English Verb Classes and Alternations

A Preliminary Investigation

Beth Levin

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To my parents

Contents

Preface

The set of resource materials on the English verb lexicon which make up this book grew out of work begun as part of the cross-linguistic study of lexical organization and lexical representation undertaken by the Lexicon Project of the MIT Center for Cognitive Science, which I was affiliated with during the years 1983–1987. I thank Ken Hale and Jay Keyser, the co-directors of the project, for giving me the opportunity to participate in the stimulating research atmosphere of the project. This book would never have happened without the Lexicon Project: it started life as a handout on lexical organization prepared for the project's seminar series. The book contains expanded and revised versions of earlier lists of verb classes and diathesis alternations (dated 1984, 1985, 1986, and 1989), which have been previously circulated.

More people than I can hope to acknowledge have contributed to this work. The late Bill Martin first encouraged me to think deeply about these issues. Boris Katz, Judy Kegl, Betsy Ritter, Jane Simpson, and especially Sue Atkins deserve my special thanks for their continuing encouragement to get the material in this book into a form that could be published. I would like to thank Sue Atkins, Ken Hale, Mary Laughren, Malka Rappaport Hovav, and Betsy Ritter for many valuable discussions. Roz Fergusson and Jim McCawley offered extensive and detailed comments on an earlier draft. Michael Brent, Annette Herskovitz, Geoff Huck, Talke Macfarland, and Tova Rapoport also commented on portions of the draft. I am grateful to Olivia Chang, Li Ya Fei, Tina Nielsen, Tova Rapoport, and Betsy Ritter for help in compiling this book and its precursors; to Olivia Chang, Jazmine Loiselle, Alice Rusnock, and Kirsten Winge for help with the bibliography; to David Weir for help with LaTeX; to Ken Church for generating the verb index; and to Christine Bartels for her excellent job copyediting the manuscript. I am also indebted to the many linguists and lexicographers whose work I have drawn on in preparing this book.

The compilation of this book was aided by a series of discussions among

members of the Lexicon Project during 1985–6 and by two meetings of the Lexicon Seminar in the fall of 1985 that were devoted to discussions of verb properties. The contents have also benefited from meetings of the Working Group on the Polytheoretical Lexicon in 1987, as well as from the Workshops on the Lexicon held at both the 1986 Linguistic Institute at CUNY and the 1987 Linguistic Institute at Stanford University.

The *Oxford Advanced Learner's Dictionary* in electronic form has been an invaluable tool for filling out specific sets of verbs. A variety of dictionaries in printed form have also aided this work. They include: *The Collins-Robert English-French Dictionary*, *The Collins COBUILD English Language Dictionary*, *The Longman Dictionary of Contemporary English*, and *The Longman Lexicon of Contemporary English*.

During the years 1983–1987, this work was supported by a grant from the System Development Foundation to the Lexicon Project of the MIT Center for Cognitive Science. Since 1989, this work has been supported in part by NSF Grant BNS-8919884.

I hope that this book serves to stimulate further research into the lexical organization and lexical representation of English verbs.

Introduction:
The Theoretical Perspective

T he resource materials on the English verb lexicon presented in this book represent some initial results of an ongoing investigation of the syntactic and semantic properties of English verbs. This introduction gives an overview of the conception of lexical knowledge that forms the foundation for this investigation and shows how a research program devoted to compiling the kinds of materials included here can assist in increasing such knowledge.

This work is guided by the assumption that the behavior of a verb, particularly with respect to the expression and interpretation of its arguments, is to a large extent determined by its meaning. Thus verb behavior can be used effectively to probe for linguistically relevant pertinent aspects of verb meaning. This book offers an attempt at delimiting and systematizing the facets of verb behavior. Its contents should help pave the way toward the development of a theory of lexical knowledge. Ideally, such a theory must provide linguistically motivated lexical entries for verbs which incorporate a representation of verb meaning and which allow the meanings of verbs to be properly associated with the syntactic expressions of their arguments.

The Nature of Lexical Knowledge

One of the most widely known views of the lexicon is that articulated by Bloomfield (1933), who wrote, "The lexicon is really an appendix of the grammar, a list of basic irregularities" (p. 274). Bloomfield's view conforms to a frequently articulated desideratum for an ideal lexicon—a lexicon that contains the minimum information necessary and that, therefore, as Bloomfield proposes, has to provide a record of precisely the idiosyncratic information associated with each lexical item. However, this view of the lexicon offers an incomplete picture of lexical knowledge as a whole. The knowledge that a speaker demonstrates with respect to lexical items suggests that there is more to lexical knowledge than knowledge of idiosyncratic word-specific properties.

