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LINGUISTIC NORMS AND PRAGMATIC EXPLOITATIONS, OR WHY LEXICOGRAPHERS NEED PROTOTYPE THEORY, AND VICE VERSA

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Abstract

Dictionary compilers are constantly faced with the problem of variability in usage, which traditional linguistic theories do not account for satisfactorily. Prototype theory offers an alternative framework within which to discuss norms and variations of usage. It is suggested that dictionary entries show *meaning potentials* (rather than *meanings*), and that these meaning potentials are in fact linguistic and cognitive prototypes. Prototype theory is linked to a Gricean theory of communication and investigated in more detail. A case study in lexical analysis shows how the work of theoretical linguists on prototype theory and the work of lexicographers on empirical analysis can be complementary. A task required for successful lexical analysis in the future is the designation of semantic types and identification of the (prototypical) lexical sets that make up these types.

Problems with received wisdom

A modern dictionary, with its neat lists of numbered senses, offers the comforting prospect of certainty to linguistic inquirers. It suggests, "Here is a menu of choices, a list of all and only the words of the language, with all and only their true meanings. All you have to do is to choose the right one, plug it into its linguistic context, and — hey presto! — you have an

interpretation". Other factors, too, encourage this view of a dictionary entry as a statement of criteria or conditions — necessary and sufficient conditions, perhaps — for the correct use of a word. 'Definitions' in most dictionaries are constructed on the principle of substitutability — that is, they are worded so as to provide a paraphrase that can be substituted for the target word in context *salva veritate* (without affecting the truth), in Leibniz's phrase (1704), or at any rate *salva interpretatione* (without affecting the interpretation). The very word 'disambiguate', so beloved of present-day semanticists and computational linguistics, implies selection from a finite menu of choices.

This is a traditional view of word meaning which goes right back (via Leibniz) to Aristotle's doctrine of essential meaning, distinguished from accidental properties.

Researchers working in artificial intelligence, machine translation, and other fields involving an empirical approach to natural-language processing and semantic interpretation have long recognized that the simplistic account of word meaning just described does not work very well in practice. Aitchison (1987, p. 49) summarizes some of the main problems thus:

There are a small number of words such as *square* or *bachelor* which appear to have a fixed meaning, that is, they are words for which we can specify a set of necessary and sufficient conditions. The majority of words, however, do not behave in this way. They suffer from one or more of the following problems: first, it may be difficult to specify a hard core of meaning at all. Second, it may be impossible to tell where 'true meaning' ends and encyclopaedic knowledge begins. Third, the words may have 'fuzzy boundaries' in that there might be no clear point at which the meaning of one word ends and another begins. Fourth, a single word may apply to a 'family' of items which all overlap in meaning but which do not share any one common characteristic.

In my view, Aitchison concedes too much, at any rate as far as *bachelor* is concerned. The boundaries of its meaning can be shown to be quite fuzzy, especially as the word is used in present-day English society, where the institution of marriage (on which any 'fixed-meaning' definition of *bachelor* is said to depend) is slowly being eroded by alternative lifestyles.

Be that as it may, the problem of fuzziness is more or less acute for any lexicographer trying to describe the meaning and use of almost any ordinary word of a natural language such as English. In previous papers (e.g. Hanks 1979, 1986), I have argued that dictionaries need to pay much more attention to norms of actual usage, and in 1979 I suggested that the standard theoretical view of definitions has led to some thoroughly bad lexicographical practices:

When theory comes into lexicography, all too often common sense goes out.

By this, I meant (I now realize) traditional Aristotelian-Leibnizian theory. In those days prototype theory and frame semantics had not been invented. I went on to argue:

Any attempt to write a completely analytical definition of any common word in a natural language is absurd. Experience is far too diverse for that. What a good dictionary offers instead is a typification: the dictionary definition summarizes what the lexicographer finds to be the most typical common features, in his [or her] experience, of the use, context, and collocations of the word.

In this paper, I shall propose that lexicography needs to temper (or replace) the received Aristotelian-Leibnizian doctrine of necessary and sufficient conditions, which may be fine for many things but is not fine for the description of natural language or human cognitive processes, with some form of prototype theory. I shall try to show how prototypes of meaning and use are associated. First, however, I need to show how word meaning and word use are rooted in Gricean communicative interaction.

Meanings and meaning potentials

Let us make a distinction between meanings as events and meanings as beliefs. **Meanings**, strictly speaking, are events that take place in the world, in which the participants are utterer and audience. Each participant draws on his or her mental stock of beliefs about word meaning to construct an interpretation. However, as Wright (1976) points out, "There is no guarantee, other than utterer's and hearer's common satisfaction over their mutual pragmatic success, that they are taking their meanings in the same way."

It is not surprising, therefore, that we find considerable variation in points of detail in beliefs about the true meaning of terms. Notwithstanding the difficulties, it is the shared elements in these beliefs that the unfortunate lexicographer has to try to capture in a dictionary. The job of the dictionary writer is, strictly speaking, to capture **meaning potentials** rather than meanings.

But, as Lewandowska-Tomaszczyk (1987) points out, a model of language use must reflect not only the fuzziness but also the dynamism of (shared) linguistic meaning. Language is dynamic; it should not be studied as if it were a dead thing. Founding our prototypes in the Gricean theory of conversational co-operation will help us to get the right perspective on the dynamics of meaning.

