized opposites is diminished by the productivity of negative morphology and phrasal negation, so that if new words are introduced to the vocabulary, antonyms for them are easily derived. The morphologically opaque antonyms are commonly found in a smaller number of semantic categories. The discussion of binarity in 5.2.1 included some of these types, namely gradable predicates (*high/low*, *hot/cold*) and description of natural binary contrasts, such as sex differentiation in words for people and animals (*boy/girl*, *fox/vixen*, *aunt/uncle*). Since most of these contrasts are already covered by basic and common vocabulary, they offer limited opportunities to view semantic change that is motivated by any pro-antonym force or principle. Because of the prevalence of antonyms that differ only in sex of the referent, we might predict that words for people of one sex will encourage words for people of the other sex. To use a recent example, the South African English slang *kugel* (a humorous or derogatory word for a stereotyped young Jewish woman) was followed by a male equivalent, *bagel* (which is often defined as ‘a male kugel’; see Silva et al. 1996).

New antonyms are more likely to be lexicalized if the contrast is culturally important and mentioned frequently enough to deserve a new word rather than a morphological or phrasal negation. Such situations often come up when a new concept is added to a culture that contrasts with an extant unlexicalized (or ‘underlexicalized’) concept. For example, introduction of electronic mail and the term *e-mail* encouraged the coinage and acceptance of *snail-mail*, since *mail* now served as a hyperonym to *e-mail* and could not then serve unambiguously as an incompatible contrast term for *e-mail*. This case also demonstrates the ease with which antonyms are coined when opportunities for morphologically related positive terms exist. Since *snail-mail* is a fairly transparent opposite for *e-mail*, it caught on.

Similarly, dynamic social categories are the site of much antonym coinage. Following categorization hypotheses from cognitive social psychology, I have elsewhere hypothesized that social categorization gives rise to antonyms (Murphy 1997), and this seems to be the case for racial and sexual orientation vocabulary at the very least. In the case of *homosexual/heterosexual*, the latter term was coined in response to the first. Dynes (1985) suggests that *homosexual*’s lexical success over other terms proposed in the late nineteenth century is due to the fact that it, unlike *Uranian* or *die konträre Sexualempfindung*,

supported the creation of a morphologically transparent antonym. For social-psychological reasons, social category labels seem particularly likely to breed positive antonyms in preference to negating ones. For example, the term *person of color* is a synonym of *non-white*, but the positive statement of identity is more personally affirming and arguably more polite. The popularity of *person of color* also reveals the particular preference for binary oppositions in social categorization, revealing an “us versus them” mentality. While *white* already contrasted with *black*, *Latino*, *Asian* and so forth, the unmarked status of whiteness in American culture gave rise to the need for a single antonym for it. Similarly, in bisexual circles a binary division is also maintained, between bisexuals and “monosexuals” (Murphy 1997).

The prevalence of dichotomous oppositions in these semantic fields does not, however, indicate a universal tendency toward the coinage of words to serve as antonyms to extant words. The bulk of a language’s vocabulary is not in canonical or near-canonical antonymic contrast. Words like *company* or *promise* have existed for ages in English without spurring on the coinage of words for a ‘non-company’ or ‘to unpromise.’

For those words that are perceived to be in established contrast or antonym relations, do these relations affect their subsequent semantic development? Many have noted a tendency toward polarization of meanings, a “drift of middle-allowing lexical contraries into middle-excluding acting [complementaries]” (Horn 1989: 271). While contraries like *big/little* or *heavy/light* describe dimensional extremes, the middle ranges in the dimension are rarely lexicalized in a specific way (Sapir 1944). In order to complete the scalar contrast set, we must resort to general terms like *medium*, *average*, or *moderate*. In everyday situations, speakers treat these contraries as complementaries. Even when a larger contrast set is lexicalized, the “middle” categories are often ignored, as in (37). The text here comes from an advertisement for a spiritual retreat. Clearly, the encouragement to be old or young, gay or straight is not meant as a warning to the middle-aged and bisexual that they are not welcome. Instead, the writer acts as if these categories are inclusive of everyone.

- (37) Be old – Be young – Be gay – Be straight – Be woman – Be man – Be black – Be white – Be anything you choose – And love who you are.
(Hamilton Hall, Bournemouth, UK)

It seems unlikely, however, that the tendency toward perfect dichotomies results in a diachronic tendency toward complementarity over contrariety. The preference for dichotomies allows us to use contraries as complementaries, but use of *old/young* as complementaries has not displaced the more relative meanings of *old* and *young* that are in contrary opposition. *Old* and *young* continue to be understood as extremes of the age scale, even though they are sometimes used in complementary ways (such as when *young and old alike* is used to mean

'children and adults'). Still, items in non-binary complementary contrast sets sometimes shift meanings in order to create a binary distinction. For example, the racial term *black* in South African English has acquired an additional sense, 'non-white' (inclusive of Asian, Arab, and mixed race people) (Silva et al. 1996).

The effect that canonical pairing can have on lexical development was noted already in 2.3.2. To sum up, if words *x* and *y* are in canonical opposition based on their minimal difference in semantic field A, and word *x* has another sense applicable to semantic field B, then if *y* is imported into field B, it may be understood to be the opposite of *x*, as Lehrer (2002) demonstrates for *hot/cold* ('stolen'/'legally acquired') *car*. However, this is not a hard-and-fast rule of meaning extension. Canonical antonyms carry best into an additional semantic field when a metaphoric transfer among the fields makes both words appropriate. For example, if we play the game where I tell you you are *hot* or *cold* depending on how near you are to a hidden object, *hot* and *cold* make good opposites because the players imagine that the hidden object metaphorically radiates heat. Where the entire field is not part of the metaphor, other senses of the canonical opposite often interfere with its extension to the additional field. So, the opposite of *a hot night out on the town* is unlikely to be phrased as *a cold night out on the town*, in which the literal meaning is likely to interfere. Similarly, phrases like *short tale* or *a short order* can only jocularly, and with sufficient context, be used as the opposites of the idioms *tall tale* ('falsehood') or *a tall order* ('a demanding order'). In both of these cases, other, more literal, senses of *short* occlude the possibility of the metaphorical sense.

Nonetheless, many items in canonical pairs are highly polysemous and their opposition holds for many of their meanings. Wirth (1983) notes that many of these patterns of polysemy are common across languages. For example, words for 'big'/'little' are frequently used to mean 'old'/'young,' and 'black'/'white' words are often used for the 'dirty'/'clean' opposition as well. Such common patterns are still far from universal, but what is universal are the restrictions on markedness patterns in polysemous antonyms. So, if two words are antonymically opposed in two semantic fields, if one is unmarked in one field, it is also unmarked in the other field.

While canonical relations tend to be reified in successive generations of language users, they are still subject to RC-LC. If the meaning of one member of a pair changes such that it is no longer minimally different from the other, then the antonym pairing is bound to change. For example, while the opposition *man/wife* has been canonical, recent preference for *husband/wife* (on the grounds that they are more minimally different in their modern usage) will likely obliterate the canonical status of *man/wife*. Tagashira (1992) demonstrates both the tenacity and the mutability of canonical antonyms with a Japanese example. Before 1300, *mae* ('in front of something') and *sirie* ('behind something')

were canonically paired. *Mae*, however, came to be used more often to mean ‘front side of something,’ and its opposite changed. At first it was paired with either *siri* or *usiro* (‘back side of something’), but later the association with *usiro* became stronger. After this, *usiro* usurped *sirie* and became the opposite of *mae* in both its senses.

Before ending this discussion of antonyms and semantic change, **enantiodromia**, the process by which something turns into its opposite, is worth mentioning. In semantic change, this means a change by which a word’s meaning is replaced by the opposite meaning (as opposed to words that simultaneously bear both meanings, as discussed in 5.1.1). That such changes occur is a testament to the semantic similarity of opposite meanings. If we take for example the use of *bad* in slang to mean ‘good,’ the word stays in the same semantic field and applies to a direction on the same semantic scale (MERIT). The only change is that it refers to the *other* direction on that scale. Such changes are not uncommon (neither are they abundant), and they are noteworthy because such “minor” shifts in meaning result in use that was incompatible with the former meaning. Irony is a likely motivator for such changes, since the changes often involve evaluative shifts, from something bad to something good, or vice versa. For example, *sycophant* started its career in English meaning ‘denouncer’ (someone who says bad things) but has since come to mean ‘flatterer’ (someone who says good things).

5.4.4 Acquisition of antonyms

How and when children learn about antonymy is an area of disagreement. Kagan, for example, believes that “the appreciation of opposites is comprehended too early and too easily to be the product of painstaking instruction” (1984: 189). Other evidence points to children learning about word opposition at later ages, and most approaches assume that antonymy is learned, rather than acquired. Discrepancies in such studies are partly a product of how “acquiring antonymy” is defined. A wide range of knowledge or abilities might be tested in an antonym acquisition study, including knowledge of and ability to apply RC, knowledge of the words involved, knowledge of common canonical pairings, knowledge of the meaning of *opposite* or *antonym*, and the ability to put all this to use in a metalinguistic task. Along the same lines, a wide range of behaviors have been used to determine children’s knowledge of antonymy, including use of antonyms in free word-association, correct responses to *What is the opposite of X?*, and use of antonyms in appropriate discourse frames. Investigations of antonym acquisition are thus often at cross-purposes.

In an early study, Kreezer and Dallenbach (1929) showed that most children only grasp a metalinguistic opposition task (using canonical or non-canonical opposites) after the age of five, with 90% of their subjects successfully learning

to play a *What's the opposite of X* game by age 7;6. This new antonymic ability seems to coincide with the paradigmatic shift, in which children start preferring paradigmatic responses in word-association tests (see 2.3.3). It is doubtful, however, that the age of antonym acquisition would be so late in a similar group tested today. Through the past century, the age of the paradigmatic shift has lowered for English speakers, as more metalinguistic skills have been directly taught at younger and younger ages (cf. Woodrow and Lowell 1916 and Ervin 1961). None of the five-year-olds in the 1929 study knew what an opposite was at the experiment's outset, but these days children in industrialized countries are exposed to the notion through countless books, songs, and television programs, both at home and in nursery schools and daycare centers. The popular baby-care manual *What to expect the first year* (Eisenberg et al. 1989: 351–2) includes instructions for the eleventh month on “helping baby to talk,” encouraging parents to “concentrate on concepts: *hot/cold, up/down, in/out, empty/full, stand/sit, wet/dry, big/little*.” Whether this does children any good in language learning is yet unproven, but it is certainly true that exposure to antonyms has become more purposeful (and presumably more frequent) in recent decades.

Kreezer and Dallenbach also showed that antonym acquisition is an all-or-none achievement. Children who learned about opposites through the game did so in a flash of insight, rather than gradually acquiring the *OPPOSITE* concept. This suggests that children have a latent ability to understand and apply the notion of opposition but that it needs to be activated at some point in their development.

In the 1970s, some attention was paid to children's acquisition of gradable contraries, especially dimensional adjectives. Such studies generally assumed a feature-based approach to semantic acquisition (Clark 1973). In this case, dimensional adjectives are thought to be learned in order of semantic complexity. Semantic complexity is judged on the basis of how many and how general the features are, and so children first acquire the general word for ‘big,’ and later add other more specific and less salient features for more specific meanings like ‘wide’ or ‘narrow’ (Clark and Clark 1977). These approaches also assume that negative terms (*little, narrow*) are learned only after positive terms (*big, wide*) (Donaldson and Balfour 1968). Thus children are predicted to recognize antonymic relations late in the acquisition process for those words, since they first learn the words' dimensional properties, and only later the polarity. For instance, Donaldson and Wales (1970) found that children go through a period in which they understand both *more* and *less* as meaning ‘more’ and similarly confuse polarities in spatial adjectives. But Evans (1984) notes problems with such studies, including their use of comparative and superlative forms (which should be acquired later than antonymy and so probably interfere with

the comprehension tasks). Indeed, when children's comprehension of spatial adjectives is tested without inflected forms of the adjectives, it appears that polarity is acquired before dimension (Brewer and Stone 1975).

In more recent pragmatically oriented theories, antonymy can play important roles in the acquisition of gradable predicate meaning. By such approaches (e.g., Clark 1993, see also 4.4.1), children assume that any new word has a different meaning from words they already know. So if children hear words like *big* and *little* in similar environments, the first thing they know about them is that they mean different things. If the child has reason to believe that the two words describe the same dimension, she might then recognize that polarity is a possible difference that could account for the existence of two words. Another possible difference is degree, as in *big-gigantic*, but since such pairs overlap in meaning and reference, polarity is a more obvious choice for the child. Even if the child has not already figured out the dimension that a pair denotes, she might still assume dimensional similarity and expect that the words differ in polarity. Such would be the case if the child recognizes the discourse cues that accompany co-occurring antonyms, such as occurrence in antonymic frames and performance of antonymic functions (see 5.4.2). In particular, prosodic patterns might highlight for children the contrastive nature of antonym pairs. Richthoff (2000) found that co-occurring antonyms are emphasized with focal accents in Swedish child-directed speech, leading Willners (2001) to suppose that prosody is a more important cue than frequency or substitutability in recognizing antonym pairings. If children recognize such patterns as contrastive, then they might be guided in their search for meaning by RC-LC – assuming a minimal relevant difference between the two words. Once the child assumes that the words in question are opposites, then any information garnered about the meaning of one of the pair can be used in determining the meaning of the other member of the pair. Such an approach presumes that children already have RC at their disposal, and the similar focus on contrast in RC and in acquisition principles like Clark's Principle of Contrast gives some support to that presumption.