This characteristic of lexical knowledge is easily illustrated with respect to verbs. Verbs, as argument-taking elements, show especially complex sets of properties. As shown in B. Levin (1985b, in prep.) and other works, native speakers can make extremely subtle judgments concerning the occurrence of verbs with a range of possible combinations of arguments and adjuncts in various syntactic expressions. For instance, speakers of English know which *diathesis alternations*—alternations in the expressions of arguments, some-times accompanied by changes of meaning—verbs may participate in. They know that verbs such as *spray* and *load* may express their arguments in two different ways, displaying the so-called *locative alternation*.

(1)   a.   Sharon sprayed water on the plants.
          b.   Sharon sprayed the plants with water.

(2)   a.   The farmer loaded apples into the cart.
          b.   The farmer loaded the cart with apples.

But the same speakers know that some verbs which are apparently closely related to *spray* and *load* do not allow both options: *fill* and *cover* show one possibility, while *dump* and *pour* show the other.

(3)   a. * Monica covered a blanket over the baby.
          b.   Monica covered the baby with a blanket.

(4)   a. * Gina filled lemonade into the pitcher.
          b.   Gina filled the pitcher with lemonade.

(5)   a.   Carla poured lemonade into the pitcher.
          b. * Carla poured the pitcher with lemonade.

(6)   a.   The farmer dumped apples into the cart.
          b. * The farmer dumped the cart with apples.

Furthermore, speakers agree in their judgments concerning subtle differ-ences in meaning associated with alternate expressions of a verb's arguments. For instance, they know that sentence (2b) suggests that the cart is full, but that sentence (2a) need not suggest this. Thus (2a), but not (2b), could be used to describe a cart that is half-full of apples. (This is the much-discussed "holistic/partitive" effect; see references cited in Part I under Locative Alternation.)

A speaker of English also knows whether a verb may participate in one of various *transitivity alternations* found in English—diathesis alternations that involve a change in a verb's transitivity. So for example, although the verb *break* shows transitive and intransitive uses, where the transitive use of the verb means roughly "cause to *break*-intransitive," this possibility—known as the *causative/inchoative alternation*—is not available for the verb

appear. That is, the verb *appear* cannot be used transitively to mean "cause to *appear*-intransitive."

(7)   a.   The window broke. (inchoative variant)
          b.   The little boy broke the window. (causative variant)

(8)   a.   A rabbit appeared out of the magician's hat.
          b. * The magician appeared a rabbit out of his hat.

The ability to make such judgments extends to novel combinations of argu-ments and adjuncts. For instance, speakers of English know that benefactive phrases, though typically expressed as *for* prepositional phrases, can sometimes be expressed as the first object in the double object construction.

(9)   a.   Martha carved a toy out of wood for the baby.
          b.   Martha carved the baby a toy out of wood.

Yet a speaker also knows when this option is not available. Though (10a) is a near-paraphrase of (9a), speakers of English know that there is no sentence (10b) comparable to (9b) where the benefactive is expressed as an object.

(10)   a.   Martha carved some wood into a toy for the baby.
          b. * Martha carved the baby some wood into a toy.

English has productive morphological processes for deriving new verbs that are zero-related to nouns,[1] and speakers of English have no difficulty in using or understanding these verbs. The advent of electronic communication has been accompanied not only by the widespread use of the noun *modem*, but also by its use as a verb meaning 'communicate via modem'.

(11)   "I'll modem him tomorrow," said one of them, urged by Mr. Krens to get in touch with an out-of-town colleague. (Arts and Leisure Section, *New York Times*, May 29, 1988, p. 1)

Modem, then, is taking its place among a set of verbs that take their names from instruments of communication (*cable*, *wire*, *radio*, etc.). Once again, speakers are aware of the limitations on the process of creating denominal verbs. Even though new verbs of this type are being coined daily, certain imaginable uses of nouns as verbs are not possible. As Hale and Keyser (1992)

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1 Here and throughout this work, I use the term *zero-related* rather than *zero-derived* when referring to the relation between the uses of a particular word in two lexical categories, such as the use of *tile* as a noun and as a verb. This choice reflects a desire to remain neutral about the direction of the relation, since although in some instances the direction is clear, in others it is not. Also, in using the term "zero-related" I do not intend to take any position with respect to the debate as to whether the derivational process involves the addition of a category-changing zero-morpheme or not.

point out, a speaker of English would never use the noun *church* as a verb meaning "give to a church," as in *They churched the money*.