When a word is used in a text, the utterer activates some part of its meaning potential from his or her own mental store, and intends to activate a corresponding part of the hearers' or readers' mental store. The logic of this conversational correspondence has been addressed by Locke and many philosophers since, but perhaps most significantly by H. P. Grice in 1957 and 1975. Grice's papers spawned a vast literature. I do not wish to get bogged down in the niceties of Gricean theory and the nature of the 'mental store' just mentioned, but it needs to be said that the general line on conversational co-operation taken by Grice is part of the reason for wishing to distinguish meanings-as-events from the meaning potentials listed in dictionaries.

Lexicographers traditionally look at texts for evidence of the meanings of words. But of course, in looking at written texts, they see only half of the communicative story. They can see something of the utterer's intention, but they cannot see or measure the effect on the intended audience. They may say, "Well, I am part of the audience, and I know the effect on me: I understand the meaning of this word." This may be true, or it may be the nearest thing to the truth that a descriptive linguist can hope to achieve in practice, but it is well known that introspection is an unreliable research tool. For example, in Hanks (1990), I argued:

Psychologically, human beings tend to register the unfamiliar rather than the familiar, the unusual rather than the usual. Thus, the files of modern dictionary publishers are full of citations for *tachograph* and *ayatollah* — words which have come into prominence within the past decade. [This was written in 1985]. But nobody notices that *take* has a common but previously unrecorded sense.

What we *think* we do when using or hearing language and what we *actually* do are not necessarily the same thing at all. A good lexicographer is always alert to the possibility that his or her own activated beliefs about the meaning of a word in context may be different in subtle ways from those of other people.

We must also bear in mind that (according to ordinary dictionaries) most words have more than one meaning. How are these to be distinguished? If a word has more than one set of meaning potentials, or if the elements of its meaning potential are grouped together in different ways to create different meanings on different occasions, then there must be some way for hearers (audience) to know which meaning potential is the right one on any particular occasion.

The simple answer is that the meaning potentials of the words that an utterer uses are projected onto the syntax. Different meanings are associated with different syntactic patterns. Unfortunately, most dictionaries do not show clearly how this works. As we shall see, a much more delicate notion

of syntax than can be found in any current dictionary will be required if we are to project meaning potentials satisfactorily onto syntax.

The advent of corpus technology, in which very large quantities of text can be stored and analysed computationally, is now enabling researchers to observe that ordinary language in use is very much more highly patterned than predicted either in traditional dictionaries or in most linguistic theory. Mainstream linguists and lexicographers up to now have asked questions about what is possible: "Can you say this in English?" All too often, the answer is, "Well, yes, I suppose you could . . . but it wouldn't be normal."

Corpus linguists today tend to ask a different kind of question. They are concerned with performance rather than competence, and they are concerned with norms rather than possibilities. They ask, for example, "Is it normal to say this in English?"

The question is of fundamental importance, not only to language teaching, but also to an understanding of such phenomena as literary style, poetic usage, mannered writing, metaphor, and meaning change, not to mention actual errors. Before you can know how a linguistic convention can be exploited, you need to be able to say what the convention is. Before you can account for unusual meanings of a word, you have got to be able to say what the ordinary meanings are. It is probably not too much of an exaggeration to say that, at the lexical level, the conventions of English (or any other language) have not yet been satisfactorily described by anyone. At the same time, contemporary dictionaries contain many unnecessary postulated senses, simply because the lexicographers have failed to achieve an appropriate level of generalization or have presented syntactic distinctions as if they were semantic ones. Corpus evidence also shows that some important, everyday, conventional uses have been completely overlooked by dictionaries.

Projecting meaning potentials onto syntax

Let me give an example designed to show how the meaning potential of a word projects onto the syntax and why the level of syntactic description needs to be extremely delicate. It is generally agreed that verbs, being the pivots of clauses, have certain grammatical structures — subject, object, and adverbial — associated with them, which are linked to their meaning. So, for example, the meaning of the verb *bank* differs depending on its transitivity. But we also need to say something in the syntax about the semantic type of its subject and object. An aircraft banks (intransitive); people bank money (transitive); a pilot banks an aircraft (also transitive, but the semantic type of *aircraft* is very different from the semantic type of *money*). These two facts (the verb's transitivity patterns and the semantic types of its arguments) determine the way in which we interpret it.

The patterns just mentioned may be exemplified in the following four sentences, taken from the British National Corpus. I have shown a partial parsing for the sentences, including an indication of relevant semantic types.

1. [SUBJ Jani [HUMAN]] banked-VBD [OBJ £60,000 [MONEY]] through successful libel actions against Options magazine and the London Evening Standard.
2. . . . [SUBJ she [HUMAN]] is believed to have banked-VBN [OBJ £10_million [MONEY]] since being booted out of Downing Street two years ago.
3. [SUBJ The plane [VEHICLE]] banked-VBD [NO OBJ], and he pressed his face against the cold window.
4. [SUBJ I [HUMAN]] banked-VBD [OBJ the aircraft [AIRCRAFT]] steeply and turned.