If children do have RC at their disposal from a young age, then it might be used both as a tool in determining the meanings of words that are contrasted in discourse and as a tool for determining antonymy among words that the child already knows. Most theories of antonym learning have approached only the former of these problems. Several hypotheses have been vetted concerning what makes children (or adults) recognize words as canonical antonyms – but they do not indicate how children become able to determine antonym relations among pairs that they have not learned as canonical. Ervin (1963) proposed that if two words are substitutable in the same semantic and syntactic contexts, then paradigmatic associations, most commonly antonymy, arise among the

words. Charles and Miller (1989) claim, on the other hand, that antonymic pairings are learned due to the fact that both members of an antonym pair co-occur in sentential contexts at a much greater than chance rate. Justeson and Katz (1991, 1992) combine the earlier approaches. They argue that antonym association is made when items co-occur within similar environments in the same sentence, for example in conjoined constructions. All of these studies have relied on data from adult-oriented writing, raising the question of whether the data contributes anything to the discussion of antonym acquisition, since people acquire the antonym relation long before they start reading newspapers and novels.

Murphy 1998a, on the other hand, investigates antonym co-occurrence in three diary studies of children in the CHILDES database (MacWhinney 1995). These children, followed from approximately ages two to five, also use antonym pairs at higher than chance rates within turns (and not necessarily the same antonym pairs that their parents are using at high rates). Even at these young ages, children use antonyms in playful, creative, and thoughtful ways, as was evident in the following examples from one child, Abe.

(38) Cookie Monster drinks it **up** and I drink it **down**. (2;9.5)

(39) ABE (3;3.1): is it dry **down** or dry **up**?

FATHER: dry up it'll dry up soon I'm not sure why but it's dry **up** instead of dry **down**

As the dialogue in (39) shows, adults' usage of co-occurring antonyms is sometimes inspired by the child. Indeed, the corpus shows that parents more commonly repeat co-occurring antonyms used by the child than vice versa. Such evidence may indicate that children are aware of antonym pairings even before they have been explicitly taught about antonyms.²⁹ This then could explain Kreezer and Dallenbach's finding that children learn the meaning of *opposite* with a flash of insight.

In summary, if we judge antonym acquisition by children's adult-like use of antonyms in discourse, then acquisition happens at a very young age. If we judge it by children's use of antonyms in metalinguistic experiments, like word-association tests and *what is the opposite* games, then acquisition happens later. The younger result is more convincing since antonym use in experiments is more susceptible to extraneous factors, such as a preference for syntagmatic thinking or misunderstanding of the task. Such tasks, however, still indicate that children, like adults, are biased toward binary, incompatible contrasts. In word-association tasks, children who respond paradigmatically prefer antonym responses to synonym ones. Even before they have mastered the test's single-word response convention, they respond contrastively before they respond with

synonyms. Heidenheimer (1978), for instance, reports that in the first grade (~6 y.o.), some children respond *not sick* to the stimulus *sick*, but do not give a synonymous phrase (*not well*) for the stimulus until fifth grade (~11 y.o.).

5.4.5 *Antonymy cross-culturally*

That we might have an innate ability to understand and use antonymy is underscored by the universality of the relation. Antonymy is often claimed to be found in all languages,³⁰ and most languages have lexicalized antonyms (usually adjectives) for a set of basic property descriptions, such as dimensions (*big/little*), physical properties (*hard/soft, ripe/unripe*), age (*young/old*), value (*good/bad*), and speed (*fast/slow*) (Dixon 1982; Wirth 1983). Languages also fail to have antonyms for similar sets of words. For example, Weigand (1998b) notes that while some emotions are paired contrastively (HAPPINESS/UNHAPPINESS, FEAR/COURAGE, LOVE/HATRED), others, such as ANGER and SURPRISE lack a clear antonym in (at least) western European languages.

Antonymy is similarly understood across cultures (Osgood et al. 1975), and members of different cultures agree more strongly about what types of relations make up the category OPPOSITE than any other semantic relation (Raybeck and Herrmann 1990, 1996; see 2.1.8). Within the parameters of this universal understanding of antonymy, culture-specific factors influence particular antonym pairings and the role of antonymy in language and culture.

While simple property descriptors tend to have similar antonym relations cross-linguistically, other pairings may vary greatly across cultures, as we saw for taste antonyms in 5.1.1. For instance, Hofmann (1993) notes that in the United States the neutral-context opposite of *mountain* is most likely to be *valley*, whereas in Japan the opposite of 'mountain' is 'ocean,' since most Japanese live between mountain and ocean.

Willners (2001) categorizes languages into two groups: those with evidence of explicit awareness of antonymy, and those with evidence of implicit awareness. Implicit awareness of antonymy is demonstrated through slips of the tongue, where antonyms are substituted one for the other. Willners counts English and Swedish as such languages. Explicit evidence involves particular use of antonyms for semantic or discursive purposes, and can be found in languages like Mandarin. While it is unclear that a firm distinction between implicit and explicit evidence can be made (after all, English has many discursive uses for antonymy, as in 5.4.2), the most explicit cases underscore the particular salience of antonymy in comparison to the other paradigmatic semantic relations. In Mandarin, antonymous stative predicates are compounded to form nominal compounds that indicate the scale that the predicates measure, as in (40) (Li and Thompson 1981: 81).

- (40) *hǎo-huài* 'good-bad' = quality
dà-xiǎo 'big-small' = size
kuài-màn 'fast-slow' = speed

Antonymic noun-noun compounds are also relatively common in Mandarin, such as those in (41). These noun-noun compounds, like the predicate-predicate nominal compounds in (40), make more general (sometimes taxonomically superordinate) categories by joining the two opposites. The similarities between these indicate a more general pattern of opposite compounding than just the joining of contraries as in (40).

- (41) *shuǐ-tǔ* 'water-earth' = climate
fù-mǔ 'father-mother' = parents

Another explicit use of antonymy is the replacement of words with their antonyms in the ritual language of *tjiliwiri* used by Walbiri men (Hale 1971).³¹ In this "upside-down Walbiri," the message is coded by replacing all content words with their antonyms. So to communicate 'Give water to me,' one must say the equivalent of *Withhold fire from somebody else*.

The cultural significance of contrast, and thus of antonymy, may differ across communities. For instance, a prevalent Chinese philosophy sees the world as organized according to binary categories, *yin/yang*, which subsume a multitude of other binary oppositions: *female/male*, *earth/heaven*, *passive/active*, and so forth. On the surface, this might not seem too different from western culture, where we see things in terms of *black/white*, *hot/cold*, *in/out*, and so forth. The difference is to be found in the cyclic and unifying nature of *yin* and *yang*, as opposed to the more fixed and diametrical nature of binary categories in the West. When we talk of matters being *black and white* it means that differences are stable and clear-cut, but *yin* and *yang* exist together in all systems and in an eternal cycle of reversal – what was *yin* is expected to become *yang* and *yin* again (see Chan 1967).

The privileged position of antonymy in human cognition, and the variation in approaches to it, is also indicated by evidence that some cultures use binary contrast as a cognitive organizing principle in preference to taxonomical thinking. Lancy and Strathern (1981) argue that the Melpa of Papua New Guinea are such a culture. Instead of organizing plants, animals, clans, or colors by class inclusion, the Melpa classify them as having membership in pairs. For instance, categories include *kui-owa rakl* ('marsupial-dog pair') and *kui-köi rakl* ('marsupial-bird pair'). These pairs are devised as minimally different: 'marsupial-dog' represents the converse relation of hunter and the hunted, 'marsupial-bird' contrasts forest creatures that are similar in that they are hunted for both food and decoration. Thus, "a dimension of similarity links the items as well as a characteristic of difference, produced either by position at opposed ends of a continuum or

by a cross-cutting dimension” (Lancy and Strathern 1981: 784). While taxonomy does occur in Melpa, it is not the main means of classifying objects, and the preference for pair-contrasts is seen throughout the language, where, for example, the words for groups or togetherness all contain either the word for ‘two’ (*rakl*) or ‘partner’ (*kup*).

5.5 Conclusions

The universality and pervasiveness of antonymy underscores the human cognitive bias toward binary contrast. While the reasons for that bias have not been explored here, its extent in lexical behaviors has been.

While linguistic and philosophical interest in antonymy has tended to emphasize the logical properties of antonym subtypes, the ways in which people use and interact with antonyms indicate that, while opposition is psychologically very real (both as a process and as a category), more particular relations like contrariety and complementarity are not well distinguished by language users. This is clear both in psycholinguistic experiments and in language use, where antonym subtypes are mostly irrelevant to their discourse functions.

RC-LC gives a means for identifying antonyms and contrast sets without specifying how exactly the words contrast. This means that any set of words, given sufficient context, can serve as a contrast set. Since words differ in their semantic (and other) properties, different semantic classes of words (e.g., gradable adjectives, achievement verbs, gendered nouns) contrast in different ways, giving rise to the different antonym types observed.

6 Hyponymy, meronymy, and other relations

The word butterfly is not a real butterfly. There is the word and there is the butterfly. If you confuse these two items people have the right to laugh at you.
Leonard Cohen, “How to Speak Poetry” (1978)

The relations in this chapter are allotted fewer pages than synonymy and antonymy because they have only a tenuous claim to the label *lexical relation*. While inclusion and part-whole relations in particular are acknowledged in lexical semantics texts, they are rarely relations among words and almost always relations among concepts or things. Since approaches to meaning and semantic relations differ in the amount and nature of semantic content represented in the lexicon, relations like hyponymy and meronymy have varying levels of relevance to different theorists. The assumption here, however, is that the lexicon includes no paradigmatic relational information. In spite of this, synonymy and antonymy are lexicologically interesting as metalexical relations – relations among word-concepts. There is little evidence, however, that hyponymy, meronymy, or other semantic relations are relations among word-concepts rather than relations among the things (or concepts) that those words denote. This chapter, then, concerns why these relations are sometimes treated as (intra)lexical relations and demonstrates that they usually are not relations among words. Relation by Contrast (RC) is still relevant to these relations, since it can contrast any concepts, not just lexical concepts, but this book is concerned with its lexical-semantic applications, and the relations in this chapter are less clearly lexical-semantic relations.

The chapter is divided into three main sections, dealing with hyponymy/hyperonymy, meronymy/holonymy, and miscellaneous relations, and considering the properties and subtypes of the relations, whether they relate words, intensions, or extensions, and their position in the metalexical and other approaches. These are followed by a brief summary in 6.4.

6.1 Hyponymy and hyperonymy

Hyponymy, the TYPE < TOKEN relation (including its converse, the TOKEN > TYPE relation, **hyperonymy**¹), is regarded as one of the most fundamental

structural relations in the lexicon, rivaled only by incompatibility (Lyons 1968; Cruse 2002), and is “[b]y far the lexical relation most studied in the computational community” (Pustejovsky 1995: 24).

Hyponymy is a central notion in many models of the lexicon due to its inference-invoking nature, its importance in definition, and its relevance to selectional restrictions in grammar. Inferences, particularly entailments, are strongly associated with the hyponym relation, such that a statement entails an equivalent statement that includes one of its words’ hyperonyms. For instance, the sentence *A dog came in* entails *An animal came in*. Classical (Aristotelian) definitions also rely on hyponymy. Such definitions, which are typical of both standard dictionaries and folk definition (Casagrande and Hale 1967), consist of *genus* and *differentiae*, that is, a hyperonym and the qualities that distinguish the defined hyponym from the larger class, as illustrated in (1), where the *genus* is in small capitals and the *differentiae* are italicized.

- (1) **martagon** – a *Eurasian LILY . . . usually having pinkish-purple, spotted flowers* (American Heritage)

Thus the hyponym relation plays a role in our (conscious) thinking about what a word means. Grammatically, selectional restrictions on (for example) the object of a verb can be phrased in terms of a hyperonym, and all hyponyms of that word are then also selected as potential objects (Resnik 1993). For instance, *drink* selects for *beverage* and all its hyponyms (*water, beer, juice*, etc.). Lyons (1977) and Cruse (2000c) note that only hyponyms and their hyperonyms (in that order) can occur in the phrase *X and other Y* (*beer and other beverages*, but not *#hot dogs and other beverages*).

Because of its links to language behavior and its relevance to models of lexical knowledge, hyponymy, as compared to the other relations in this chapter, is the most relevant to the question of whether the lexicon is semantically organized and the most likely to be metalinguistically represented in the metalexical approach. Definitions of hyponymy and types of hyponymy are surveyed in 6.1.1 and 6.1.2, respectively. Section 6.1.3 covers the debate on what hyponymy relates – words, meanings, or things. In 6.1.4 the properties of hyponymy are considered with reference to how these have influenced views of the lexicon. Section 6.1.5 summarizes the metalexical approach to hyponymy, hyperonymy, and taxonomy.

6.1.1 Definitions of hyponymy

In natural language, **hyponymy** is loosely defined as the ‘kind of’ relation.² *Oak* is a hyponym of *tree* because an oak is a kind of tree. In computational models, it is frequently represented as an IS-A (e.g., Rumelhart et al. 1972) or IS-A-MEMBER-OF (Kintsch 1974) function. Logical definitions for this relation are

usually stated in terms of set inclusion. If hyponymy relates extensions, then the extension of the hyponym is included in the extension of the hyperonym. So, the set of paperbacks is a subset of the set of books. If hyponymy relates intensions, then the inclusion is reversed: the intension of a hyponym includes the intension of its hyperonym. For example, *paperback* is a hyponym of *book* because the meaning of *paperback* includes all the features (or other representations of meaning) that constitute the meaning of *book* (having pages, being bound on one side, etc.). (See 6.1.3 on whether hyponymy relates extensions or intensions.) Most definitions of hyponymy specify that the inclusion is unidirectional, for if the inclusion were bidirectional, then the relation would be synonymy.