Speakers of English also know that certain English verbs manifest what B. Levin and Rapoport (1988) have called *extended meanings* (or senses) and what Apresjan (1973) calls *regular polysemy*. This phenomenon is best introduced with an example. Verbs like *whistle* and *roar*, which basically describe the emission of a sound, can regularly take on certain additional senses (see Atkins and B. Levin (1991), B. Levin (1991)). For instance, they can be used as verbs of directed motion, describing an object moving and simultaneously emitting a sound, as in *The bullet whistled through the window* or *The car roared up the driveway*. Yet speakers know that they cannot use the apparently comparable *The dog barked down the street behind the jogger* to say that a dog ran down the street barking behind a jogger.

The examples described in this section are representative of a wide range of phenomena that suggest that a speaker's knowledge of the properties of a verb goes well beyond an awareness of the simple expression of its arguments—the type of lexical knowledge traditionally represented in subcategorization frames. Furthermore, the speaker's ability to make subtle judgments about possible and actual verbs and their properties makes it unlikely that all that a speaker knows about a verb is indicated in its lexical entry.

Verb Meaning: A Key to Verb Behavior

What underlies the ability to make such judgments? Hale and Keyser (1987) present a telling example that suggests the following answer: what enables a speaker to determine the behavior of a verb is its meaning.

Hale and Keyser consider the archaic English verb *gally*, a whaling term, used as in *The sailors gallied the whales*. A speaker of English who is unfamiliar with this verb might assume that *gally* means "see" (*The sailors saw the whales*), while a second speaker might take *gally* to mean "frighten" (*The sailors frightened the whales*). What is striking is that, on the basis of these assumptions about the meaning of *gally*, the two speakers are able to make judgments about its syntactic behavior. To illustrate this point, Hale and Keyser look at the *middle* transitivity alternation. The subject of the intransitive middle use of a verb corresponds to the object of the transitive use; compare the transitive use of *slice* in *The baker sliced the bread* with the middle use of the same verb, *Stale bread slices easily*.[2] The speaker who believes that *gally*

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2 The middle alternation should not be confused with the causative/inchoative alternation illustrated in (7) with the verb *break*. Although both are transitivity alternations where the subject of the intransitive use of the verb bears the same semantic relation to the verb as the object of the transitive use, there are differences between the two constructions. First, the middle construction differs from the inchoative construction, the intransitive variant of the causative/inchoative alter-

means "see" would not allow the middle construction *Whales gally easily* (cf. *Whales see easily*), although the speaker who interprets *gally* as "frighten" will find this construction perfectly acceptable (cf. *Whales frighten easily*).

Thus the two speakers' different treatment of *gally* may be explained by their different assumptions concerning its meaning. Hale and Keyser propose that the middle construction is available only to a certain semantically defined class of verbs: verbs whose meaning involves a notion of causing a change of state. They point out that change of state verbs such as *frighten, cut, split, open*, and *crush* have middles, but that other types of verbs such as *see, consider*, and *believe* do not. Only the speaker who attributes the change of state meaning "frighten" to *gally* will allow the verb to be used in the middle construction. The speaker who—contrary to fact as it turns out—believes that *gally* means "see" correctly does not allow this option.

The *gally* example shows vividly that for speakers of English, knowing the meaning of a verb can be a key to knowing its behavior. Presumably, predictions about verb behavior are feasible because particular syntactic properties are associated with verbs of a certain semantic type. The *gally* example and others like it suggest that general principles of grammar are at work, allowing the syntactic behavior of a verb to be predicted from its meaning. Their existence should explain a speaker's ability to make the judgments discussed in the previous section.[3]

A More Complex Example

Further examination of the nature of lexical knowledge confirms that various aspects of the syntactic behavior of verbs are tied to their meaning. Moreover, verbs that fall into classes according to shared behavior would be expected to show shared meaning components. This point about the nature of lexical knowledge can be demonstrated with a more extensive example: an investigation of the verbs *break, cut, hit*, and *touch*, which draws on several studies of these verbs, including Fillmore (1967), Guerssel, Hale, Laughren, B. Levin, and White Eagle (1985), Hale and Keyser (1986, 1987), and Laughren (1988).

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nation, in not denoting an event; that is, it need not have a specific time reference. Second, the middle construction always implies an agent (*Crystal vases shatter easily*), while the inchoative construction need not (*The crystal vase shattered*). See the discussion of these two alternations in Part I and the references cited there.