To account for sentences such as these, the relevant parts of the accompanying entry for *bank* in a formal dictionary entry, showing how the meaning potential projects onto the syntax, would be something like this:

5. [SUBJ[HUMAN]] __ [OBJ[MONEY]]
= deposit or invest [MONEY] in a bank or other financial institution for safe keeping
6. [SUBJ[AIRCRAFT]] __ [NO OBJ]
= raise one wing higher than the other in order to change direction
7. [SUBJ[HUMAN]] __ [OBJ[AIRCRAFT]]
= cause [AIRCRAFT] to raise one wing higher than the other in order to change direction

Semantic types remain to be identified and listed, in the form of lexical sets. If an accurate a-priori description of semantic types were possible, then the semantic types of language would be as familiar to us as the well-established part-of-speech classes: verb, noun, adjective, etc. In a sense, they are: joking aside, we all know, informally, that the expression "Mrs Thatcher" falls into the class [HUMAN]. But a satisfactory formal account of such classes is not yet available. Preliminary empirical work suggests that all a-priori assumptions are suspect. For example, the class [HUMAN] seems plausible enough, but it may turn out to be unsatisfactory. As a matter of syntax, it may work better if divided into two classes: defined, on the one hand, by properties which Mrs Thatcher shares with cats, horses, and monkeys, such as eating, sleeping, and climbing [i.e. the type ANIMAL], and on the other hand by properties which she shares with nations, governments, business organizations, family-history societies, and computers [i.e. the type COGNITIVE], namely analysing, negotiating, banking money, making statements, expressing sympathy, and so forth. The details at present are uncertain, so for present purposes I shall continue to use [HUMAN].

We cannot rule out the possibility that the relevant set of semantic types for each verb in a language will turn out to be slightly different from those relevant to every other verb. But it is to be hoped that at least some gross overlaps will be discovered, e.g. that there are many features common to the direct objects of, say, causative verbs of motion or verbs of perception. These overlaps remain to be established as an empirical fact. One thing is already clear, however: the sets of semantic types are extremely fuzzy. If they can be identified at all, set membership will be stated in terms of similarity to a contextually determined prototype. Interestingly enough, it seems likely that statistical tests of the kind described in Church, Gale, Hanks, *et al.* (1990, 1994) may help us to identify set membership.

Prototype theory

If the numbered senses in dictionaries can be seen as lists of meaning potentials rather than meanings, then it is only a short step to arguing that meaning potentials are in fact prototypes. If we take this step, we can draw on the rich literature on prototype theory that has grown up since Eleanor Rosch delineated the notion of conceptual prototypes in the 1970s. Probably the best account of prototype theory for present purposes is to be found in Taylor (1989). At the core of his book (pp. 59, 60), Taylor says:

The prototype can be understood as a schematic representation of the conceptual core of a category. . . .

Entities are assigned membership in a category in virtue of their similarity to the prototype; the closer an entity to the prototype, the more central its status within the category.

Moreover (p. 61),

Prototypicality is recursive, in that the very attributes on whose basis membership in a category is determined are more often than not themselves prototype categories.

This, then, is a foundation on which to build. The ground floor of our theory for lexicography will consist of syntactic prototypes; the upper floors will consist of cognitive categories and prototypes as explored by writers such as Rosch (1978) and Lakoff (1987), and the roof (if this is not extending the metaphor too far) will be stereotypes as in Putnam (1975), including "the division of linguistic labor", favouring technical expertise over folk knowledge for certain kinds of meaning potentials.

If lexicographers are to take prototype theory seriously as a theoretical foundation for their work, they will need to be very clear about the distinction between sociolinguistic and psycholinguistic prototypes. All speakers of

a language rely unconsciously on their belief in the existence of shared conventions of meaning as well as syntax in order to achieve successful communication. To the extent that a language is learned by its native speakers (rather than pre-programmed genetically), each speaker acquires it differently and in different ways. In the words of Quine (1960),

Different persons growing up in the same language are like different bushes trimmed and trained to take the shape of identical elephants. The anatomical details of twigs and branches will fulfil the elephantine form differently from bush to bush, but the overall outward results are alike.

This is the psycholinguistic prototype: largely a prototype of belief. The sociolinguistic prototype is rather different: it is a syntactic pattern, a pattern of linguistic behaviour which can be identified by painstaking corpus analysis. A corpus provides only indirect evidence for word meaning. A large element of interpretation is required to get from the syntactic patterns observed in a corpus (traces of linguistic behaviour) to meanings, and a further interpretative step is required to get from meanings to meaning potentials. The task of the ideal lexicographer is to show how each meaning (in an ideal dictionary) is associated with one or more syntactic patterns, which we may regard as prototypes of linguistic behaviour.

Consequences of prototype theory for lexicography

What are the consequences if we invoke prototype theory to explain dictionary definitions? It is clear there are advantages, but what are the disadvantages?

An objection sometimes voiced is that prototype theory involves abandoning the certainties of Aristotelian conceptual categories and replacing them with something that is so uncertain as to be almost meaningless. It is undoubtedly true that adoption of prototype theory leads to abandoning comfortable certainties. However, it seems that prototypes stand a better chance of being true, since meaning potentials are themselves vague and variable. In the words of Anna Wierzbicka (1985):

An adequate definition of a vague concept must aim not at precision but at vagueness: it must aim at precisely that level of vagueness which characterizes the concept itself.

A good prototype will not be so vague as to be meaningless, but will show quite precisely the combinations of conventional syntactic and semantic features that go to make up the conventional usage and meaning potential

of a word. If we then find uses in a text in which none of the conventional features are present or can be activated, they are mistakes. When only some of the features are present, we may be looking at a mistake, or we may have found some kind of literary or metaphorical exploitation. Prototype theory provides a machinery for talking about the great area between correct and incorrect.

Most monolingual lexicographers since 1755 (when Dr Johnson's great dictionary of the English language was published) have been straining after the idea that they were constructing sets of necessary and sufficient conditions for "correct" word meaning. So the idea that what they are actually doing is constructing prototypes would necessitate a radical revision of many entries. Most of the rest of this paper is devoted to exploring what might be entailed in such a revision.