One problem with inclusion definitions is that they flout the notion of hyponymy as a paradigmatic relation, since members of different syntactic categories might be intensionally related in this way. Lyons (1977) terms such relations **quasi-hyponymy**, and notes that adjectives often have nominal superordinates, such as *shape* > *round/square/oval* and *taste* > *sweet/bitter/sour/salty*. The line between hyponymy and quasi-hyponymy is not a clear one, however. While *taste* and *salty* clearly belong to different categories, what of *furniture* and *chair*? Both are nouns, but the hyperonym in this case is a non-countable noun (**furnitures*) while the hyponym is countable. Such examples are not uncommon among English nouns, for example, *cutlery* > *knife*, *clothing* > *shirt*, and *equipment* > *net*. In all these cases, we see patterns: basic level adjectives are likely to have nominal hyperonyms, and disparate countable categories are likely to have uncountable hyperonyms. The existence of and patterns in these examples again raise the question of whether PARADIGMATIC RELATION can be defined in terms of sameness of syntactic category (see 2.1.5.). (The end of this subsection returns to syntactic categories and hyponymy.)

Cruse (1986, 2000c, 2002) notes a second problem with set-inclusion definitions of hyponymy: they allow many more inclusion relations than can be comfortably related by the natural language definition of hyponymy *X is a kind/type/sort of Y*. Cruse (2000c: 152) illustrates this with the examples in (2).

- (2) a. A horse is a type of animal.
 b. ?A kitten is a sort of cat.
 c. ?A queen is a kind of woman.

Unlike for *horse* < *animal*, the ‘kind of’ claims for *kitten* < *cat* and *queen* < *woman* are odd. Cruse labels *horse* < *animal* and other “kind-of” relations as **taxonyms** and proposes (in his 1986 book) that taxonyms are a subspecies of hyponyms. (In other words, *taxonym* is a hyponym of *hyponym*.) However, he notes problems with this proposal. For example, *shoot* is not logically a hyponym of *kill* (since shooting isn’t necessarily killing), but it behaves as a taxonym of *kill* in (3) (where *way* serves as the *kind* equivalent for verbs).

(3) Strangling and shooting are ways of killing someone.

Wierzbicka (1984) also claims that intensional-inclusion definitions are unsatisfactory, pointing out that all policemen are members of the category *SOMEONE'S SON*, but this does not mean that a policeman is 'a kind of son.' However, her reasons for opposing inclusion definitions are particular to her own approach to lexical meaning, in which the senses for hyponyms are not necessarily more information-heavy than the senses of their hyperonyms. For instance, she claims (1980, 1984) that the meaning of *parent* includes the meanings of *mother* and *father*, rather than vice versa. Her representation of the meaning of *parent*, then, can be paraphrased as *MOTHER OR FATHER*, and the definition of *mother* would not include the element *PARENT*. Traditional compositional approaches (e.g., Katz and Fodor 1963) would define *mother* as *FEMALE PARENT*, and thus hyponymy for them is clearly reflected in informationally bottom-heavy taxonomic hierarchies. Wierzbicka's position on meaning leads her to posit different types of hyponymy from others (see 6.1.2).

To get away from inclusion definitions, Cruse (1994, 2000c, 2002) proposes that hyponymy should be treated as a prototype category, and that taxonyms are central members of the *HYPONYM* category. In his most recent attempt at listing the prototypical features of hyponyms (2002), he includes the following six, of which the first two are most heavily weighted:

Features for determining the goodness-of-exemplar rating for *X is a hyponym of Y*:

- There is no "categorical incongruity" between *X* and *Y*.
- The truth of *A is X* leads to an expectation of the truth of *A is Y*, which is greater than the reverse expectation.
- Expressions of the form *An X is a kind/sort/type/variety of Y* are normal.
- No lexical item *Z* is a hyponym of *Y* and a superordinate of *X*.
- The extra specificity that distinguishes *X* from *Y* is central to the meaning of *X*.
- *X* and *Y* match in their non-propositional features (register, expressiveness, etc.).

(adapted from Cruse 2002)

Cruse notes that this definition of hyponymy is only superior to a logical inclusion definition in that it predicts goodness-of-exemplar judgments.

The last definition to consider is the RC approach, but I leave that for the end of this section. The intervening subsections, meanwhile, force the question of whether we need an account of lexical hyponymy.

6.1.2 Types of hyponymy, and types of words that are hyp(er)onyms

Like the other relations, hyponymy can be divided into subtypes, but how many subtypes and whether they provide a valid and complete taxonomy of hyponym relations are issues for debate. In other words, *hyponym* has many competing hyponyms. The most commonly mentioned distinction is among **taxonomic**

and **functional** hyponymy (Miller 1998b).³ Taxonomic relations are the IS-A-KIND-OF relation, whereas functional relations are the IS-USED-AS-A-KIND-OF relation. For example, *cow* is in a taxonomic relation to *animal* (a cow *is* an animal), but in a functional relation to *livestock* (a cow *functions as* livestock). The functional relation is more tenuous because it is not a logically necessary relation: not every cow is livestock; not every dog is a pet; not every baseball bat is a weapon (but since every bat is potentially a weapon, they might be subject to laws that are phrased in terms of the hyperonym *weapon*). Taxonomic relations, on the other hand, are analytic: non-animals cannot be cows.

Does the vowel that distinguishes *taxonomy* and *taxonymy* indicate that the relations are different? This depends on how the taxonomic relation is defined and how it is differentiated from other subtypes of hyponymy. If it is defined by class or meaning inclusion, then *horse* > *Arabian*, *horse* > *mare*, and *horse* > *foal* are all taxonomic relations (but not all taxonyms). But when most authors use the term *taxonomic*, they intend to refer to the TYPE > BREED relation (i.e., taxonyms). This would leave the TYPE > AGE-SUBGROUP or TYPE > SEX-SUBGROUP relational types out of most taxonomies of hyponymy. But while most authors use taxonyms as exemplars of the taxonomic subtype, their definitions of that subtype do not exclude other inclusion relations.

Wierzbicka (1984) names (rather ornately) three categories of superordinates in addition to the taxonomic and functional. These categories are marked by their particular morpho-semantic status, in terms of countability and number. The **collectiva-singularia tantum** class (e.g., *furniture* > *chair*) involve non-countable, singular superordinates that have countable subordinates. Wierzbicka claims that these superordinates are defined in terms of “what for and where” (1984: 324). The **collectiva-pluralia tantum** superordinates are non-countable, plural superordinates, defined in terms of “where and why” (1984: 325). This is a bit harder to justify as a type of hyponym relation since her examples (*leftovers*, *odds-and-ends*, *remains*), while collective, do not have clear hyponyms. The last category, **pseudo-countables**, include examples like *vegetables* and *narcotics*, and are defined in terms of “what for and where from” (1984: 325). Wierzbicka contends that *carrot* cannot be defined as ‘a kind of vegetable’:

Carrots is a taxonomic concept; it stands for a kind of thing. But *vegetable* does not stand for a kind of thing; it is impossible to draw a vegetable of some unspecified type because the concept *vegetable* is not based on similarity and includes no perceptual components . . . To define *carrots* as a kind of vegetable (or *oats* as a kind of cereal) is similar to defining *eggs* as a kind of groceries or *buttons* as a kind of odds-and-ends. (Wierzbicka 1984: 323)

We can see here that Wierzbicka considers taxonomic relations to be a kind of perceptual relation, while others (e.g., Rosch 1973) have no qualms about

considering *vegetable* > *carrot*, *furniture* > *chair*, and *animal* > *bear* to all be examples of the same relation, taxonomic hyponymy. While Wierzbicka is forced to make an exception for unique beginners (the highest level of a taxonomic hierarchy), she claims “all taxonomic concepts must be defined in terms of other taxonomic concepts.” Thus, she argues, the further three categories of relation are necessary.⁴

Wierzbicka’s conceptualization of taxonomic hyponymy is reliant on a notion of taxonomic concepts (and words for them), and similarly her other subtypes of hyperonyms rely on qualities of the words in the hyponymy relation, rather than qualities of the relation itself. Like Wierzbicka, Chaffin and Herrmann (1984) define their hyponymic types according to the types of words involved (see 3.5.1), and they also hold that items defined by perceptual cues have a special type of hyponym relation, which they call **perceptual** subordination and exemplify with *animal* > *horse*. They also include **functional** subordination (*vehicle* > *car*) which relates items defined by their function. Their other four types of subordination are likewise defined by how the items in the relation are individually defined: **geographical** (*country* > *Russia*), **activity** (*game* > *chess*), **state** (*emotion* > *fear*), and **action** (*cook* > *fry*). The subordination “types” here seem to name the highest superordinate levels (e.g., *activity* > *game* > *chess*). It is less clear that these subtypes reflect different ways for words to be related.

Unlike Wierzbicka’s, Chaffin and Herrmann’s taxonomy includes hyponymic subtypes that correspond to parts of speech other than nouns, in particular the action type, which is illustrated by verbs, and the state type, which might include properties described by adjectives. Most discussions of hyponymy focus on relations among nouns (or things), but the relation is found in the other major categories as well. For example, as there is a hyponym relationship between *crimson* (n.) and *red* (n.), it follows that *crimson* (adj.) is a hyponym of *red* (adj.). However, as already noted, adjectives and verbs are less likely than nouns to have hyperonyms from the same part of speech, and so they often seem like less prototypical cases of hyponymy. Descriptions of hyponymy, as the ‘kind of’ or ‘type-token’ relation reveal that nominal bias. While we recognize hyponyms (or taxonyms, at least) through *X is a kind of Y* statements (or variations thereof⁵), hyponymic statements for verbs and adjectives usually involve nominalizing them, as for *waltz* < *dance* in (4).

- (4) a. Waltzing is a kind/way of dancing.
- b. A waltz is a kind of dance.

Translations into nominal form do not always satisfactorily reflect the hyponymy relation between two adjectives or verbs. For instance, *excellent* is logically a hyponym of *good* (since *good* has the broader meaning, and since the extension of *excellent* is a subset of the extension of *good* – Lehrer and Lehrer 1982), but it sounds odd to claim that *Excellence is a kind of goodness*.

In order to make a hyponymic statement with unnominalized verb or adjective forms, we would have to abandon the *is a kind/type/way of* formula in favor of something like *To (be) X is to (be) Y in a certain way*, as suggested by Lyons (1977).

- (5) a. To waltz is to dance, in a certain way.
- b. To be friendly is to be nice, in a certain way.

This still does not work very well for the logical hyponymy of scalar adjectives, for which we would have to say something like *To be excellent is to be good to a certain degree*. This raises the question of whether hyponymy among scalars should be considered another subtype of hyponymy, and if so, where the boundaries of that type are. For example, is *crimson* a way or a degree of being *red*?

Having accommodated the discussion of hyponymy to verbs and adjectives, it is still a very noun-y relationship, since nominal taxonomies are well established and well developed. We might say that *stealing* is a way of *getting* but what is *getting* a kind of? *Doing*? The higher up in the taxonomy we go, the less clear the decisions become – but this is a problem for nouns as well, since no two models agree on the number or nature of the **unique beginners** in nominal hierarchies (see Lyons 1977: 297ff. for discussion).

In conclusion, as for the other relations, taxonomies of hyponymy fail to cover the full range of relations that can be included under the general term. The range of things that are considered to be hyponyms in these taxonomies indicate that the notion of HYPONYMY is broader than logical inclusion definitions of it allow – since functional hyponyms are not necessarily members of the hyperonym set (e.g., *baseball bat* < *weapon*). Logical definitions are also broader than any of the other categories determined: while *policeman* < *son* is a valid inclusion relation, it does not constitute taxonomy, the true KIND-OF relation. Wierzbicka in particular distinguishes hyponymic relations based on the morpho-semantic properties of the hyperonyms involved, and (more so than the relations we have studied so far) hyponymy seems particularly at home in a single grammatical category, nouns. These issues raise the question of whether hyponymy is a relation among word-concepts or among the meanings involved. This question is tackled in 6.1.4.

6.1.3 *Properties of hyponymy and taxonomies*

This subsection first deals with logical properties and hyponymy (reflexivity, symmetry, and transitivity), and then turns to the question of what a hyponymic taxonomy should and should not (or can and cannot) include.

Hyponymy is not reflexive, if it is considered to be a relation among meanings. However, if it is considered a relation among lexical items, then **autohyponyms**

would count as items that are their own hyponyms. Autohyponymy is a type of polysemy in which a word has general and specific senses (discussed in Cruse 1986; Fellbaum 1998b; Becker 2000), as in the examples in (6) and (7), where the sense of the bold word in (a) is a hyponym of the sense in (b).

- (6) a. A square is a **rectangle** with equilateral sides.
 b. A square has four equal sides, but a **rectangle** has only two.
- (7) a. Trees, shrubs, and herbs are **plants**.
 b. The garden has enough trees, now we need some **plants**.

For most definitions of hyponymy, however, the two uses of the words are treated as separate meanings and therefore the relation is not reflexive.

While hyponymy and hyperonymy are anti-symmetrical (“*p* is a hyponym of *q*” entails “*q* is not a hyponym of *p*”), hyponymy and hyperonymy are symmetrical with respect to each other, as in (8).

- (8) a. *p* is a hyperonym of *q*. $\leftrightarrow$ *q* is a hyponym of *p*.
 b. *Digit* is a hyperonym of *finger*. $\leftrightarrow$ *Finger* is a hyponym of *digit*.

Hyponymy, or at least taxonomic hyponymy, is transitive, and its transitivity is responsible for its “deductive power” (Evens et al. 1980; 128). This relation between transitivity and deduction is reflected in the classical syllogism, which involves entailment based on inclusion relations. For example, the deduction in the old chestnut in (9) relies on the transitive *Socrates* < *man* < *mortal* relations.