3 Providing an explanation for each of these judgments goes beyond the scope of this introduction. See Rappaport and B. Levin (1988) and Pinker (1989) for a discussion of the *spray/load* facts. See Hale and Keyser (1991) for a discussion of the *church* example and E.V. Clark and H.H. Clark (1979) for more general discussion of productive strategies for coining verbs from nouns. The extended meaning example is discussed in B. Levin (1991) and B. Levin and Rappaport Hovav (1991). The causative/inchoative alternation is discussed at greater length in the following section.

The verbs *break*, *cut*, *hit*, and *touch* are transitive, taking two arguments expressed as subject and object, but we will see that they have little else in common.

(12) a. Margaret cut the bread.
      b. Janet broke the vase.
      c. Terry touched the cat.
      d. Carla hit the door.

In particular, these verbs differ with respect to their participation in diathesis alternations. First, the middle alternation differentiates among these four verbs. Only *cut* and *break*, but not *hit* and *touch*, are found in the middle construction.[4]

(13) a. The bread cuts easily.
      b. Crystal vases break easily.
      c. * Cats touch easily.
      d. * Door frames hit easily.

On the other hand, *cut* and *hit* appear in the *conative construction*, as shown in (14), but *break* and *touch* do not.

(14) a. Margaret cut at the bread.
      b. * Janet broke at the vase.
      c. * Terry touched at the cat.
      d. Carla hit at the door.

The conative alternation is also a transitivity alternation, but unlike the middle and causative/inchoative alternations, the subject of the transitive variant (12) and intransitive variant (14) bears the same semantic relation to the verb. The variants differ in the expression of the other argument: in the conative construction, the argument corresponding to the object of the transitive variant is expressed in a prepositional phrase headed by *at*. The conative construction is set apart by its meaning: there is no entailment that the action denoted by the verb was completed. Thus (14a) means something like "Margaret tried to cut the bread."

Yet another diathesis alternation—the *body-part possessor ascension alternation*—distinguishes *cut*, *hit*, and *touch* from *break*. Only *break* does not display this alternation.

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4 The uses of *hit* in this section involve the simple "contact through the motion of an instrument" sense of this verb. The verb *hit* is not found in the middle construction on this sense, which does not necessarily involve any subsequent motion of the entity that is hit. However, the verb *hit* has a second sense that might be described as "contact using an instrument and set in motion," as in *The batter hit the ball over the fence*. This second sense of *hit* allows the middle for some speakers. To ensure that the examples in this section unambiguously involve the simple sense of *hit*, the examples have an immovable entity as the object of the verb.

(15) a. Margaret cut Bill's arm.
      b. Margaret cut Bill on the arm.

(16) a. Janet broke Bill's finger.
      b. * Janet broke Bill on the finger.

(17) a. Terry touched Bill's shoulder.
      b. Terry touched Bill on the shoulder.

(18) a. Carla hit Bill's back.
      b. Carla hit Bill on the back.

This alternation is characterized by a change in the expression of a possessed body part: either the possessed body part may be expressed as the direct object of the verb, as in the (a) sentences, or the possessor may be expressed as the object of the verb, with the possessed body part expressed in a prepositional phrase, as in the (b) sentences.

Each verb shows a distinct pattern of behavior with respect to these three alternations, as summarized in the table.

	touch	hit	cut	break
Conative:	No	Yes	Yes	No
Body-Part Possessor Ascension:	Yes	Yes	Yes	No
Middle:	No	No	Yes	Yes

The four patterns of behavior observed here cannot simply be dismissed because they are linked to four different verbs. Corresponding to each one of these four verbs are other verbs that show the same pattern of behavior.

(19) a. *Break* Verbs: break, crack, rip, shatter, snap, ...
      b. *Cut* Verbs: cut, hack, saw, scratch, slash, ...
      c. *Touch* Verbs: pat, stroke, tickle, touch, ...
      d. *Hit* Verbs: bash, hit, kick, pound, tap, whack, ...

Not only can four verb classes be recognized that are defined by the shared behavior of their members with respect to the above diathesis alternations, but several studies (Fillmore (1967), Guerssel et al. (1985), Hale and Keyser (1986, 1987)) have examined each set of verbs in (19) closely and found that their members share certain aspects of meaning. Thus their members have common syntactic as well as semantic properties. These studies propose that the differences in verb behavior can be explained if the diathesis alternations are sensitive to particular components of verb meaning.

As a first step in identifying the relevant meaning components, let us look more closely at the body-part possessor ascension alternation. What distinguishes *cut*, *hit*, and *touch*, which enter into this alternation, from *break*, which

does not, is that the actions the first three verbs denote necessarily involve contact. Although the real-world event denoted by the verb *break* often involves contact, it need not. Evidence drawn from an examination of a variety of diathesis alternations indicates that, linguistically speaking, *break* is a pure change of state verb and a notion of contact is not inherent to its meaning (see below). It appears that a verb shows the body-part possessor ascension alternation only if its meaning involves the notion of contact.