We are contrasting a theoretical tradition of approximately 20 years' duration with one of approximately 2400 years' duration. So far, only one major dictionary (The Collins Cobuild English Language Dictionary, ed. Sinclair, Hanks, *et al.* 1987) has come anywhere near taking systematic notice of prototype theory. Sinclair's work is, in part, founded on that of Halliday, as for example (1966), where he argues against making too sharp a distinction between grammar and use of language, and proposes to "supplement the grammar by formal statements of lexical relations". There is still a lot of work to be done in this area.

To illustrate the sort of work that is needed, building on the start made by Cobuild, I shall offer a case study showing how the meaning potential of a word is associated with its syntax, in the light of prototype theory. The word chosen is *climb*, partly because it has been much discussed in the literature, and partly because it was one of the words studied in detail as part of the 'Hector' project, a collaboration between Oxford University Press and the Systems Research Center of Digital Equipment Corporation, described by my colleague Sue Atkins at the 1992 Complex conference (Atkins 1992).

Climb: theoretical analysis

One of the questions we asked ourselves in the course of the Hector project was: Is there a better model than a list of numbered definitions for representing the tenuous interplay of norms and variations by which words in use make meanings?

Any case study in lexical analysis should start by reviewing the theoretical basis, then go on to analyse the data, seeking theoretically sound ways of accounting for the linguistic patterns and constructions that may be found. This is how I shall proceed.

To review the theoretical literature, we may start with Fillmore (1982), who goes to the heart of things:

Semantic prototypes can be realized in at least six ways, named here by the typical English words which exemplify them. . . .

Case 1: Type CLIMB The category is identified in terms of a disjunction of mutually compatible conditions, and the best examples are those in which all members of the disjunction are present.

The English verb *climb* can be taken in illustration of Case 1. Its two critical conditions may be named Clambering and Ascending. A monkey climbing up a flagpole satisfies both of these and thus exemplifies the prototype well. A monkey clambering down a flagpole, or clambering horizontally in the rafters of a warehouse, can also be said to be climbing, even though in that case only the Clambering component is present. A snail ascending a wall, in the way a snail usually moves, can be said to be climbing (up) the wall, even though in that case only the Ascending component is present. (Snails, lacking limbs, cannot clamber.) But the snail when returning to the bottom of the wall cannot be described as climbing, since it is neither ascending nor clambering. Either of the two critical conditions may be absent; but they may not both be absent.

To Fillmore's account, we need to add the notion of preferences. Preference semantics was invented by Wilks (1975), who says in a seminal paper:

The key point is that word sense and structural ambiguity in natural language will always, in any system, give rise to alternative competing structures, all of which can be said to 'represent' whatever chunk of natural language is under examination. What I mean by 'preference' is the use of procedures, at every level of the system, for preferring certain derived structures to others, on the basis of their 'semantic density'.

Wilks shows how the notion of semantic preference may be used to resolve problems of anaphoric reference, for example identifying the antecedent of *it* in fragments such as:

8. John left the window and drank the wine on the table. It was good.

vs.

9. John left the window and drank the wine on the table. It was brown and round.

The formulation of a preference rule system in Jackendoff (1990) makes clear the relevance of this notion for our present purpose. In part I of that book, headed 'Basic Machinery', he says:

Preference rule system

Consider the following examples:

- 10a. Bill climbed (up) the mountain.
- 10b. Bill climbed down the mountain.
- 10c. The snake climbed (up) the tree.
- 10d. ?* The snake climbed down the tree.

Climbing appears to involve two independent conceptual conditions: (1) an individual is travelling upward; and (2) the individual is moving with characteristic effortful grasping motions, for which a convenient term is *clambering*. On the most likely interpretation of (a), both these conditions are met. However, (b) violates the first condition, and, since snakes can't clamber, (c) violates the second. If *both* conditions are violated, as in (d), the action cannot at all be characterized as climbing. Thus neither of the two conditions is necessary, but either is sufficient.

However, the meaning of *climb* is not just the disjunction of these two conditions. That would be in effect equivalent to saying that there are two unrelated senses of the word. If this were the correct analysis, we would have the intuition that (a) is as ambiguous as *Bill went down to the bank*. But in fact it is not. Rather, (a), which satisfies both conditions at once, is more 'stereotypical' climbing. Actions that satisfy only one of the conditions, such as (b, c), are somewhat more marginal but still perfectly legitimate instances of climbing. In other words, the two conditions combine in the meaning of a single lexical item *climb*, but not according to a standard Boolean conjunction or disjunction. [Jackendoff (1983)] calls a set of conditions combined in this way a *preference rule system*, and the conditions in the set *preference rules* or *preference conditions*.

Both Wilks and Jackendoff posit a further aspect of preference rule systems, namely that when one lacks information about the satisfaction of the conditions, they are assumed to be satisfied as *default values*. Thus, "The reason why (10 a) is interpreted as stereotypical climbing is that the sentence gives no information to the contrary. It is only in the (b) and (c) sentences, which do give information to the contrary, that a condition is relinquished." (Jackendoff 1990, p. 36)

Jackendoff actually goes further, seeking to supplement "feature-based semantics" in conceptual analysis with a "three-dimensional model" of a

word's meaning. (Actually, a four-dimensional model, since verbs of motion also involve the dimension of time.) Lexicography cannot follow him here, however, nor is there any need to until or unless multimedia language reference tools replace traditional dictionaries. For lexicographic purposes, the use of words to express conceptual structures is inevitable. This will inevitably look like a feature analysis with semantic components, but, as we shall see, the status of those components is preferential and probabilistic, rather than necessary.