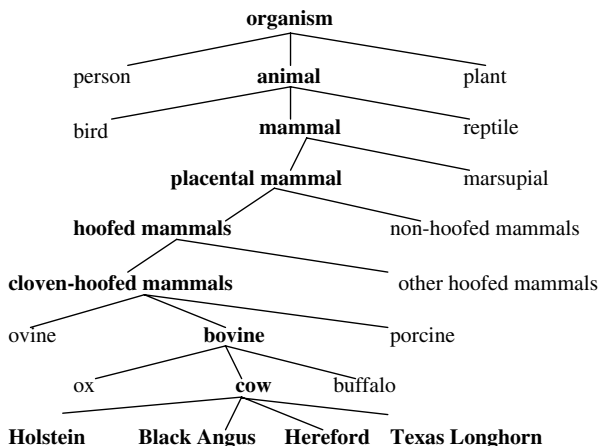
- (9) Socrates is a man. *Socrates* < *man*
Men are mortals. *man* < *mortal*
 $\therefore$ Socrates is a mortal. *Socrates* < *mortal*

Such syllogisms have been claimed to be fundamental to the logics of both western and non-western cultures (Evens et al. 1980; Hamill 1990 – but see discussion of Lancy and Strathern 1981 in 5.4.5). However, Cruse (2000c) gives a counterexample to the transitivity claim, in (10).

- (10) A hang-glider is a type of glider.
A glider is a type of airplane.
 $\therefore$ A hang-glider is a type of airplane.

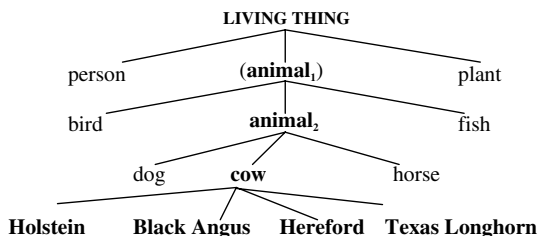
Cruse concludes that the relations expressed in (10)’s premises do not constitute a logically defined taxonomy. When making such generic claims about hang-gliders and gliders, we interpret the statements as ‘a *prototypical* hang-glider is a type of glider’ and ‘a *prototypical* glider is a type of airplane,’ thus the syllogism fails since a hang-glider is not a prototypical glider.

Since (taxonomic) hyponym relations are anti-symmetrical and transitive, they are often represented in taxonomical tree diagrams, which may be many

Figure 6.1 Logical taxonomy for *cow*

levels deep. We have already seen such a diagram in the discussion of WordNet in 3.4.2 (see figure 3.6), which included hyponym and meronym relations. Figure presents only hyponymic relations, and illustrates the parts and controversies inherent in taxonomic structures. Only a sampling of contrasting items at each level is given, and only the hyponymy relations that are connected to *cow* are developed.

Figure 6.1 is, to my knowledge, a valid representation of a taxonomy relating to *cow*, but it is unsatisfactory in several ways. On the one hand, it does not include enough. Cows are not just cloven-hoofed animals, they are also ruminants and livestock (among other things), and types of cow could be divided into *bull/cow/calf* or *dairy cow/beef cow*, and so forth. In order to give a full representation of the links to *cow*, we need a multidimensional diagram of intersecting taxonomies, and there is no reason (but for the limits of the page) not to have one. Cruse (1995, 2002; see also Cruse 2000b) points out that many words have different hyponymic relations depending on what **facet** of their meaning is deemed relevant to the context. Using his example, a book has **TOME** and **TEXT** facets, which have hyponyms like *paperback* and *novel*, respectively. Cruse's facet approach is intended to allow items like *book* to stand in these different types of relations without multiplying the number of senses (and thus the number of nodes in the hierarchy) the word has. Still, an attempt at a complete taxonomy requires some proliferation of senses, even what Cruse calls **microsenses**. For instance, Cruse (2000a) claims that *knife* has many superordinates (*cutlery*, *weapon*, *surgical instrument*, *tool*), and these do not represent differences in the facets of *knife*'s meaning, but rather reflects different kinds of knives, and therefore, arguably, different meanings of *knife*.

Figure 6.2 Folk taxonomy for *cow*

While on the one hand this taxonomy includes too little detail, on the other, it includes too much. The standards of (scientific) biological taxonomy and componential semantics encourage us to see taxonomical levels as representing single-feature differences. Such fine differences of categorization are not always reflected lexically, resulting in **covert nodes** in the taxonomy (Berlin et al. 1968). In figure 6.1, we see such covert categories as **OTHER HOOFED MAMMALS**, which are necessary if we want to represent **CLOVEN-HOOFED MAMMALS**, but do not feel that it should be on the same level of classification as *equine* (which in 6.1 would be a daughter of **OTHER HOOFED MAMMALS**). Other covert nodes are necessitated by contrast sets that do not have a common superordinate term (Lyons 1977; Handke 1995). Lyons (1977: 302) offers the following examples: *go/come*, *teacher/pupil*, and *buy/sell*. Werner (in Evens et al. 1980) warns that such nameless nodes might proliferate limitlessly, especially if one assumes that the number of levels in a taxonomy directly reflects the number of semantic features present at each level. The more covert categories in a taxonomy, the weaker the case for the thesaurus-style model of the lexicon, which assumes that contrast (in this case hierarchical contrast) among words is responsible for their meanings. The lack of words at crucial points in the taxonomy undermines that assumption.

“Scientific” taxonomies like that in 6.1 are “not mind-like” for a number of reasons. They are not “mind-sized” (Ungerer and Schmid 1997: 63), in that they have too many levels, and they are not sensitive to the greater importance speakers give to certain levels of the taxonomy. **Folk taxonomies**,⁶ such as that in figure 6.2, are arguably more “mind-like.”

Figure 6.2 better reflects how the average person would use *cow* in hyponymic contexts. If asked *What is a cow?* an English speaker would likely respond *A cow is a kind of animal* rather than *A cow is a kind of ruminant* or *A cow is a kind of mammal*. If asked to name animals, people respond with basic level terms like *cow*, *horse*, *giraffe*, and *elephant*, rather than more inclusive terms like *carnivore*, *herbivore*, and *omnivore*. The mediating categories of *mammal* and *bovine*, even if known by the speaker, are usually not treated as *cow*’s most natural superordinate. When asked *What kind of animal is a cow?*, one still

might not think of *mammal* or *ruminant*, but instead offer *farm animal* or some other descriptive phrasal superordinate.

Folk taxonomies “are characterized by gaps, inconsistencies and alternative paths” (Ungerer and Schmid 1997: 83). Typically, folk taxonomies have five or fewer levels, including a level at which generic (or *basic*) terms are found (the *cow* level in 6.2). They may include covert categories, especially at upper levels (such as *LIVING THING* in 6.2), and do not necessarily branch at all levels (Berlin et al. 1973). But while folk taxonomies are what we are more likely to discuss in lay contexts, this does not mean that they are any more ‘linguistic’ (e.g., intralexically represented) than scientific taxonomies. Folk taxonomies are cognitive constructs quite apart from the lexical items that are associated with them. That lexical items exist at these levels of categorization indicates only that the concepts associated with them are important and/or salient. The existence of lexical gaps in such taxonomies is evidence that the relations are conceptual and not intralexical.

6.1.4 Words, intensions, or extensions? What hyponymy relates

As mentioned already, sources differ on whether hyponymy is considered a relation among words, among meanings, or among things. For most lexical semanticists, who frequently speak of ‘sense relations,’ hyponymy is a relation among intensions (e.g., Kempson 1977; Cruse 1986; Persson 1990). In this case, the meanings of hyperonyms are contained within (or inherited by) the meanings of their hyponyms. In Lyons’ (1977: 293) words, “in many cases at least, a hyponym encapsulates the sense of some . . . modifier and combines it with the sense of the superordinate lexeme.” In formal semantics (and the philosophies it derives from), hyponymy relations are treated as meaning postulates that indicate an inclusion relation between two words’ extensions, such that the extension of the hyponym is a subset of the extension of the hyperonym (e.g., Cann 1993). For many working in the taxonomical tradition in linguistic anthropology, the taxonomic structure relates sets of objects (e.g., Kay 1971). Others, often in the computational discipline, do not distinguish between the extensional and the intensional relations (see Evens et al. 1980 for examples). The intensional and extensional positions are generally taken to be two sides of the same coin, since intensions determine extensional sets. For example, the meaning postulates in the formal approach comprise the intension of a word, and so the extensions that are related by meaning postulates are intensionally determined. That hyponymy (in its usual sense) is not simply set-membership among extensions is demonstrated by Wierzbicka’s (1984) example, that all members of the extension of *policeman* are members of the extension of *someone’s son*, but the intension of *someone’s son* is not necessarily part of the intension of *policeman*.

Other problems are created by viewing hyponymy simply as meaning-inclusion, in which the semantic components of one item are a subset of the hyponym's. For Magnusson and Persson (1986), treating hyponymy as a meaning-inclusion relation means that *employ* > *employee* is a hyponym relation since the meaning of *employee* presumably includes the meaning of *employ*. Such an approach confounds the notion of hyponymy as a paradigmatic relation, and thus demonstrates that MEANING-INCLUSION is not so definable a concept as CLASS-INCLUSION. This forces us into a midway point between intensions and extensions. Hyponymy exists where a word has an intension such that the category it defines contains a definable subcategory.

The next question is whether hyponymy is a relation among words as well as a relation among the categories they name. As discussed in chapter 3, hyponymy is one of the main relations in associationist models of the lexicon, and is sometimes treated in these models as a relation among words. One of the problems for such approaches is how words come to be associated in such ways. Past studies have claimed that young children's lexicons start out unorganized but later gradually take on hierarchical organization. Such claims rely on evidence that (unlike adults) preschool children do not prefer taxonomical over other types of categorization in sorting tasks (e.g., Inhelder and Piaget 1964), nor do they prefer *genus/differentiae* strategies in defining nouns (e.g., Watson and Olson 1987). The shift toward adult-like behaviors begins around the same time as the paradigmatic shift in word-association tasks. But just as late-acquisition of antonym behaviors in word association does not mean that preschool children do not know antonyms (see 5.4.4), there is plenty of evidence that children do understand and know the hierarchical relations among things (and the words for those things) at an earlier age than they display that knowledge in certain experimental situations (see Blewitt 1993 for extensive discussion). For instance, preschool children are more likely to sort items taxonomically if given containers to sort the items into (Markman et al. 1981), indicating that young children do have taxonomical knowledge, even if they do not always prioritize it. But this is still not necessarily *lexical* knowledge. So, one might argue that the paradigmatic shift at around school age indicates that the latent taxonomical relations among concepts have become expressed as hyponymic relations in the lexicon as well, leading to children's use of hyp(er)onyms in more abstract tasks such as definition and word association. But these abstract tasks are not purely linguistic tasks – they are metalinguistic tasks revealing the child's new ways of thinking *about* words and uses *for* words, rather than new ways that the words can interact in the linguistic system. For example, children do not suddenly discover the selectional restrictions of words (e.g., *drink* takes hyponyms of *beverage* as its direct object) after they have undergone the paradigmatic shift. So, young children develop conceptual taxonomic hierarchies, relating superordinate and subordinate categories, although they do not make use of these categories in the same tasks that adults do. Their shift toward taxonomical sorting and use

of hyponymy indicates a growth in cognitive and metalinguistic abilities (including consciousness of paradigmatic lexical relations), but does not indicate a change in the linguistic system itself.

If semantic relations among words (rather than the concepts they denote) are represented as metalexical relations among word-concepts (as argued for here), then we need evidence that it is words and not just meanings that are related. In other words, both lexical form and meaning are relevant to the relation if it is a lexical as well as semantic relation. But form is less relevant to hyponymy than antonymy and synonymy. If we ask *What is a kind of animal?*, *cat* seems a “better” answer than *kitty*, and so we might conclude that similarity of register is important to hyponym decisions. But if we use a word from a marked register in the question, the answer is not necessarily “better” if we match registers. So, if we asked *What is a kitty a kind of?*, *animal* is a perfectly good answer, and (in most contexts⁷) there would be little need to answer with *critter* or some such informal word. In discussing taxonomies, it seems natural to revert to the least marked form available, because the issue at hand is category membership, not word association. This contrasts with antonymy, in which form is more usually relevant. In thinking of an opposite for *awake*, one is likely to prefer *asleep* over *sleeping*, either because *awake/asleep* are canonically related or because *awake* matches the morpho-phonological form of *asleep* better than *sleeping* does.

In the case of antonymy, the existence of canonical antonyms provides clear evidence of lexical opposition. But canonical hyponyms are rare, if they exist at all. If we were to ask people for examples of the KIND-OF relation, chances are that they would give us examples from a limited range of semantic fields (e.g., biological), but this is more likely because such fields are heavily taxonomized rather than because they experience those words together more often than other hyponym-hyperonym pairs.

In summary, hyponym relations exist where named categories have named subcategories. (Relations among unnamed, or covert, categories are taxonomical, but not hyponymic.) While there is no reason to assume that hyponym relations among word-concepts cannot be derived, there is little reason to assume that they generally are, since word form is rarely relevant to hyponym selection. Instead, it seems that hyponym relations simply reflect taxonomical relations among non-lexical concepts.

6.1.5 *The metalexical approach to hyponymy*

As 6.1.4 showed, hyponymy is rarely a relation among words, and so we have little motivation to treat it as a metalexical relation among word-concepts (and thus it is misleading to continue referring to it as *hyponymy*). Thus, hyponymy does not merit a version of Relation by Contrast that specifically relates words for types and words for subtypes (or tokens). Instead the relatedness of hyponymic

word sets follows from the minimal difference among the non-lexical concepts the words represent (the difference being taxonomic level). The registral constraints for taxonomic associations seem more to do with communicative issues and individual word meaning than with the relation between the hyponym and hyperonym. 'Basic' words and taxonomical jargon (like the Latin names for plants and animals) unambiguously indicate conceptual types, while less neutral descriptions muddle the issue with affective or connotative information. If we want to say something about the class of things known as *cats* (particularly its relation to other classes of things), we are better off using a neutral description than more 'charged' words like *kitty* and *moggy* for which it is less clear that we are talking about the whole class and not some part of it (like CUTE-CATS or PET-CATS).