But even if the meaning component 'contact' is common to *cut*, *hit*, and *touch*, there must be further meaning components that distinguish between them. After all, *touch*, unlike the other two, does not show the conative alternation. Guerssel et al. (1985) suggest that verbs which enter into the conative alternation have meanings that involve both motion and contact components. Only the meanings of *hit* and *cut* involve both. The motion component is missing from the meaning of *touch*, which is a pure verb of contact, while the meaning of *break* lacks both these components. If both contact and motion are necessary for the conative alternation, then pure verbs of motion would also be predicted not to show this alternation, and in fact, they do not.[5]

(20)   a.   Jean moved the table.
        b.   * Jean moved at the table.

As we have also seen, *cut* and *break* both show the middle alternation, while *hit* and *touch* do not. As discussed above, this alternation is manifested by verbs of causing a change of state. The behavior of the verbs *hit* and *touch* suggests that they are not change of state verbs. And indeed, hitting and touching need not entail a change of state, unlike cutting and breaking. Although they behave differently in some respects from one another, *cut* and *break* nevertheless show similarities that go beyond the middle construction. For instance, both have associated zero-related nominals with a similar interpretation: they refer to the result of the action. In contrast, the nominals zero-related to *hit* and *touch* do not allow this interpretation, but refer instead to the action itself.

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5 The interpretation that would be expected to be associated with the conative use of *move* in (20b), if this construction were possible, would be roughly "Jean attempted to move the table." However, this particular conjunction of meaning and syntactic frame is not observed. The verb *move* can be found with an *at* phrase, as in *The two opponents moved at each other*, but the interpretation associated with this use of *move* is not that expected in the conative construction. Rather, the use of *at* here parallels that found in *run at* or *charge at*. Furthermore, this use of *at* is not paired with a transitive use of the verb that is derived by "dropping" the preposition *at*; *The opponents moved each other* is not at all related to *The opponents moved at each other*. The existence of this use of *at*, as well as many other uses of *at* with verbs that do not show the conative alternation, raises another question: Are there some meaning components that are common to all these uses of the preposition? If there are, they may not be precisely the ones that determine participation in the conative alternation. The investigation of a unified characterization of *at* falls outside the scope of this book.

(21)   a.   a break
        b.   a cut
        c.   a hit
        d.   a touch

This additional difference supports the proposal that *cut* and *break* are both verbs of causing a change of state; presumably, the actions they denote have a result that can be referred to by a nominal.

Finally, a few words concerning the difference between *cut* and *break*. Although the meaning of both verbs involves a change of state, *cut*'s meaning also involves notions of contact and motion. The verb *cut* describes bringing about a change of state by means of contact through motion; cutting involves bringing a sharp object into contact with a surface and causing a "separation in its material integrity" in the words of Hale and Keyser (1986). The verb *break* is a pure change of state verb: in both its transitive and intransitive uses it simply expresses a change of state (plus a notion of cause when transitive), without specifying how this change of state comes about. For example, throwing a rock at a window, bending a twig sharply, and dropping a cup are only a few of the many imaginable ways of breaking things. Not only does *break* differ from *cut* in not showing the conative or body-part possessor ascension alternations, but *break*, unlike *cut*, participates in the causative/inchoative alternation, as illustrated above in (7), which is repeated here as (22).

(22)   a.   The window broke.
        b.   The little boy broke the window.

(23)   a.   Margaret cut the string.
        b.   * The string cut. (on the interpretation "became cut")

This fact has been attributed to this alternation's sensitivity to pure change of state verbs. And as expected, since they are not change of state verbs, the verbs *hit* or *touch* are not found in the causative/inchoative alternation.[6]

(24)   a.   Terry touched the cat.
        b.   * The cat touched.

(25)   a.   Carla hit the door.
        b.   * The door hit.

Studies such as Guerssel et al. (1985) offer an explanation for the contrasting behavior of *break* and *cut*. A pure change of state verb like *break* is basically a single-argument verb, denoting an entity undergoing a change of state, as in the inchoative variant. The two-argument form of the verb found in the causative

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6 The absence of a causative form for *appear* illustrated in (8) would be attributed to its not being a verb of change of state; it belongs to the class of verbs of appearance.

variant is derived by the addition of a notion of cause. Because the meaning of a verb like *cut* inherently involves an instrument, this verb requires the existence of an agent that uses this instrument to bring about a change of state in the patient; hence, *cut* is basically a two-argument verb and would never be found in the inchoative construction. Both *cut* and *break* are found in the middle construction because this construction is open to verbs of causing a change of state, whether or not their meaning also specifies how this change of state comes about.