Wierzbicka (1990) comments on Jackendoff's analysis:

But this analysis is deficient . . . because it fails to predict, for example, that if a train went quickly up a hill it couldn't be described as 'climbing'. There is a difference in meaning between the (a) and (b) variants in the following pairs of sentences:

- (a) The train climbed the mountain.
- (b) The train shot up the mountain.
- (a) The temperature climbed to 102 degrees.
- (b) The temperature shot to 102 degrees.

Despite his rich arsenal of descriptive devices, including multiple brackets and 'preferential features', Jackendoff's analysis cannot account for facts of this kind.

In my view, all that is really needed to account for such facts is a more careful, and more imaginative, phrasing of the necessary and sufficient components of the concept 'climb'. Tentatively, I would propose the following:

X climbed . . . = X moved like people move in places where they have to use their arms and legs to move upwards

interpreted as referring to anything other than slowness. For trains, it can be interpreted as referring to slowness and apparent difficulty. For people, too, it can be interpreted as referring to slowness and apparent difficulty; but it can also be interpreted as referring to a quick and apparently effortless movement upwards in places where normally people would have to use their arms and legs to move upwards at all (cf. 'Watching him climb the cliff quickly and effortlessly, I was filled with pride and admiration').

Thus, a prototype is indeed relevant to the concept 'climb'. But this prototype is not 'suppressed' in less typical uses of the verb. It is part of the semantic invariant itself.

It will be clear from what I have said so far that I believe Wierzbicka's attempt to rescue necessary and sufficient conditions to be doomed. For one

thing, it relies on the word 'like' in her definition of *climb*. This reduces the necessary condition to one that is trivially true. It will be true whatever is said, for as Davidson (1978) points out, "All similes are true and all metaphors are false. . . . everything is like everything else."

Lexical analysis in prototype theory, then, will draw heavily on the notions of preferences and default values. A third, equally important concept mentioned by Jackendoff is:

a repertoire of major conceptual categories, "the semantic parts of speech". These categories include such entities as Thing (or Object), Event, State, Action, Place, Path, Property, and Amount.

Jackendoff's "semantic parts of speech" sound quite similar to Hanks's "semantic types", described above. A point of difference is that I propose that semantic types should be discovered empirically and arranged into lexical sets whose typical members are to be listed rather than assumed a priori.

The question arises, how confident can we be in relying on "semantic parts of speech" in our analysis? After all, the major syntactic parts of speech (noun, verb, etc.) have been pretty well established for around 2000 years in European grammatical theory. How come the so-called "semantic parts of speech" are not equally well established? Perhaps it is because, unlike regular part-of-speech classes, they are extremely fuzzy sets, of a kind which could not stand up at all until fuzzy logic was invented (Zadeh 1965). Actually, as Geoffrey Sampson (1987) has pointed out, the traditional part-of-speech classes are also open-ended and fuzzy, but they are so large and have so many central and typical members that the fuzziness was long thought to be an irritating side-issue rather than a central property of the class.

Climb: empirical analysis

It is not the primary purpose of theoretical discussions such as the foregoing to improve individual entries in ordinary dictionaries. However, if we look at ordinary dictionary entries (examples are given in Figure 1), we can see that this would be a beneficial side effect. Neither of these works have identified the 'CLAMBER' meaning sense of *climb* as succinctly as Fillmore and Jackendoff, though both dictionaries are obviously troubled by contexts in which the 'ASCEND' component is absent.

But, as the quotation from Wierzbicka shows, theoretical analysis alone can leave haunting doubts. How serious is the threat to necessary and sufficient conditions from counterexamples? Are such counterexamples central or peripheral? Are problems with the traditional account of word meaning hopelessly flawed, or are the differences merely a matter of taste? What is

climb /klaɪm/ *v.* Pa. t. & pple **climbed**, (*arch.*) **clomb** /klɔ:m/. Pa. t. also †clamb. [OE *climban* = (M)LG, (M)Du. *klimmen*, OHG *klimban* (G *klinmen*), f. WGmc nasalized var. of base of CLEAVE *v.*² (orig. = hold fast).] I *v.i.* 1 Raise oneself by grasping or clinging, or by the aid of hands and feet; ascend a steep place. Freq. foll. by *up* (*adv.* & *prep.*). OE. b Rise with gradual or continuous motion; (of the sun, an aeroplane, etc.) go upwards, move towards the zenith; *fig.* increase steadily. OE. c *fig.* Rise in dignity, rank, or state by continued effort; ascend in the intellectual, moral, or social scale. ME. d Of a plant: creep up by the aid of tendrils or by twining. L18. 2 Slope upwards. ME. 3 Foll. by *down*: (a) (*adv.* & *prep.*) lower oneself (along) by grasping or clinging, or by the aid of hands and feet; (b) *fig.* (*adv.*) withdraw, esp. with ignominy, from a position taken up, abandon a declared position. ME.

NEW SHORTER OXFORD ENGLISH DICTIONARY

climb /klaɪm/ *v.* & *n.* — *v.* 1 *tr.* & *intr.* (often foll. by *up*) ascend, mount, go or come up, esp. by using one's hands. 2 *intr.* (of a plant) grow up a wall, tree, trellis, etc. by clinging with tendrils or by twining. 3 *intr.* make progress from one's own efforts, esp. in social rank, intellectual or moral strength, etc. 4 *intr.* (of an aircraft, the sun, etc.) go upwards. 5 *intr.* slope upwards.