For the rare occasions in which lexical form must be matched in hyponym relations, the version of Relation by Contrast drafted in the last chapter, RC-Lexical Contrast, suffices. It holds that lexical contrast relations hold within sets of word-concepts that differ in just one relevant property. In certain contexts, that relevant contrast is a level of taxonomic description. RC-LC predicts that sets like {*BOTTLE*, *CONTAINER*} and {*TABBY*, *CAT*, *MAMMAL*, *ANIMAL*} are relatable, based on the minimal difference among their members (describing objects at different taxonomical levels). What RC-LC cannot do is represent the asymmetrical relation between a hyperonym and several co-hyponyms. That is, it does not capture the tree-structure associated with taxonomies. Again, it is unlikely that formal properties of words are particularly relevant in discussions of taxonomical trees, but if evidence can be found for such relations among word-concepts (rather than the non-lexical concepts those words represent), then one might propose an asymmetrical version of RC-LC, as in (11).

(11) **Relation by Contrast – Asymmetrical Lexical Contrast (RC-ALC)**

An asymmetrical lexical contrast set includes just a subset containing one word-concept and one or more subsets that are lexical contrast sets themselves, and these subsets have all the same contextually relevant properties but one.

RC-ALC defines relations like *book* > {*hardback*/*paperback*}, which are not only asymmetrical, but complex, in that there are relations within the relation. However, the case for such a relation is not convincing, since there is little evidence that such relations rely (in part) upon word form, and since the relation derived through RC-ALC just sums up the RC-LC-derivable relations *book* > *hardback* and *book* > *paperback*.

Earlier I proposed that RC is a general cognitive relation, not just a means for relating word-concepts. I would not go so far as to claim that RC is responsible for taxonomic relations. While RC easily describes contrast relations of many sorts, the multi-layered, asymmetrical nature of taxonomies is likely determined

by other principles of categorization as well as RC. Nevertheless, the lack of evidence that word form must be matched in taxonomic relations should discourage us from looking further than RC to explain lexical hyponymy. RC-LC itself can account for relations that follow a single branch-line through a taxonomic tree, such as *building* > *house* > *mansion*, since the items in such relations differ in the (potentially relevant) property of taxonomic level, but are similar in that they can all refer to the referent of the lowest item in the tree (*mansion*).

6.2 Meronymy and holonymy

While little evidence suggests that hyponymy is a lexical relation, even less suggests that meronymy and holonymy are lexical relations. The only reason they merit their own section here is that they are frequently mentioned in lexical semantics texts. Like hyponymy, meronymy probably captures lexical semanticists' interest because of its relevance to definition. *Part* is the second most common noun in dictionary definitions of English nouns (Smith 1985). Nevertheless, meronymy itself was not one of the relations identified in Casagrande and Hale's (1967) study of Papago folk definitions, and they only added it to their taxonomy of relations as an afterthought (see 3.1.3).

Whether meronymy is a relation type unto itself is a matter of some debate. Werner and Topper (1976) derive meronymy from taxonomy, translating *an engine is part of a car* into *an engine is a kind of car-part*, and Winston, Chaffin, and Herrman (1987: 419) note several psychological studies and semantic models that have included part-whole relations as examples of class-inclusion relations. On the other hand, Iris, Litowitz, and Evens (1988) consider class-inclusion relations (hyponymy) as a subtype of PART < WHOLE relations. And on yet another hand, Handke (1995: 90) considers meronymy to be a basic sense relation because it "cannot be fully explicated" in terms of antonymy, synonymy, and hyponymy.

6.2.1 Definitions, types, and properties of meronymy

Meronymy is the IS-A-PART-OF (OR HAS-A) relation, and (like *hyponymy*) the term refers either to the directional relation from whole to part or collectively to that relation and its converse, **holonymy**. So, for example, *cockpit* is a meronym of *airplane* and *airplane* is a holonym of *cockpit*, and the relation between these two items is meronymy. Cruse's (1986) definition of meronymy involves two test sentences:

X is a meronym of Y if and only if sentences of the form *a Y has Xs/an X* and *An X is a part of a Y* are normal when the noun phrases an X, a Y are interpreted generically. (Cruse 1986: 160)

Winston et al. (1987) find this definition too restrictive and instead propose that meronym relations are those that can be expressed using the word *part* or derivations of it, including any of the following test frames: *X is a part of Y*, *Y is partly X*, *Xs are part of Ys*, and so forth. Their definition thus denotes such relations as *dating*<*adolescence* (*Dating is a part of adolescence*) and *aluminum*<*bicycle* (*Bicycles are partly aluminum*), whereas Cruse's definition does not (?*An adolescence has [a] dating*; ?*[An] aluminum is a part of a bicycle*.). The more inclusive definition is the more common approach, as the below discussion of proposed meronym types shows.

Cruse's definition of meronymy specifies it as a relation among nouns. While Winston et al. do not limit meronymy to nouns, any verbs they test for meronymy are nominalized (e.g., the gerund *dating*), and are related to other nouns *adolescence*. Furthermore, they claim that attribution relations (e.g., *yellow*<*canary*) are mis-categorized as part-whole relations, severely reducing the possibility of adjectives in (cross-categorical) meronymic relations. Generally, meronymy is assumed to be a relation among names for things, and so nominalized descriptions of activities or properties are acceptable in meronym relations (*swallowing*<*eating*, *nausea*<*disgust*), but non-nominal items are not in meronymic relation (**swallow*<*eat*, **nauseous*<*disgusted*). The nominalization of potential meronyms (and holonyms) betrays the need to conceptualize PARTS (and WHOLEs) as THINGS. This serves a first clue that the relation here is not so much among words, but among certain kinds of concepts – THING concepts.

The physical relations among parts and wholes vary. A slice is a part of a pie in quite a different way than a lieutenant is a part of an army. But while parts and wholes are related in different ways, this does not entail that different kinds of *lexical* relations (among words for parts and words for wholes) must be distinguished.

The number of identified subtypes of meronym or PART<WHOLE relations varies from two (Cruse 1986) to at least eight (Nagel 1961). On logical grounds, Lyons (1977) and Cruse (1986) distinguish **necessary** meronyms, such as *ear*<*body*, and those that are **optional**, such as *handle*<*door*.⁸ Note that an *ear* is a body part even if it is removed from the body, but a handle is not necessarily a door part. With Cruse's limited definition of meronymy, he need not go much further, but others have found many types of evidence for multiple types of meronymy.

Varying transitivity is proposed as evidence for necessary and optional meronymy (Lyons 1977), as in the examples below:

- (12) The house has a roof. *house*>*roof*
 The roof has a chimney. *roof*>*chimney*
 ∴ The house has a chimney *house*>*chimney*

- (13) The house has a door. *house>door*
The door has a handle. *door>handle*
 ?∴ The house has a handle. *?house>handle*

Iris et al. (1988) use transitivity differences in distinguishing their meronym subtypes; **whole>segment** relation (*month>day*, *bread>slice*) is transitive, while the **whole>functional component** (*car>engine*, *door>handle*) and **collection>member** (*pride>lion*, *crew>captain*) are not necessarily transitive. This does not, however, account for the differences between (12) and (13), which both involve whole>functional component relations.⁹ WordNet (Miller 1998b) also distinguishes three meronym relations, which differ from Iris et al.'s in distinguishing a separate type for **whole>substance** but not recognizing segments as a part-type. However, WordNet theorists themselves (Miller 1998b; Priss 1998) consider its typology of meronymy to be deficient.

Winston et al. (1987) claim that all meronym relations are transitive, and that apparent intransitivities involve more than one type of meronymy. They instead cite the 'common argument' criterion in determining the number of meronymic types: two instances of relating constitute different relations if they can both apply to the same word "but answer different questions about it" (1987: 420). So, for example, *fabric* and *sleeve* have different types of relation to *shirt* because a shirt can have both those things as parts, but "has" them in different ways. Winston et al. (1987) posit three relation elements (see 3.5.1) for meronymy: **functional**, **homeomerous** (the part is the same kind of thing as the whole, e.g., *slice<pie* versus *crust<pie*), and **separable**. In treating these as features, rather than types, of meronymy, they are able to identify additional types because the three features can be specified as 'plus' or 'minus.' Using these elements, they identify the six relations in table 6.1.

While Winston et al. show how the six meronymic types differ in their relation-element structure, they do not explain whether the other three possible configurations of these feature specifications are impossible or whether there is any other explanation for their failure to be found in natural language. In Chaffin, Herrmann, and Winston (1988), they found that these types of meronym relations primed subjects for other examples of the same type, but less so for examples of another type. However, it is no surprise that PLACE < AREA relations prime each other better than FEATURE < ACTIVITY relations, since the possible members of such relations are semantically similar to begin with. As was the case for hyponym relations (see 3.5.1), the Relation Element theorists have introduced relational types that describe the semantic content of the individual related items, thus confusing relations in the abstract with particular types of words that can instantiate those relations.

Similarly, Chaffin (1992) uses the lexicalization of different kinds of parts as a basis for hypothesizing meronymic subtypes. So, for example, *member of* and

Table 6.1 *Winston et al.'s (1987) meronymy types*

Relation	Examples	Funct	Homeo	Separ
COMPONENT < INTEGRAL OBJECT	<i>pedal < bicycle</i> <i>punchline < joke</i>	+	—	+
MEMBER < COLLECTION	<i>member < committee</i> <i>card < deck</i>	—	—	+
PORTION < MASS	<i>slice < pie</i> <i>grain < rice</i>	—	+	+
STUFF < OBJECT	<i>flour < cake</i> <i>glass < bottle</i>	—	—	—
FEATURE < ACTIVITY	<i>swallowing < eating</i> <i>dating < adolescence</i>	+	—	—
PLACE < AREA	<i>oasis < desert</i> <i>London < England</i>	—	+	—

material of lexicalize different kinds of PART-OF relations in Chaffin's view. As we have seen, hyponym relations can also be described with a variety of English nouns – *kind of*, *shade of*, *brand of*, *way of*, but there is little reason to believe that they indicate different types of relation. Instead they reflect different items in the relation. For example, *toothpaste* > *Crest* hardly exemplifies a different kind of relation from that of *car* > *Mercedes*, even though one is described as *brand of* and the other as *make of*. In looking at types of PART-OF relations, we would want to be assured of other reasons to differentiate them other than their idiosyncratic collocation patterns in such constructions.

Like Casagrande and Hale's (1967) initial categorization of relation types, Meaning-Text Theory (Mel'čuk 1996, see 3.3.3) does not recognize any common PART < WHOLE relation. Instead, it has other relations, such as **Cap**, which indicates the chief member of something (e.g., *Pope* < *Roman Catholic Church*), and **Mult** which relates individual and aggregate terms (*bird* < *flock*).

Researchers also differ as to whether relations like **possession**, or ownership (*millionaire* > *money*), and **attribution** (*mansion* > *large*) are variations on the PART < WHOLE theme (e.g., Collins and Quillian 1969), or if they are incomparable to meronymy (Winston et al. 1987). Possession, like meronymy, is described in English (and equivalently in other languages) with the verb *to have* (*A millionaire has money*), and the line between possession and part-having is fuzzy at best. As for attribution, when people are asked to list properties of objects, they do not distinguish between attributes and parts (Tversky and Hemenway 1984). Priss (1998) suggests that meronymy might be formalized as an attribution relation, such that HAS-A-HANDLE-FOR-A-PART would be

an attribute of *hammer* and *cup*. Thus, the case for separating attribution and possession from meronymy is not strong.

To summarize, in a broad definition of meronymy, different meronymic relations are apparent. Nevertheless, the criteria used to develop typologies of those relations do not satisfactorily differentiate those types. While the Relation Element theorists have considered this problem most thoroughly, their treatment is at best descriptive, as it seems to predict more types of meronymy than actually occur.

6.2.2 What meronymy relates

Things and their parts are certainly conceptually related, but are names for things and names for their parts (meta)lexically related? Some approaches to lexical knowledge (e.g., MTT) treat PART < WHOLE relations as relations among words. However, few give any rationale for treating meronymy as a lexical relation. For instance, in formalizing a definition of meronymy for WordNet, Priss (1998: 187) states that “Two disambiguated words are in *meronymy relation* if their denotative word concepts are in relation $R^m_{(Q4; Q2)}$ where m is a meronymy relation among denotata.” In other words, a word is a meronym if it denotes a part. While Winston et al. (1987: 418) claim that meronymy is “particularly important to our understanding of the structure of the lexicon” and that “meronymic relationships structure semantic space,” they avoid considering the relation as generically holding among words (1987: fn. 2), but instead consider it as a relation among lexical units in context (in order to avoid the matter of whether necessary and optional parts must be distinguished as different types). This seems to be an attempt at eating one’s cake while baking it too: claiming that the relations are important to lexical structure (i.e., presumably lexically represented), yet can be considered only in specific contexts (i.e., presumably context driven and not lexically represented).

In most instances, meronym relations do not exhibit the kinds of idiosyncrasies that would indicate that some instantiations of the relation are lexical, not just semantic, relations. Issues of linguistic form rarely come into play in making meronymic decisions. For example, in deciding whether *stalk* or *stem* is a better meronym for *daisy*, only semantic issues (*Is the daisy-part more stem-like or stalk-like?*) come into consideration. However, some meronyms and holonyms are so specific to each other that it might seem that the words are linked. For example, *admiral* is a meronym to *navy* while *general* is meronym to *army*. Still, the items are related on semantic rather than lexical grounds, in that the meaning of *admiral* includes the information that it is a high-ranking officer in a sea-faring military organization, whereas *general* is associated with other types of military organizations. *Admiral* and *navy* are in the meronymic relation not because the *admiral-navy* lexical link prevents another word, *general*, from

being *navy*'s meronym, but simply because navies have admirals and do not have generals. The concepts associated with *admiral* and *general* prevent them from being associated with inappropriate meronyms.