The four verbs examined in this section then differ as follows: *touch* is a pure verb of contact, *hit* is a verb of contact by motion, *cut* is a verb of causing a change of state by moving something into contact with the entity that changes state, and *break* is a pure verb of change of state. These characterizations are not intended to exhaust the meaning of these verbs; rather, they simply capture those aspects of meaning that serve minimally to distinguish the verbs participating in the alternations discussed here. The notions of motion, contact, change of state, and causation that figure in these characterizations must be taken into account in selecting a lexical representation of verb meaning. These same notions are correlated with participation in diathesis alternations, including those discussed here. The body-part possessor ascension alternation is sensitive to the notion of contact, while the conative alternation is sensitive to both contact and motion. The causative/inchoative alternation is found only with verbs of pure change of state, while the middle alternation is found with verbs whose meaning involves causing a change of state.

The existence of ties between verb behavior and verb meaning is not particular to English. Alternations—including analogues of many of those found in English—are manifested across languages by verbs of the same semantic types. To take one example, the Australian language Warlpiri also shows the conative alternation. As in English, this alternation is not found with *break*-type verbs and *touch*-type verbs, though it is found with *hit*-type and *cut*-type verbs.[7] Such examples reinforce the evidence from English that certain components of verb meaning determine verb behavior. This is not to say that all languages have the same inventory of verbs or diathesis alternations.[8] But to the extent that languages are similar—and the similarities between them are often great—the same meaning components, and hence the same classes of verbs, figure in the statement of regularities concerning the expression of arguments. Even when alternations are specific to only some languages, they are often

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7 For more discussion of Warlpiri, see Guerssel et al. (1985) and Laughren (1988).

8 Talmy (1985, 1991) and others, including Choi and Bowerman (1991), Pouradier Duteil and François (1981), Green (1973), Iordanskaja and Mel'chuk (1981), and B. Levin and Rapoport (1988), have described interesting differences between languages involving both the possible words of a language and the possible senses that can be associated with a given word.

sensitive to aspects of verb meaning that have been shown to be significant to the characterization of verb behavior in other languages as well.

The discussion of *break*, *cut*, *hit*, and *touch* underscores the conclusions drawn in the earlier sections. Studies of diathesis alternations show that verbs in English and other languages fall into classes on the basis of shared components of meaning. The class members have in common a range of properties, including the possible expression and interpretation of their arguments, as well as the existence of certain morphologically related forms. Furthermore, the existence of regular relationships between verb meaning and verb behavior suggests that not all aspects of a verb's behavior need to be listed in its lexical entry, a conclusion also suggested by a speaker's ability to make judgments about possible and actual verbs and their properties. The picture that emerges is that a verb's behavior arises from the interaction of its meaning and general principles of grammar. Thus the lexical knowledge of a speaker of a language must include knowledge of the meaning of individual verbs, the meaning components that determine the syntactic behavior of verbs, and the general principles that determine behavior from verb meaning.

The Larger Context

These observations about the nature of lexical knowledge fit well with proposals that the ideal lexical entry for a word should minimize the information provided for that word. This goal can be achieved by factoring predictable information out of lexical entries, leaving only idiosyncratic information. If the syntactic properties of a verb indeed follow in large part from its meaning, then it should be possible to identify general principles that derive the behavior of a verb from its meaning. Given such principles, the meaning of a verb will clearly have a place in its lexical entry, but it is possible that the entry will need to contain little more. And since a word's meaning is necessarily idiosyncratic, the inclusion of a word's meaning in its lexical entry conforms to Bloomfield's characterization of the lexicon as a locus of idiosyncrasy. In fact, Bloomfield (1933) follows his famous statement to this effect by writing that this view of the lexicon "... is all the more evident if meanings are taken into consideration, since the meaning of each morpheme belongs to it by an arbitrary tradition" (p. 274). Certainly this statement is just as true of words—at least monomorphemic words and multi-morpheme words whose meanings are not compositional. (It is not clear that this statement should apply to multi-morpheme words whose meanings are compositionally determined. The properties of such words are determined from their component parts, as discussed in recent work on argument structure and morphology; see, for example, Lieber (1983), Rappaport Hovav and B. Levin (1992), Sproat (1985), Williams (1981).)