CONCISE OXFORD ENGLISH DICTIONARY,

8th edition. 1990.

Figure 1 Some dictionary definitions for the verb climb.

the status of uses not accounted for by the theoretical account? Has some important or central component of the prototype been overlooked entirely, or are we dealing merely with boundary cases?

Thoroughgoing empirical analysis of a well-selected corpus can go a long way to resolve those doubts. The aim of an analysis such as that shown in Figure 2 is to account for all and only the conventional uses of the verb, while at the same time showing how it varies according to context. There is only one prototype for *climb*, since all the features are related in a Wittgensteinian family resemblance. Other verbs (for example, *bank*, where there is a disjunction of features) may have more than one prototype. If the analysis has been done properly, any use of the English verb *climb* not accounted for in Figure 2 is either an exploitation (literary trope, metaphor, etc.) or a mistake. A separate set of rules needs to be compiled to show how the prototype may be exploited.

Figure 2 records both the core facts about the meaning potentials of *climb* and the way in which these vary according to context. Like all verbs, the valency slots around *climb* attract some lexical items more strongly than others, and these can be summarized in the form of lexical sets, which are sets of default preference conditions. The analysis in Figure 2 is supported by a selection of corpus evidence, given in Figure 3. Figure 3 also includes a few examples of exploitations of conventions, illustrating metaphors and boundary cases for correct usage.

| S | V | comb. | O | A |
|---|--|----------------------------------|--|---|
| Thing _i LS: HUMAN LS: ANIMAL | Event GO UPWARD with effort SLOWLY (?) | USING ALL LIMBS TO TOP OF (?) | Thing _j LS: MOUNTAIN LS: BUILDING | |
| | | USING ALL LIMBS | LS: TREE LI: ladder LI: drainpipe LI: scaffolding | |
| | | USING ALL LIMBS UP AND OVER | LS: BARRIER | |
| | | ON FOOT | LS: STAIR LS: PATH | |
| LS: VEHIC | GO UPWARD SLOWLY | ON WHEELS | LS: PATH | |
| LS: PATH _i | UPWARD | State | LS: PATH _j | |
| LS: HUMAN | Event GO UPWARD WITH EFFORT SLOWLY | UP MOUNTAIN USING ALL LIMBS | 0 | |
| LS: PLANE | GO UPWARD | THROUGH AIR | 0 | (ADVERBIAL from SOURCE to GOAL) |
| LS: VAPOUR | GO UPWARD | THROUGH AIR | 0 | (ADVERBIAL from SOURCE to GOAL) |
| LI: sun | GO UPWARD PERCEIVED | | 0 | |
| LS: PLANT | GROW UPWARD | AROUND THING | 0 | |
| LS: HUMAN LS: ANIMAL | Event GO WITH EFFORT | USING ALL LIMBS | 0 | ADVERBIAL from SOURCE via PATH to GOAL |
| LS: PATH | UPWARD | State | 0 | ADVERBIAL from SOURCE to GOAL |
| LS: ABSTRACT | Event BECOME GREATER | | (AMOUNT) | (ADVERBIAL by AMOUNT to AMOUNT) |

LS = lexical set; LI = lexical item.

Figure 2 Prototype for 'Climb'.

CLIMB EXAMPLES

I. TRANSITIVE USES

[HUMAN] climb [THING]

1. Stalin died in 1953, and Hillary climbed Everest 'because it was there'. In
2. dge University Climbing Club, to climb Mont Blanc by the Goutier route befo
3. r walkers, and almost anyone can climb Triglav: the last refuge is only 400
4. road range. When Charles Whitman climbed the university tower in Austin, Te
5. Wood Green School, Witney. They climbed a drainpipe to enter the school th
6. lete that the postman has had to climb a ladder to the front entrance to de
7. d generously collusive. He could climb an oak and sit there alone for all o
8. nted it. Show her a tree and she climbed it. Not so Prince Charles. He was
9. earsing everything. If necessary climb the scaffolding yourself to get the
10. ur climb. Young boys are forever climbing things. "Beaming she swung the ga

11. ion. How good are the beetles at climbing cereal plants and locating aphid
12. don't know whether to eat it or climb it!" A five-minute drive up the roa
13. med down into the troughs before climbing the next steep wave. Away from th
14. plotter in the Air Force before climbing the civil service ladder with a j
15. he answer is probably that he is climbing the ladder of a lucrative career

16. the end of the footpath and then climbed a stile. He believed he dot home u
17. 1942 I should think, I remember climbing some railings at the back of Guil
18. g refugees. Some of the refugees climbed the embassy wall. Others broke thr
19. conceived of the possibility of climbing the Abbey wall. Now suddenly it s

[HUMAN] climb [STAIR]

20. we crawled, troglodytes all. We climbed a narrow and broken staircase towa
21. ago on a gentle Autumn evening I climbed some steep stairs in a converted h
22. xiety. She chewed her lip as she climbed the remaining stairs to Nevil's do
23. g: a rectilinear spiral. She had climbed nearly 400 steps and

[HUMAN] climb [PATH]

When the direct object is a PATH word, it is not always clear from the immediate context whether the subject refers to people on foot or in a vehicle. In this case, the condition "ON_FOOT" may nevertheless be taken as applicable: it is a default, so it applies until and unless it is overridden by evidence to the contrary.