The one example of lexically sensitive meronymy that I have found is the entertainment of contriving collective nouns for groups, as popularized by the book *An exaltation of larks* (Lipton 1968). Following on the example of specific group names for animal herds (*pride of lions*, *gaggle of geese*), the author discovered old collective nouns, coined some, and encouraged others in coining more, such as *an agenda of tasks* or *an aarmory of aardvarks*. The latter example emphasizes the potential relevance of lexical form to meronymic decision, and would argue for metalexical representation of the lexical relation. Such examples sit so squarely in the domain of word play that they plainly involve metalinguistic, rather than linguistic, associations. Arguably, other such specific (but current) examples, like *lion* < *pride* might also be metalexically represented, since its relation to *pride* could be said to be something one knows about the word *lion*. Still, it is more likely that belonging to a pride is something one knows about lions, rather than something one knows about the word *lion*, in which case the relation is semantic (LION < PRIDE) or semi-lexical, in which case the non-linguistic concept LION relates to the word-concept PRIDE – that is, one of the things you know about lions is that the name for a group of them is *pride*.

6.2.3 RC and meronymy

The argument for intralexical organization by meronymic relations is extremely weak, since the meronymic relation is semantically regular (i.e., predictable from non-lexical conceptual information) and does not depend upon lexical form. Thus meronymy in the metalexical approach is treated in the same way as hyponymy. Usually, meronymic relations are simply reflexes of the conceptual PART < WHOLE relations they describe. In those cases where the actual words have influence on relation decisions, the general principle Relation by Contrast-Lexical Contrast (RC-LC) suffices. In a context such as inventing humorous meronyms (*aarmory of aardvarks*), the relevant difference for two words is whether they are part-names or whole-names, and the more similar they are otherwise (in relevant semantic and formal properties), the more amusing the game.

6.3 Other relations

The range of other lexical-semantic relations that have been proposed is too long, and in some cases too idiosyncratic, to catalogue and discuss here. The relations considered in the past three chapters are those that have most often

been considered to be lexical relations in the collective literatures of the relevant fields. Some less-accepted relations have been mentioned in passing, such as attribution and possession in 6.2.

The popularity of WordNet as a computational tool has brought entailment relations among verbs into the lexical spotlight. WordNet represents four such relations (Fellbaum 1990, 1998b). **Cause** (*show-see, kill-die*) and **backward presupposition** (*forget-know, untie-tie*) are familiar semantic relations among predicates. The WordNet group devised the other two relational categories to get around the problems involved in recognizing hyponymic relations among verbs (see 6.1). **Troponymy** is essentially manner hyponymy for verbs, in which the verb with less inclusive reference entails the verb with the more inclusive reference, for example *amble* is a troponym of *walk* because ambling is equivalent to *walk* plus some manner description (*walk in an ambling manner*).¹⁰ While troponymy bears much resemblance to hyponymy, the remaining relation (which does not have a name of its own, so I will call it **non-troponymic inclusion**) is more like meronymy. In this case, the action described by one verb is a sub-action to that described by the other verb, as in *step* < *walk*. Whether troponymy and non-troponymic inclusion are really different types of relation from hyponymy and meronymy is debatable. Keeping the types of relation different for the different parts of speech allows WordNet to justify its separate lexicons for nouns, verbs, and modifiers. No one, not even the WordNet theorists, would claim that these verbal relations are lexical rather than semantic in nature. Thus, they do not merit any further attention here.

Miller (1998b), in a discussion of relations not represented in WordNet, suggests the IS-NOT-A-KIND-OF relation for cases in which we explicitly remember not to include a seemingly appropriate category as a hyponym to another – for example, *WHALE* is not a kind of *FISH*, and *BAT* is not a kind of *BIRD*. This is certainly information that needs explicit representation in conceptual memory, but again we have no reason to consider it a lexical relation.

6.4 Summary: The asymmetric relations in the metalexical approach

The relations discussed in this chapter have been represented as part of lexical knowledge by some theorists, in spite of the fact that they are semantically predictable relations. These relations are not particularly interesting from a metalexical perspective, since they rarely relate words rather than non-linguistic concepts. When words *are* related in hyponymic, meronymic or other such relations, those relations are derivable through RC-Lexical Contrast.

7 Lexicon and metalexicon: implications and explorations

There is no use indicting words, they are no shoddier than what they peddle.
Samuel Beckett, *Malone Dies* (1958)

The previous chapters have reviewed modern thinking on paradigmatic semantic relations and proposed that such relations are metalinguistic rather than linguistic in nature. Whereas many theorists have assumed that the lexicon is organized according to relations like synonymy and antonymy, the evidence is against semantic organization of the lexicon, since meaning itself is not wholly resident in the mental linguistic faculty. This chapter returns to the assumptions put forth in chapter 1. Three questions are raised and briefly discussed: Is semantic organization of the lexicon necessary? What is a plausible model of the lexicon? And finally, if paradigmatic relations are metalinguistic in nature, what business do linguists have in studying them?

7.1 Is semantic organization of the lexicon necessary?

Throughout this book, I have argued that paradigmatic semantic relations are derived and stored metalexically, rather than intralexically. This argument has rested on the assumptions that linguistic knowledge and processes belong to a mental faculty that is separate from general cognition and that the lexicon should contain all and only idiosyncratic information that contributes to the construction of well-formed expressions in a particular language. Given these assumptions, the argument for metalexical representation and derivation of paradigmatic relations has rested on three points: (a) such relations are not necessary for the production of well-formed sentences, (b) derivation of such relations can rely on both linguistic and non-linguistic (context-bound) factors, and (c) intralexical representation of semantic relations is redundant, since relations among concepts (or the means for deriving such relations) must be present outside the lexicon as well. The evidence about paradigmatic relations that comes from metalinguistic activities (word-association tasks, thesaurus building, self-conscious stylistic choice-making) provides no strong evidence for intralexical semantic organization, but such evidence accords with the claim

that paradigmatic relations relate word-concepts at the metalinguistic level. However there remains one type of evidence that may point to intralexical semantic organization: that of speech-processing errors.

As discussed in 2.3.4, substitution and blend errors frequently involve words that are semantically related in a paradigmatic way. This leads many to the conclusion that the mapping errors involved here arise from the “proximity” of paradigmatically related words in a semantically organized lexicon. While alternative explanations of substitutions and blends (involving metalinguistic but not intralexical organization) were offered in 2.3.4, these alternatives are suspect in that they have not been empirically tested. So, while I have suggested that speech error evidence does not prove that semantic relations are intralexically specified, there has been no direct evidence against the position that speech errors indicate semantic organization of the production lexicon.

Even if it is eventually shown that substitution and blending errors occur because the lexicon is semantically organized, this does not negate the need for a metalexical account of paradigmatic relations. Firstly, the other arguments for metalexical representation of canonical relations and metalinguistic derivation of non-canonical relations still hold – namely, the derivability of these relations and the relevance of non-linguistic factors to those derivations. Semantic relations must be established at the conceptual and metalinguistic levels, since the information that allows the establishment of these relations is not strictly intralexical information. Secondly, there is no reason to believe that the particular relations discussed in the previous chapters are represented as such in the lexicon. Speech-error evidence indicates that lexical items might be confused due to the strength of links between them, but it does not indicate that the links for, say, antonymic relation are any different than those for synonymic relation – nor does it indicate that the links for semantic relation are of a different type than links for phonological relation. Lexical entries might be strongly linked in the lexicon because of well-worn paths among words that tend to be used together or because of shared information (phonemic, syntactic) among the items. Knowing that words are antonyms or synonyms is a qualitatively different kind of knowledge than simple relation-by-proximity. At the metalinguistic level, we differentiate between words that are related because of their meaning or their sound, and we further differentiate among types of meaning or sound relation. While certain relations seem over-represented in speech-error data this does not lead to the conclusion that those relations in particular are represented in the lexicon. As discussed in 2.3.4, over-representation of, say, antonymy in substitution errors is attributable to limits of error recognition and data collection. It thus does not provide clear evidence that antonymy is represented in the lexicon in a different way than synonymy or phonological similarity are. Furthermore, words that are related in less direct or more obscure ways are

commonly confused in speech errors. Models of the lexicon (e.g., WordNet or Meaning-Text Theory) that intralexically specify particular paradigmatic relations do not help to account for substitutions like *Volkswagen* for *dachshund* (cited in Fromkin and Rodman 1998) or errors involving words that are related in more than one way (e.g., semantic and phonemic – such as substituting *colon* for *comma*).

To conclude, particular relations with particular uses in language cannot be located in a modular lexicon. This does not rule out the possibility that lexical entries are “close” in certain ways, and that this closeness can result in speech errors. While relations in the lexicon and relations at the metalinguistic level may be somewhat redundant in that the same words may be related, the informational content of those relations is different. In the lexicon, *hot* and *cold* may be linked, but at the conceptual level *HOT* and *COLD* are recognized as antonyms. The next section considers some other, non-modular solutions to this problem.

7.2 What is a plausible model of the lexicon?

The arguments and analysis presented in this book have rested on very conservative assumptions about the nature of the lexicon. As discussed in chapter 1, these assumptions forced a more challenging analysis of the approaches under review by defining “the lexicon” in a very strict way. But the pragmatic approach to semantic relations presented here does not entail such a strictly defined lexicon. The next task is to investigate whether this model of semantic relations among words is compatible with various current models of the lexicon.

Having removed paradigmatic relations from intralexical representation, the metalexical approach says little, in fact, about the nature of the lexicon itself. For this reason, it is compatible with most proposed architectures of the lexicon, except for those (discussed in 3.3–4) that maintain that intralexical paradigmatic relations are the source of lexical meaning. Since the metalexical view relies on meanings to determine semantic relations, meanings must exist apart from lexical networks.

While traditionally the lexicon has been imagined as a “dictionary in the mind,” more modern approaches break down or rearrange the boundaries of the lexicon. If we take, for example, the **representational modularity** espoused by Jackendoff (1997 and elsewhere), then knowledge of words is represented as three different types of knowledge – syntactic structures, phonetic structures, and conceptual structures – which intersect to give a complete representation of the knowledge that we apply in order to use the word successfully. This diffuse tripartite structure prevents the relation of words within the lexicon, since words are not stored as distinct wholes. At best, the model can represent stored paradigmatic organization among meanings, syntactic structures, or phonemic

forms, but not among linguistic expressions, since linguistic expressions as such are not located in any particular “linguistic” domain, but are represented across domains. So *semantic* relations among lexicalized concepts might exist in the conceptual realm, but *lexical* relations, which relate more than just semantic information, still must be accounted for in the conceptual realm, as relations among word-concepts. Jackendoff’s approach still treats some knowledge as specifically linguistic (i.e., modular).

Even less modularity is found in the range of theories known as Cognitive Linguistics (e.g., Langacker 1990). The metalexicical view is compatible with most of these approaches as well. While the arguments for the metalinguistic nature of paradigmatic relations rested on assumptions of modularity, this was in order to show that paradigmatic relations could not be represented in a modular lexicon. As noted in chapter 1, one way to go about arguing for a non-modular approach to the lexicon is to examine whether the alleged contents of a modular lexicon need to (or indeed can) be represented in that way. The preceding chapters show that semantic relations cannot be represented in a modular lexicon. Thus, this approach is compatible with the non-modularity assumption of cognitivist theories.

Another trend in linguistic theory is the view that lexicon and grammar exist on a continuum, rather than being fundamentally different kinds of linguistic object. The continuum view is supported in many linguistic theories, including Construction Grammar (Fillmore and Kay 1995), Cognitive Grammar (Langacker 1990), and Functional Grammar (Halliday 1994), but remains foreign to the Chomskyan framework. At the lexical end of the continuum, we have a complete mapping between a simple free morpheme’s form, its grammatical category, and some conventionalized concrete meaning. At the other extreme, we have grammatical structures with no phonological content and extremely abstract semantic content. So in a continuum model of linguistic knowledge, the distinction between words, multi-word expressions, and unlexicalized linguistic structures is a graded rather than absolute distinction. This predicts that there should be no sharp distinction between lexical relations and relations among other types of expression. It remains to be investigated whether relations among linguistic objects other than words (e.g., phrases and lexically unfilled syntactic structures) are comparable to lexical relations. Do such related items, for example, show particular co-occurrence patterns in conversation or interfere with each other in speech errors, as semantically related lexical items do? This line of questioning is worth pursuing, as the answers could lend support to the continuum hypothesis.

A lack of distinction between the lexical and the grammatical also raises the possibility of narrowing the distinction between the syntagmatic and the paradigmatic in the representation of relations among linguistic items. Following the Construction Grammar (Fillmore and Kay 1995; Goldberg 1995) line of

thinking, language users have a ‘vocabulary’ of complex (but often underspecified) structures that contribute to well-formed utterances by overlaying each other to give a fully specified form. (Similarly, this would work in a unification grammar, like Head-driven Phrase Structure Grammar [Pollard and Sag 1994], but Construction Grammar is highlighted here for its attention to constructions that specify lexical elements.) In this case, one could think of a pair of canonical antonyms (e.g., *hot-cold*) as a construction that consists of two words without any inherent ordering or phrase structure. In other words, this would be a paradigmatic construction that might also be described as syntagmatic – since it indicates words that are to be used together – but it is not a fully fledged syntactic construction. Because of the way in which constructions can overlay each other in Construction Grammar, the paradigmatic constructions could slot into the sorts of syntactic constructions that have space for two related words (e.g., *from X to Y*, *X and Y*), such as those described by Fellbaum (1995) and Jones (2002), and discussed in chapters 2 and 5.