Taking this approach seriously requires a re-evaluation of previous assumptions concerning the contents of lexical entries, since it suggests that they may contain less information than has sometimes been proposed. Specifically, if there are indeed correlations between verb meaning and verb behavior, some properties that might have been included in lexical entries because they were thought to be idiosyncratic could turn out on further examination to be predictable from verb meaning and could be eliminated from a verb's lexical entry.

Subcategorization frames are a case in point. Recently, there has been much investigation of the proposal that the subcategorization requirements of a lexical item might be predictable from its meaning, a position that is consistent with the view of lexical knowledge proposed here, though the motivation has come from efforts to constrain the power of syntactic rules. Those facets of syntactic constructions that cannot be made to follow from general principles of grammar are considered to be projections of the lexical properties of the words in these constructions. Concomitantly, the lexicon has assumed an increasingly central place in several syntactic frameworks (e.g., Government-Binding, Lexical Functional Grammar, Head-driven Phrase Structure Grammar), and much effort has been devoted to investigating the nature of lexical representation. This move has led to an increased interest in *argument structure*—the representation and characterization of argument-taking properties of verbs and other predicators. As discussed here, studies of these properties suggest that argument structures might in turn be derivable to a large extent from the meaning of words. Chomsky (1986), for example, speculates that only the meaning of a verb needs to be learned, and "semantic bootstrapping" models of child language acquisition (Pinker (1989)) are built on the assumption that a word's syntactic properties are predictable from its meaning. Within this context then, the ability to build representations of linguistically relevant aspects of word meaning and to formulate the principles that determine syntactic properties from word meaning becomes essential.

Challenges

Although no one is likely to deny that words with similar meaning show at least some tendency toward displaying the same syntactic behavior, the hypothesis that the syntactic behavior of a word is fully semantically determined is not uncontroversial. Many researchers have argued that this hypothesis must be rejected, citing numerous purported counterexamples to it. Nevertheless, the meaning of a verb does have considerable predictive ability, as the examples above and examples cited in other work illustrate, suggesting that the ties between a verb's meaning and its syntactic behavior cannot simply be ignored. And there are studies that show that this hypothesis receives substantial support,

particularly in restricted domains (Laughren (1988), B. Levin and Rappaport Hovav (1991), Zwicky (1971a), among others). This work pursues the hypothesis of semantic determination seriously to see just how far it can be taken, even if it does ultimately turn out to meet with limited success (see Jackendoff (1990b) for some discussion).

The key to maintaining this hypothesis is the identification of the appropriate representation of verb meaning. Determining the appropriate meaning components is not easy, since a priori it is possible to classify verbs in many ways according to their meaning. So it would not be surprising if some proposed semantic/syntactic correlations did not make reference to the proper choice of meaning components. Such correlations will be found to have limited applicability, suggesting that the relation between verb meaning and verb behavior is more idiosyncratic than it actually is and that the search for generalizations is doomed to fail. However, these conclusions may not be warranted. Apparent deviations from semantic/syntactic correlations might reflect the use of the wrong meaning components in the statement of the correlations, rather than the absence of such correlations. It is possible that many examples intended to demonstrate the limitations of the hypothesis that syntactic properties are semantically determined might, if reanalyzed, turn out to support it. An illustration, discussed in B. Levin and Rappaport Hovav (1991, 1992) and repeated here, underscores the importance of carefully evaluating purported counterexamples to the hypothesis.

This illustration involves the Unaccusative Hypothesis, a hypothesis concerning the syntactic configurations associated with intransitive verbs first proposed by Perlmutter (1978) and further elaborated by Burzio (1986). The proposal is that the single argument of some intransitive verbs, the unaccusative verbs, is an underlying object, while the single argument of the others, the unergative verbs, is an underlying subject. The Unaccusative Hypothesis has provided a rich context for debating whether syntactic behavior is semantically determined. Some researchers, including Perlmutter himself, have argued that the membership of an intransitive verb in the unaccusative or unergative class can be determined from its meaning. However, other researchers, including Rosen (1984), have concluded that meaning alone is not predictive of class membership. To support this view, Rosen points out that bodily process verbs in Italian do not show uniform behavior: *russare* 'snore' patterns like an unergative verb, while *arrossire* 'blush' patterns like an unaccusative verb.