24. d through the ford and began to climb the gradual slope beyond. dogs barke
25. ce. It was still raining as we climbed the pass to the Spanish frontier,
26. er water seemed louder when she climbed the road by herself. Martha though
27. of hundred feet above as they climbed the slope, like a fortress behind
28. gaps in the teak boards as we climbed the gangplank. A plump old man sit
29. Rashidiyeh. But they had never climbed the hill. There are, of course, s

[PATH] climb [PATH]

Expresses a state rather than an event

30. hamlet the smaller unpaved road climbed a shallow hill before disappearing
31. tray of refreshments. The lawn climbs a slope several yards in front of t
32. down to Boscombe Pier. It then climbs the inevitably steep hill back up t

Figure 3

[VEHICLE] climb [PATH]

33. were bumper to bumper as they climbed Headington Hill, the Astra behind
34. very efficiently. A trolleybus climbing a hill was often aided by power f

II. NULL COMPLEMENT

[HUMAN] climb

35. gainst the rock. Harlin began to climb. Charsky stared up after him. Then s
36. a mixed Italian and German team climbing not far away, heading for

[PLANE] climb

37. where it was grown." The plane climbed ponderously but the mountain slid
38. outh overhead Dunster Castle we climbed through the cloud which had now fo

[VAPOUR] climb

39. th the column of steam and ash climbing eleven kilometres high above the
40. h explosions and oily smoke was climbing from the burning trucck ks to t
41. her than later. Thunder-clouds climbed steeply over Poitiers, and as Peli

sun climb

42. matched their joy; the sun was climbing into a cloudless sky and beginnin
43. But faces grew red as the sun climbed, the cicadas chanted and the tar b

III. WITH PP COMPLEMENT

[HUMAN] climb [from SOURCE] [via PATH] [to GOAL]

44. to a halt in front of her Maggie climbed aboard and went upstairs. She ado
45. aded when approaching a house or climbing across a fence. If it hadn't bee
46. the embassy railings even as she climbed across to safety. Only the interv
47. olice said the man was trying to climb from a tower block's seventh floor
48. ket. Angry workers glowered as I climbed from my car. A policeman waved me
49. Taylor said: 'We have a man who climbs in with the sharks to clean the ta
50. Charlie loaded up the van, then climbed in. 'Mr Lawler will be upset that
51. to Mum and Dad's room. There he climbs into bed and goes to sleep. Mum an
52. fice in Sanaya, west Beirut, and climbed into his armoured Mercedes, wavin
53. limbing-frame. That it should be climbed on, into and through, compliments
54. The front door blocked, the men climbed onto the roof and then things got
55. slowly, Gower wandered back and climbed over the stile. He made wretchedl

[PATH] climb [ADVERBIAL OF DIRECTION]

Expresses a state rather than an event

56. and verges. A precipitous road climbs from Batcombe to the crest of the
57. erythere is in perfect order. It climbs in tiered rows up a hard, bare hil
58. oot, banks thick with daffodils, climbing out of sight. 'She would enjoy
59. e next mile is a wonderful walk, climbing out of the valley, with panorami
60. rly planted beet the pine forest climbed over gently undulating hills. 'Y
61. ked up at the dim stairway which climbed steeply out of the bare and musty

Figure 3 (cont'd)

*And, metaphorically . . . *

62. for first-time buyers trying to climb on to the first rung of the housing

With 'down'

63. tion of running water, attempt to climb down the slippery cemented sides

64. t an ice axe he would be lucky to climb down fifty feet without falling. It

65. third floor but people there had climbed down from the balconies and were

[PLAYER] climb above [PLAYER]

A cliché. Genre: British sports journalism

66. w-in enabling Chris Fairclough to climb above defenders and head past Carte

67. rom their second corner, Robinson climbed above static defenders to head

68. er 38 minutes when Alan Kernaghan climbed high to Putney's corner and head

IV.

[ABSTRACT] climb ([AMOUNT]) [ADVERBIAL-AMOUNT]

69. uring wage costs will accordingly climb by 4 per cent in 1990 and wages in

70. the good: coal prices look set to climb by 80 per cent over the next 25 yea

71. a week of losses ended as the MIB climbed 10 points to 1,088, boosted by fo

72. ined 6p to 227p and Racal Telecom climbed 12p to 342p. STC was the subject

NP climb [AMOUNT] PP

73. to raise money for diabetic children &dash. by climbing 15,000 feet up Mount Kilimanjaro. Siste

74. The road angled towards the rim of the valley, climbing 2,000 feet in eight relentless miles. T

Figure 3 (cont'd)

The salient features of the analysis are as follows. The headings show subject, direct object, and adverbial complement slots surrounding the verb itself. Most of the items in capital letters are themselves prototypes (remember, prototypes are recursive, and explained in terms of other prototypes). The meaning potential of the verb in each of these prototypical contexts is shown in the column headed 'V'. Meaning potentials that derive from the combination of elements rather than from any single component are in the column headed 'comb.'

At the highest level of analysis, we note that *climb* appears in four syntactic patterns:

1. with a direct object
2. with a null complement
3. with no direct object and an adverbial complement
4. with an abstract subject, an amount as optional direct object, and an optional adverbial complement also involving an amount

Let me now give a few more detailed informal comments on each of these patterns.