This approach capitalizes on the notion of canonical relations, but it says neither that such relations are part of our knowledge of the involved words nor that meaning derives from those relations. Instead of claiming that *hot* and *cold* are linked in the lexicon (as the associationist views claim), it says that, in addition to the lexical items *hot* and *cold*, there is a paradigmatic construction *hot/cold*. *Hot/cold* is not part of the meaning of *hot*, nor need it be a part of the lexical representation of *hot* (but rather the reverse: *hot* is a part of the lexical representation of *hot/cold*). Thus, *hot* is free to be related to other words in context, and one means for asserting the antonymy of *hot* and some other word (e.g., *uncool*) is to use it in a construction that is associated with contrast (e.g., *By putting on that hat, Jim went from hot to uncool in seconds*). A construction-based approach bears a strong resemblance to the metalexical approach, in that it provides a role for canonical relations while also allowing for non-canonical relations to be used and recognized. It still requires a relational device (the Relation by Contrast principle) that allows for the semantic interpretation of such constructions and plays a role in the creation of new paradigmatic constructions. The construction approach differs from the metalexical approach by bringing the issue of canonical paradigmatic relations back into the realm of the linguistic.

To summarize, while the metalexical approach to paradigmatic relations makes no particular claims about the shape of the lexicon, it is compatible with both a modular, dictionary-style lexicon in the early generative tradition (as demonstrated throughout this book) and more modern positions, in which the borders between lexical, grammatical, and conceptual knowledge are drawn differently (or not at all). The metalexical position is only inconsistent with structuralist views in which words are related (and meaning arises from these relations). Although such views suffer other challenges in modern linguistic

theory as well, they have been the standard approach to lexical semantic paradigms.

7.3 Whither metalinguists?

As the last two sections indicate, much remains to be investigated with regard to paradigmatic relations, including the relation between lexical representation and linguistic processing, and how relations might be represented in cognitivist and other recent linguistic theories. Another item for concern is that the issue of paradigmatic relations has mostly been explored with reference to languages with a fairly robust *WORD* category (e.g., English, French, Chinese). The roles of paradigmatic semantic relations in language use and metalexicological thinking could be quite different in languages with less robust word categories – for instance, circumfixing languages (like Hebrew and Arabic), where morphological variations grossly affect the phonetic form of the word, or polysynthetic languages (like Mohawk and Greenlandic Eskimo), in which the notion *WORD* is problematic to begin with.

Plainly, the topic of lexical semantic paradigms has not been exhausted, and the metalinguistic approach discussed in this book gives rise to a number of new directions for lexicological research. It fits with (and exploits) a general trend in linguistic research to appreciate the particular relations that language engages in: the relations between language and context, language and conceptualization, language and linguistic behavior. While Bloomfield (1985 [1936]) argued that linguists should ignore meaning because it is not properly “linguistic,” to hold such a position in the current disciplinary context is untenable, since many if not most (if not all) linguistic phenomena cross boundaries between the linguistic, the conceptual, and the communicative. In the case of lexical relations, this means that those who study it are not just linguists, but metalinguists.

Appendix: Relation elements

Adapted from Stasio, Herrmann, and Chaffin 1985.

Relation element	Definition	Example
Attachment	X's referent is attached to Y's referent	functional location <i>car – engine</i>
Attributive	X 'is' Y (must/can be like)	necessary attribution (similarity) <i>tower – high</i>
Bilateral Position (BiP)	X and Y are on opposite sides of dimensional midpoint	incompatible <i>happy – morbid</i>
Componential	X is a component of Y (partial makeup of)	ingredient <i>cheese – pizza</i>
Connotative	X connotes Y (affective sense)	invited attribution (similarity) <i>food – tasty</i>
Continuous	X and Y can be qualified (gradable)	contrary <i>old – young</i>
Dichotomous	If X, then not Y (mutually exclusive)	contradictory <i>alive – dead</i>
Dimension	X and Y share a single dimension	dim. similarity <i>warm – hot</i>
Discrete	X and Y cannot be qualified (non-gradable)	attribute similarity <i>rake – fork</i>
Homogenous	X's referent is indistinguishable from Y's referent	measure <i>mile – yard</i>
Inclusion	X is included in Y (general inclusion)	class inclusion (all types)
Intersection	X is semantically included in Y	all denotative similarity relations
Locative inclusion	X's referent is dependent on Y's referent (locational)	place <i>China – Asia</i>
Overlap	X is partially included in Y	necessary attribution <i>tower – high</i>
Partive inclusion	X is literally part of Y	place <i>China – Asia</i>
Possession	X belongs to Y	necessary attribution <i>tower – high</i>

(cont.)

(*cont.*)

Relation element	Definition	Example
Property	X 'has' Y (property of)	collection <i>forest – tree</i>
Social	X is socially committed to Y	group <i>singer – choir</i>
Spatial	X is spatially opposite Y	directional <i>front – back</i>
Symmetrical Position	X is of equal magnitude to Y	contrary <i>old – young</i>
Unilateral Position	X and Y are on same side of dimensional midpoint	dim. similarity <i>warm – hot</i>
Vector	X is directionally opposed to Y	reverse <i>buy – sell</i>

Notes

1 WHY LEXICAL RELATIONS?

1. I follow Verschuere (1999) in considering pragmatics as a linguistic perspective, rather than a linguistic subfield. As such, pragmatics is not the study of any particular set of language phenomena, but rather a way of approaching the study of all language phenomena. Similarly, psycholinguistics can be understood as a perspective on linguistic inquiry, in that any language phenomenon can be approached from a psycholinguistic angle by asking how it is acquired, how it is mentally represented, and so forth.
2. A *representation* in this sense is a mental data structure that is input to various cognitive abilities. *Representation* here should not be assumed to mean 'symbolic representation.' Other types of representation (e.g., neural networks) could instead be at work.
3. While I take the non-innateness of meanings and relations as nearly self-evident, some meaning holists (see Fodor and Lepore 1992) do assume that meanings are innate. See 3.4.1.
4. As discussed in Part II, synonymy and antonymy are not necessarily symmetric. I therefore prefer the terms *hierarchical* and *non-hierarchical*.
5. As discussed, the issue of what is arbitrary (and thus lexically represented) is theory dependent and often controversial. But while the arbitrariness of grammatical category is debatable (Hopper and Thompson 1985), ignoring this debate for the sake of the example does not affect the argument.
6. Contrary to some of these authors, I use *polysemous* to indicate that a word has different senses in different contexts. Jackendoff (1997), for instance, uses *polysemy* to indicate the situation in which a lexeme is represented in the lexicon as having two or more senses. Following Nunberg, Cruse (1992–93), Green (1996), and others, my use of *polysemy* only indicates that a word's intensional criteria for reference vary (across contexts).
7. Wierzbicka makes a similar point when she claims that "neither lexical items nor grammatical categories have any meaning: only utterances have meaning, because only utterances express thoughts" (1977: 164).
8. It could very well be that no semantic information is in the lexicon, since it might be derived from the conceptual and contextual aspects of meaning. However, I am not entering that debate here. So, when I refer to "whatever semantic information is in the lexicon," I may be speaking of the null set.

2 A PRAGMATIC APPROACH TO SEMANTIC RELATIONS

1. New instances of meronymy or hyponymy are usually indistinguishable from new instances of categorical class inclusion or part-whole relations, so they have not been given attention here. See chapter 6.
2. A longer version of this argument with much more data appears in Murphy 1995. Tobin (1999) has independently made several of these points. Similarly, Muehleisen (1997) has shown that *big/little* and *large/small* differ in the ranges of nouns they modify.
3. *Small* occurs about seven times more often than *little* in the *Wall Street Journal*. While *big* and *large* occur at roughly equivalent rates, most occurrences of *big* are in names (*The Big Board*, *Big Blue*) and idioms (*big business*, *big-ticket items*, *big league*, *the big time*) (Murphy 1995: 77).
4. Crosslinguistic studies must compare relations among meanings, rather than relations among words, since any two languages are unlikely to have the same word forms associated with the same meanings. But note that *same meaning* should be interpreted as ‘having significant overlap in denotation,’ since most translational equivalents are not really equivalent.
5. In Murphy 2000, this was termed an *extralexical* approach.
6. Minimal difference has often been noted in discussions of antonymy (e.g., Clark 1970; Hale 1971; Gundel et al. 1989; and Grandy 1992). I apply the term more generally, so as to include relations other than antonymy.
7. Most of Fromkin’s examples include no sentential context, so it can be difficult to tell whether blended items are synonymous or contrasting. I counted items as near-synonyms if substitution of one for another would be unlikely to change the semantic appropriateness of a statement (e.g., *draft* + *breeze* → *dreeze*), and as contrasting if they represented incompatible states (e.g., *clarinet* + *viola* → *clarinola*). On these criteria, forty were near-synonymous and ten contrasting. Twelve others were semantically related in a less definable way, and five lacked any obvious semantic connection.
8. In a more detailed illustration of a spreading activation model, contrasting concepts would likely be composed of a number of nodes, with the two contrasting concepts sharing many of the same nodes and connections. It would be at this level that Relation by Contrast would determine that the concepts were similar enough to be only minimally different.
9. These word families are idiosyncratic mental categories and therefore rely on individuals’ metalinguistic beliefs, rather than historical fact. Say that Sam believes that *religion* and *sacrilege* are etymologically related, even though they have no common historical root. This mistaken belief would then affect Sam’s beliefs about semantic relations involving these words.

3 OTHER APPROACHES

1. For instance, Block (1998: 488) defines *semantic holism* as “the view that the meaning of a sentence is determined by its place in the web of sentences comprising a whole theory.”
2. In fact, some writers (e.g., Kempson 1977; Larson and Segal 1995) do not differentiate lexical synonymy and paraphrase, calling both *synonymy*.

3. While analytic statements do not necessarily involve semantically related words, other types are not of concern here.
4. While Montague himself did not use the term, *meaning postulate* is used to refer to such constraints in his theory (e.g., Dowty 1979; Bach 1989).
5. Marconi refers to patients in Warrington 1985, Riddoch and Humphreys 1987, Shallice 1988, and McCarthy and Warrington 1988.
6. Marconi refers to the Alzheimer's patient Mme. D. T. described by Brennen et al. (1996).
7. See Coseriu and Geckeler 1981 for nineteenth-century history of field theory.
8. Neither Lyons nor Cruse can be said to be strict Firthians, but Firth's influence is evident in their approaches to meaning (see Lyons 1995a).
9. Folk taxonomy contrasts with scientific taxonomy, such as the Linnaean classification system for plants and animals. The boundaries between 'folk' and 'scientific' are fuzzy, but anthropologists are interested in classification systems that are used commonly (rather than "expertly").
10. *Associative meaning* can also be used to refer to the association of a word to its denotation (through *associative learning*). The sense used here refers specifically to associations among words (not words and things).
11. For example, Collins and Quillian (1972) discuss the types of relations that are important for semantic memory. They include superordination, similarity, and, for specific semantic fields, part/whole and precedence/consequence. No form of contrast or opposition is mentioned.
12. The term *decomposition* refers to the process of breaking down meanings into semantic constituents. The term can be used either to describe a process in language comprehension (i.e., on-line, by language users) or a process in linguistic analysis (i.e., off-line, by linguists). Because of this ambiguity, I refer to *componential analyses* rather than *decomposition*.
13. Of course, in writing about such features, theorists must name them. Usually, they give features names with mnemonic value (like MALE or BOVINE, below), and so it often looks as if the semantic features are words.
14. Fodor and Lepore (1998) criticize Pustejovsky (1995) for claiming that his approach accounts for paradigmatic relations and then not demonstrating the claim. Pustejovsky's 1998 response does not remedy this.
15. Geckeler (1971) and Lyons (1977) review the history of these terms in the German literature.
16. The word *extremities* can be used to mean 'hands and feet', but it refers not to body parts with recognizable boundaries at the joints), but to fuzzily delimited body areas extending inward from the fingers or toes.
17. Lehrer's (1974) means for representing gradable contrary antonyms is slightly different from the contrast sets illustrated here. However, that representation is still descriptive rather than explanatory.
18. In 1992, Cruse writes, "it is not sufficient, in my opinion, to treat word meaning exclusively in terms of relations between lexical items. (My views on this have hardened since I wrote *Lexical Semantics*.)" (p. 289). Although Cruse 1986 has since been reissued, it has not been revised.
19. Mel'čuk and Wanner (1996) suggest that this system might better be replaced with a system for default inheritance.

20. Wilks et al. (1996: 2) relate the story of a group of NLP researchers who, “in a moment of great honesty,” tallied up the numbers of words in their projects’ lexicons and found it to be an average of thirty-six words per lexicon.
21. In spite of this claim, WordNet counts as ‘non-componential’ because it does not actually represent those features in its lexical architecture.
22. Aitchison uses the same example, but does not jump to the mental lexicon conclusion in the second edition of *Words in the Mind* (1994).
23. This justifies further the decision to ignore case relations in this book.
24. The class-inclusion family has only one other member, the place relation, which is analyzed as a part-whole relation, headed by **INC (PARTIVE)**.
25. Another mis-classified relation in the sorting task may not have belonged in this cohort of relations at all. The **invited attribute** relation was sorted as a similarity relation, but Stasio et al. (1984) analyze it as an inclusion relation (**Inc, Poss, Con**) that fits into neither the hyponymy nor meronymy categories. This relation covers things like *food > tasty* and *cut > knife*, which look like selectional restrictions rather than paradigmatic relations. So it is not clear whether such a relation type can or should be analyzed using the same tools as relations involving the same part of speech.