But in fact, this particular example only emphasizes the importance of identifying the appropriate meaning components and does not necessarily argue against the semantic determination of syntactic properties. The verbs *russare* 'snore' and *arrossire* 'blush' would be expected to show similar behavior only if the semantic notion "bodily process" plays a part in determining a verb's status with respect to the Unaccusative Hypothesis. If it does not, then these

verbs need not necessarily pattern in the same way. The fact that they do not suggests that the semantic notion "bodily process" is probably not relevant to verb classification. There are other possible characterizations of bodily process verbs. The concept denoted by English *snore* can be classified as an activity in the sense of Vendler (1957), while that denoted by English *blush* is open either to an activity or to a change of state interpretation. Interestingly, Italian *arrossire* 'blush' literally means "become red," suggesting that *arrossire* is a change of state verb. There is evidence, in fact, that the semantic notions of activity and change of state are facets of meaning that figure in the determination of a verb's status with respect to the Unaccusative Hypothesis (B. Levin and Rappaport Hovav (1992), McClure (1990), Tenny (1987), Van Valin (1990), Zaenen (in press)).

If the hypothesis that syntactic properties are semantically determined is taken seriously, then the task is to determine, first, to what extent the meaning of a verb determines its syntactic behavior, and second, to the extent that syntactic behavior is predictable, what components of verb meaning figure in the relevant generalizations. The identification of the relevant components of meaning is essential if this approach is to be successful. And once these questions are answered, others remain. What kind of lexical representation of verb meaning is necessary? How are the mapping rules formulated that determine the syntactic properties? And more important, why are certain phenomena sensitive to certain meaning components? The attested patterns of behavior exhibited by verbs in English and other languages must be accounted for in a principled and systematic way. The present study is intended to lay the groundwork that will facilitate the future investigation of these questions, even though it does not offer explicit answers.

The Underlying Research Methodology

The assumption that the syntactic behavior of verbs is semantically determined gives rise to a powerful technique for investigating verb meaning that can be exploited in the development of a theory of lexical knowledge. If the distinctive behavior of verb classes with respect to diathesis alternations arises from their meaning, any class of verbs whose members pattern together with respect to diathesis alternations should be a semantically coherent class: its members should share at least some aspect of meaning. Once such a class is identified, its members can be examined to isolate the meaning components they have in common. Thus diathesis alternations can be used to provide a probe into the elements entering into the lexical representation of word meaning.[9]

9 A similar approach is proposed and illustrated by Deane and Wheeler (1984), who call it "correlation analysis." See also Green (1974, 66–69) and Wierzbicka (1987, 24–26).

The availability of this technique for investigating word meaning is important since it can be quite difficult to pin down the meanings of words using introspection alone. For instance, dictionaries provide rather different definitions of the sense of the verb *whistle* found in the context *The bullet whistled through the air*. They seem unsure whether to treat this sense as involving a verb of sound or a verb of motion. Thus *Webster's Ninth* (Mish (1986)) sees this sense as involving sound emission, giving the definition "to make a shrill clear sound, esp. by rapid movement;" in contrast, the *Collins English Dictionary* (Hanks (1986)) gives the definition "to move with a whistling sound caused by rapid passage through the air." By itself, intuition provides little guidance as to which one of these definitions is correct.

Distinctions induced by diathesis alternations help to provide insights into verb meaning, and more generally into the organization of the English verb lexicon, that might not otherwise be apparent, bringing out unexpected similarities and differences between verbs. A striking example is provided by verbs of motion. Verbs of motion are frequently cited as a large and important class within the English verb inventory. Yet a study of the syntactic behavior of these verbs (B. Levin and Rappaport Hovav (1992)) shows that this class is not homogeneous. It includes at least a subclass of verbs of inherently directed motion (e.g., *arrive, come, go*) and a subclass of verbs of manner of motion (e.g., *jump, run, trot, skip*). In the absence of a directional prepositional phrase, verbs of directed motion describe the direction of motion but not the manner of motion, while verbs of manner of motion describe the manner of motion but not the direction. In fact, some verbs of manner of motion do not necessarily entail any displacement, as in *run in place*. However, the verbs *run* and *whistle*—one a verb of motion and the other a verb of sound emission—are in some respects more similar to each other than the verbs *run* and *come*—although both are verbs of motion. The verbs *run* and *whistle* manifest a similar extended meaning: both can be used as verbs of directed motion in the presence of a directional prepositional phrase (*The bullet whistled through the window*, *The man ran into the room*), though neither is basically a verb of this type. Returning to the question of the best definition for one of the senses of *whistle*, it is likely that the *Collins English Dictionary* is on the right track in treating the relevant sense as a motion sense, since the verb shows the complement-taking properties of verbs of motion in this sense, which is only available in the presence of a directional phrase.

As these examples show, by providing independent criteria for isolating narrow classes of verbs known to share certain aspects of meaning, the study of diathesis alternations can lead to the identification of the linguistically relevant meaning components which determine a verb's behavior. In order to identify the full set of meaning components that figure in the lexical representation of verb meaning, the investigation of semantically relevant syntactic properties