Pattern 1: At the heart of the *climb* prototype are uses in which the subject is human and the direct object is a thing such as a mountain, building, tree, barrier, stair, or path. The subject may also be an animal or even a vehicle. If the direct object is a mountain or building, there is a prototypical implication that climbing it results in the climber getting to the top. This is not so if the direct object is a tree. If the direct object is a barrier, such as a style or wall, there is a strong or weak implication that the climber goes up and over. Generally, the combination of subject, verb, and object imply that the climber uses all his or her limbs, but if the direct object is a staircase or path, the climber proceeds on foot. Obviously, if the subject is a vehicle, it has no limbs to use, so it proceeds in its normal way, namely on wheels, and the direct object will be a path (not a mountain, building, tree, barrier, or stair). Finally, if the subject is a path or road and the verb is transitive, the object will be another word in the same set, as in 11.

11. The smaller unpaved road climbed a shallow hill . . .

If the subject is a path or road, the categorization of the verb changes from event to state.

Adverbial phrases are sometimes found complementing this pattern, but if so they are to be regarded as optional extras, not part of the prototype as in pattern 3.

Pattern 2: *climb* also occurs in a null-object alternation. Here, in the most central use, the default interpretation 'suppressed direct object: mountain' is subsumed, as in 12.

12. Harlin began to climb.

Sinclair (1990, p. 49) calls such uses 'text-transitive'. Discussing the verb *decline*, he points out that "Whatever is declined is expressed in the text in one way or another" (i.e. other than as an overt direct object).

With this pattern, we also place uses such as those in 13 and 14.

13. Oily smoke was climbing from the burning trucks.

14. The sun was climbing into a cloudless sky.

For such sense, there is an optional adverbial complement. Here we are near the boundaries of the prototype, and the pattern is very unstable. For example, the semantic component 'THROUGH AIR' may be moved out of 'comb.' and made explicit, as in 15.

15. We climbed through the cloud which had now formed.

Many people would say that such uses are metaphorical and should therefore be classed as exploitations rather than as part of the prototype. However, since they are conventionalized metaphors if they are metaphors at all, it seems better to include them here.

Pattern 3: The subject is human or animal and there is an adverbial complement, usually involving a prepositional phrase (*from* here, *through* there, *under* that, *to* there). This is the celebrated sense which seems to have caused some perplexity for our traditional dictionaries, in which *climb* has no sense of 'go upward', but rather only a sense of 'go with effort'. However, if the subject is a path, as in 16, then the conditions associated with PATH at pattern 1 apply: the verb is a verb of state and the meaning is 'UPWARD'.

16. A precipitous road climbs from Batcombe to the crest of the downs.

Pattern 4: The subject is something abstract such as prices or temperature, and the meaning is 'become greater' or rise on a scale. There are optional adverbial complements expressing the amount by which something becomes greater and/or the level that it reaches, as in 17.

17. The MIB climbed 10 points to 1088.

Many more comments could be made, but those are the main points. The representation may seem complex, but actually it is quite straightforward. It would, however, benefit greatly from a hierarchical three-dimensional presentation, as would be possible in a hypertext on-line dictionary such as that described in Atkins (forthcoming), rather than the flat, two-dimension presentation given here.

Conclusion

The example of *climb*, discussed exhaustively here, suggests that there is a need for detailed empirical analysis of the lexicon, projecting the meaning potentials of words onto the syntactic patterns with which they are associated. *Climb* is actually one of the simpler verbs of motion: its analysis may serve as a model when more complex items are tackled. There are between 5000 and 8000 verbs in English which demand analysis in this way. Nouns and adjectives demand rather different treatment — but that is a subject for a different paper.

We have seen how theory-based analysis can interact with empirical analysis, to the benefit of both. The empirical analysis itself demonstrated how some elements in the meaning potential of a word are associated with combinations rather than with individual lexical items.

Above all, we saw how various lexical sets in particular syntactic roles can alter the meaning of the target word. For this reason, it is particularly unfortunate that work on semantic types and lexical sets is in a rather primitive state. There is an urgent need, it seems to me, for a list of the lexical sets that are relevant clues for selecting the appropriate meaning of each other word in the language. These lexical sets may be designated as semantic types, but they play a syntactic role. They are fuzzy sets, and they are themselves prototypical in character.

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Some definitions

The following definitions summarize some of the points made in this paper. They do not necessarily reflect the common acceptance of the words being defined.

Activated beliefs: a hearer's beliefs about the meaning of the words used by an utterer for some communicative purpose; an utterer's beliefs about (and reasons for using) those words.

Meaning potential: the potential that a word has to contribute to the fulfilment of an utterer's communicative purpose.

Text: a sequence of words designed to activate beliefs (turn meaning potentials into meanings).

Dictionary definitions: a list of the meaning potentials of lexical items.

Corpus: a collection of texts.

Corpus technology: facilities to analyse computationally the patterns of word use found in a corpus, thus providing a syntactic framework onto which meaning potentials may be projected.

Semantic type: a more delicate level of syntactic classes than traditional part-of-speech classes. Together with *syntactic patterns*, they enable us to show how meaning potentials are realized as meanings.

Convention: any of the recurring patterns of word use found in a corpus, which are associated with meaning potentials.

Exploitation: the way in which a convention is used. Linguistic conventions are exploited in just the same way as the maxims described by Grice (1975) are exploited: they may be fulfilled, or they may be flouted.

Flouting: the mechanism by which literary style, metaphors, and meaning changes take place. Only part of a convention may be flouted in any one use. Too much flouting results in a communication breakdown, as when Lewis Carroll's Humpty Dumpty used *glory* to mean 'a nice knock-down argument'.