4 SYNONYMY AND SIMILARITY

1. Whether this is a case of synonymy or subordinate bilingualism (Weinreich 1953) is debatable, but perhaps there is no great need to distinguish the two. Several theorists (e.g., Mates 1952; Lewandowska-Tomaszczyk 1990; Sikogukira 1994) treat translational equivalence as a subtype of synonymy. See the discussion of variants in 4.2.3.
2. Definitions of synonymy are unevenly presented in the literature, and the coverage here reflects this. Textbooks are well represented here because they explicitly define terms such as *synonymy* with a minimum of theory-specific concepts and jargon. However, some semantics textbooks (e.g., Larson and Segal 1995) only give examples as explication. In psychology, the meaning of *synonym* is often assumed but not defined, such that Evens et al. (1980: 152) conclude that “[a]ppeal to synonymy by psychologists has largely been intuitive, rather than theoretically motivated.”
3. Mutual entailment determines synonymy among propositions, rather than words. But this definition is easily extended to lexical synonymy: words are synonyms if mutual entailment holds between sentences that are identical except for the substitution of one word for the other.
4. Cruse’s *cognitive synonymy* is synonymy among word-senses, without reference to non-denotative aspects of meaning. See 4.2.2.
5. This avoidance runs Hurford and Heasley (1983) in circles since they claim that “Synonymy is a relation between predicates, not words” (p. 103), but they define *predicate* as “any **word** (or sequence of words) which (in a given single sense) can function as the predicator of a sentence” (p. 46; emphasis added).
6. This is related to the notion of **synthetic synonymy** (Harris 1973), in which two expressions mean the same thing when taken as wholes, but whose internal semantic structure differs. **Analytic synonyms**, in which the parts as well as the whole of two expressions are semantically identical, should pass the *belief* context test, since they describe the same referents in compatible ways. So, if Jane Doe believes that prime numbers are *indivisible*, she necessarily believes that they are *not dividable*.

7. Others use the term **cognitive synonymy** (e.g., Quine 1961; Cruse 1986). Church et al. (1994) use the term **categorical synonymy** to indicate an exact semantic match among synonyms.
8. Cruse (1986) and others call these **plesionyms**. *Partial synonymy* is sometimes confused with *near-synonymy*. **Partial synonyms** are those that do not exactly match in some aspect (denotative, expressive, collocational), whereas near-synonyms do not exactly match particularly in their denotations. Thus, all near-synonyms are partially synonymous, but not all partial synonyms are near-synonymous (see Lyons 1995b).
9. Apresjan (1973: 175) goes on to claim “emphasis is laid not on the general semantic properties of synonyms, but on the differences between them.” Apresjan’s generalization exemplifies the fact that the Russian tradition in lexical semantics is often more intertwined with practical lexicographical and translational problems (as for MTT in 3.3.3) than the western linguistic tradition, which has tended to regard semantic relations first as a philosophical problem. See Baranov and Dobrovol’skij 1996.
10. Complete synonyms are also called **strict synonyms** (Jackson 1988).
11. One might argue that they are not perfect sense synonyms because *addled* really means ‘rotten in the way that eggs are rotten.’ However, if it denotes an eggy way of being rotten, then it should be extendable to other contexts where things are rotten in an egg-like way. It is not clear that this is the case.
12. Taylor (1995) concludes that the two words have different prototype representations – thus assuming that a denotational difference causes any frequency or collocational differences. Such a position assumes that if two words are used differently, they must be associated with different non-linguistic concepts. This is at odds with the conceptual/linguistic differentiation made by Hirst et al. (see 4.2.2).
13. See Lyons 1963 for an explicit methodology for testing potential synonym relations via substitution tests.
14. Nida (1949) also claims that pronunciation variants display avoidance of synonymy, but he limits his examples to dialectal pronunciation variants and their differences in social meaning.
15. See October 2000 archives at <http://www.americandialect.org>.
16. This is Clark’s Principle of Contrast. Other theorists have proposed similar principles, such as Mutual Exclusivity (Merriman 1991) and N3C (Novel Name for Novel Category, Golinkoff et al. 1992). Clark’s approach is highlighted here because it takes the strongest position on synonym avoidance and is not specific to nouns or any other category.
17. These are only candidates for complete/full synonymy, not absolute synonymy, since only the /i:/ form occurs in the phrase *me neither*.
18. Harvey and Yuill (1994; cited in Partington 1998) found that synonym searches accounted for 10% of dictionary consultations during writing tasks, indicating that synonyms are much valued by writers.

5 ANTONYMY AND CONTRAST

1. Both *semantic contrast* and *incompatibility* are common terms in the literature. The two terms are not, however, synonymous, since *contrast sets* are usually understood to comprise co-hyponyms and *incompatible* either describes co-hyponyms (Lyons 1977; Cruse 2000c) or any words that cannot refer to the same thing, such as

cat/justice. Note that the term *contrast*, as in *Relation by Contrast*, is used for sets of semantically compatible words like synonyms and hyperonyms > hyponyms.

2. Other terms for Janus words include **auto-antonyms** (Baron 1989) and **enantiosemy** (Lepschy 1981), and, more humorously, **antagonyms**.
3. Emotion terms have been discussed in more detail in 3.2 and 3.3.1.
4. In these studies, the distinction is made between *direct* and *indirect* antonyms, and I have translated this distinction into *canonical* and *non-canonical*. The differences implied by these two sets of terminology are discussed later in this section.
5. Mettinger (1994: 169) lists *cat/mouse* among the “antonyms in context” in his corpus study. *Cat/mouse* are certainly antonymous, but Mettinger’s discovery of *cat/mouse* rather than *cat/dog* is probably explained by the fact that his corpus was composed largely of Agatha Christie novels.
6. Charles et al. (1994: 338) found that word frequency does not account for subjects’ reaction times in assessing the antonymy of canonical and non-canonical pairs, since the same words grouped into unrelated pairs did not elicit a similarly quick reaction time.
7. *Fat* might be thought to have negative connotations, but this is only when it is applied to humans. For instance, fat books and fat wallets are not necessarily or even stereotypically bad things.
8. But a word form can represent two opposed senses. See 5.1.1.
9. And since any symmetry involves similarity, even though the reversed expressions are different, they are similar.
10. For an excellent survey of markedness in linguistics, see Battistella 1996.
11. Another example is Bierwisch’s (1967) use of the feature [+/- POL] (polarity), which is equivalent to [+/- UNMARKED], and is thus subject to the same criticisms as treatments using the term *markedness* (see Teller 1969 and Mettinger 1994 for critiques of Bierwisch 1967 in particular).
12. I am ignoring the interpretation of *six feet short* meaning ‘six feet too short,’ as this is not the opposite of *six feet tall*, but of *six feet too tall*.
13. The word *coolth* is not unthinkable, though. *The Oxford English Dictionary* (1989) includes citations of it (defined as ‘coolness’) from 1547 to 1965, although it allows that the word is “now arch[aic].”
14. Even though *hot* does not display unmarked distribution with respect to *cold*, some theorists impose a marked/unmarked distinction. For example, Dixon (1982: 18) states that *hot* is “plainly unmarked” with respect to *cold*, but offers no evidence to support this judgment. Interestingly, in the Chinese compound *lěng-rè* (‘temperature’) the word for ‘cold’ precedes the word for ‘hot.’ Since the marked term must occur second in Chinese antonymic compounds (Li and Thompson 1981 – see 5.4.5), this is evidence against HOT being unmarked with respect to COLD.
15. As ever, the terminology varies among authors. In the Aristotelian tradition, the contraries discussed in this section are **mediate**, **weak**, or **non-logical** contraries. *Contrariety* in that tradition encompasses the complementaries described in the next section. (See Horn 1989.) Leech (1981) and Singleton (2000) use the term *polar opposition* for contrariety, but this conflicts with Cruse’s use of the term, discussed below.
16. This sentence is unacceptable if it is pronounced with main sentential stress on the gradable adjective – the same stress pattern with which sentence (15a) receives an

impartial interpretation. The sentence may be allowed with other prosodic patterns, but that is not relevant to the use of *how* questions as a diagnostic for antonym subtypes.

17. At first glance, it might not seem that *cool* and *warm* apply to the whole scale, since we might claim that something that is *hot* is *not warm*. This is not a matter of scalar semantics so much as scalar pragmatics – if we can use the more specific term *hot*, it blocks use of the more general term *warm*. The semantic status of *warm* is made evident in a comparison between a hot thing and a cold (or non-hot) thing, where we can often describe the hot thing as *warm*, as in: *I like the hot climate of Malta. It's so much warmer than Sweden.*
18. Note that *frais*, often translated as *cool* in English, has far more semantically restricted occurrence, and thus is not truly comparable to either *cool* in English or to *chaud* (as an antonym) in French.
19. The same goes for Cruse's example of *gut/schlecht*, which is semantically more like English *good/poor* than *good/bad*.
20. Complex (and conflicting) tastes, such as bittersweet and sweet-and-sour, are the result of having multiple ingredients with contrasting tastes. For example the sugar in an apple is sweet but the acid in it is sour. Similarly, one might argue that Mary in (20) could be both happy and sad that she has won, but the happiness and sadness are not about the same thing. She could be happy to have the recognition of the awards panel, but sad that her friend couldn't win as well.
21. In the Aristotelian tradition, these may be known as **immediate** (or **strong** or **logical**) **contraries**. They are also often called **contradictories** (e.g., Jespersen 1924; Horn 1989; Allan 2001). The term *contradictory* is avoided in this section because it assumes a binary distinction (affirmative/negative), and *complementarity* (usefully) does not. However, Egan (1968) uses *complementary* to refer to the relation among items that imply each other, such as *question/answer*. That meaning is not used here. Handke (1995) and others refer to complementary antonyms as **binary antonyms**.
22. This is also called **relative opposition** (Egan 1968; Persson 1990), **relational antonymy** (Handke 1995), and **reciprocal antonymy** (Jones 2002). Cruse 1986 divides the category into sub- and sub-sub-types.
23. Lyons (1977) further divides directional antonyms into **orthogonal** (perpendicular: *north/east*) or **antipodal** (diametrical: *north/south*).
24. Complementaries also fared worse in the experiment than contraries, but not as badly as converses. Varley attributes this to the more abstract, less imageable nature of the pairs in comparison to the contraries (e.g., *guilty/innocent* vs. *tall/short*).
25. Note that common-noun *heaven/hell* are simple, rather than complex antonyms. One is the best place to be, the other is the worst place to be.
26. Sabourin (1998) compared priming and recognition times for synonym and antonym pairs that differed in morphological complexity. Since she looked at suffixed antonyms that do not share stems (e.g., *safe/dangerous*, *fictitious/real*), her results are not directly relevant to the current discussion, but they do underscore the canonical nature of the simple antonym pairs. Pairs like *old/young* and *strong/weak* were recognized more quickly as antonymous and had stronger priming effects on each other than pairs like *raise/lower* and *angelic/demonic*.

27. *Non-* tends to negate the “objective” or descriptive meaning of a word, while *un-* and *iN-* are more likely to be associated with a word’s “emotive” senses. See Marchand 1960, Horn 1989.
28. Particularly, his **EXTREME** category (e.g., *neither too large nor too small*) is only superficially different from the **COORDINATED** category, and the **CONFLICTING** category (*X versus Y*) might be a subtype of **DISTINGUISHED**.
29. The relative poverty of the diary data does not allow for a definite conclusion on this matter, since the recorded material includes only short periods of unstructured family interaction, and does not include other types of input to the child or input from the child’s prelinguistic period. However, the ease with which very young children exploit antonymic pairs and the lack of evident adult modeling of those pairs are suggestive.
30. In e-mail communication, M. J. Hardman has claimed that Jaqi speakers do not “do” antonyms, but her methods in determining this have not been reported. (See Murphy 1996.)
31. Hale was able to publish this work because he assured the Walbiri men that Walbiri women would not be told the secret of this ritual language. I trust that the reader will cooperate in keeping Hale’s promise.

6 HYPONYMY, MERONYMY, AND OTHER RELATIONS

1. Hyponyms/hyperonyms have also been called **units/archiunits** (Coseriu and Geckeler 1981). *Hyperonym* is a less common term than its opposite. **Superordinate** (Lyons 1977) is often preferred, although it also denotes non-lexical relations. The alternative **hypernym** (e.g., Fellbaum 1998c) is less preferred due to its phonetic similarity to *hyponym* (Lyons 1977) and because the Greek root for name is *onym*, not *nym* (Sampson 2000).
2. See Cruse (2002) for a thorough review of means for defining hyponymy. Notably, Cruse finds none of the means entirely satisfactory.
3. The terms *taxonomic/functional* are from Wierzbicka (1984). Pustejovsky (1991) calls them **formal** and **telic** hyponymy, respectively.
4. Dwight Bolinger (1992) (responding to Wierzbicka 1990) presents some arguments that *furniture* and taxonomic countables like *bird* should not be considered as separate types of hyperonymic categories. For example, “[t]he problem with *furniture* is not that it cannot conceptually embrace pieces of furniture, but that it was learned after the names of the pieces” (1992: 113) and therefore we tend to think of this hyperonym in terms of its hyponyms rather than vice versa.
5. *Kind*, *sort*, and *type* are roughly synonymous for these purposes. Some hyponyms of *kind* serve as well in some cases, such as *shade* in *Lime is a shade of green* or *species* as in *Chimpanzees are a species of apes*.
6. Also called **natural taxonomies** (Cruse 1986).
7. The only counterexample I can imagine would be a context in which language variety was plainly the issue at hand. For example, if in a biology class I was expected to demonstrate my knowledge of the Latin names of animals, then I would prefer to respond with *Felis catus* rather than *cat* if asked *What’s a type of Mammalia?* On the contrary, if we imagine a quiz show with the question *What is Micropterus*

salmoides *a type of?*, the desired answer is assumed to be *fish* (or *bass*) rather than *Pisces* (or *Micropterus*).

8. Cruse (1986) terms the necessary and optional types of meronymy **canonical** and **facultative**, respectively. Since *canonical* is used otherwise in this book, those terms are not adopted here.
9. Winston et al. (1987, following Cruse 1986) explain the intransitivity in (13) by noting that the functional domain of *handle* is limited to *door* (the handle moves the door, but does not move the house). Thus they interpret *The handle is part of the door* as ‘The door handle is part of the door.’
10. Interestingly, troponymy is the most frequently coded relation in WordNet (Fellbaum 1998b).

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