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Making Sense of Nonce Sense

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A 'parser' is a device, either human or mechanical, that is designed to analyse a person's utterances as a part of deciding what that person meant. Most mechanical parsers do this by breaking down, or 'parsing', each utterance into parts, selecting senses for each part, and combining these senses into a meaning for the whole utterance. How human parsers do this is a question in which researchers have invested much time and energy, and for good reason. It is hard to imagine a model of language understanding without a parser of one sort or another.

One of the main stumbling blocks for parsers is ambiguity. When a parser encounters the word *post*, it must decide whether it means 'pole', 'mail', or something else. When it meets the phrase *good king*, it must decide whether it means 'king who rules well', 'king who is a good person', or something else. When it meets the clause *that he knew* in *He whispered to the woman that he knew*, it must decide whether it modifies *the woman* or is a complement of *whisper*. Parsers so far have been outfitted with syntactic, semantic, and pragmatic strategies for resolving ambiguity. For each expression, they anticipate the right meaning, or a small set of meanings, and thereby avoid the expensive computation of unintended meanings. Or they select the right meanings after the fact, pragmatically.

At the heart of what I will call traditional parsers is the *sense-selection assumption*. The idea is this. Each parser is in possession of a lexicon, or dictionary, that lists the potential senses for each word (like *post*), each morpheme (like *pre-*), and each idiom (like *kick the bucket*). For *post*, let us say, the lexicon lists six distinct senses. When a parser encounters *post* in an utterance, it selects from among these six senses the one that the speaker must have intended on this occasion. When it encounters *good king*, it parses the phrase into *good* and *king*, combines the possible senses of the two separate words by appropriate rules of combination, and arrives at, say, twelve poss-

ible senses for the phrase. From among these twelve it selects the sense the speaker must have intended. The skill to parsing is in making these selections deftly, with the minimum fuss and computation. Still, the assumption that is virtually always made in traditional parsers is this: each constituent of an utterance has a finite number of possible senses, and people *select* the intended sense from among them.

The sense-selection assumption seems so natural, so obviously true, that it isn't even open to dispute. Yet in the last few years, more and more evidence has been brought to the fore suggesting that it is in fact false. The problem is this. Not only can expressions be ambiguous, but they can also be *semantically indeterminate*. Many expressions, contrary to the assumption, do not possess a finite number of senses that can be listed in the parser's lexicon. Nor can they be assigned their possible senses by any rule. Each expression of this sort, instead, has only a *nonce sense*, a sense 'for the nonce', for the occasion on which it is used. It would be hard enough for traditional parsers if there were *any* such expressions, but, as I will argue, they are ubiquitous. No parser can avoid them, yet when traditional parsers meet them, they break down.

In this chapter I have two main aims. The first is to describe two fundamental problems that nonce sense poses for traditional parsers. In doing this, I will demonstrate how natural and ubiquitous nonce sense is in daily usage. The second aim is to argue for a new view of parsing altogether. In this view, the goal is to infer the speaker's intentions in using each word and constituent that he used. The idea is to meet nonce sense head-on, to treat nonce sense as an intrinsic part of language, which it is.

TWO PARSING PROBLEMS

For examples that will stymie any traditional parser, we need look no further than the daily newspaper, which is replete with them. The passage I have selected is from a column in the *San Francisco Examiner* by satirist Erma Bombeck about her daughter's difficulties in finding a roommate. Bombeck is quoting her daughter:

> We thought we were onto a steam iron yesterday, but we were too late. Steam irons never have any trouble finding roommates. She could pick her own pad and not even have to share a bathroom. Stereos are a dime a dozen. Everyone's got their own systems. We've just had a streak of bad luck. First, our Mr. Coffee flunked out of school and went back home. When we replaced her, our electric typewriter got married and split, and we got stuck with a girl who said she was getting a leather coat, but she just said that to get the room.

As newspaper prose, this paragraph is unremarkable. Yet of the eight sentences, six will fail on the traditional parser. Why? Not because the six sentences sound odd, or use a peculiar vocabulary, or are in a strange dialect. It is only because they each contain a noun phrase used in a nonce sense—*a*

steam iron, steam irons, stereos, our Mr. Coffee, and *our electric typewriter*. For *steam iron*, the parser will search its lexicon for the sense Bombeck intended for it—'a person who has a steam iron'. Since this sense won't be in the lexicon, it will search in vain. It will fail to deal with *steam iron*, just as it will fail on the other five instances of nonce sense. Clearly, Bombeck isn't at fault. The parsers are.

The difficulties that parsers run into in this passage are of two kinds—non-parsing and mis-parsing. Consider *Our electric typewriter got married*. A traditional parser would meet *electric typewriter* and then *got married* and would search among the listed or computed senses for the two expressions to find ones that fit together sensibly. Because it wouldn't find any—electric typewriters, not being humans, cannot marry—it would fail to come to any interpretation. It would mark the utterance as uninterpretable nonsense rather than as interpretable nonce sense. This is what I will call the *non-parsing problem*.

The problem posed by *Stereos are a dime a dozen* is superficially quite different. As a sentence, this one is quite unremarkable and, unlike *Our electric typewriter got married*, is not semantically anomalous on the face of it. The traditional parser would work its way through the sentence and arrive at roughly the interpretation, 'Phonographs are very common.' The trouble is, this isn't what Bombeck meant. She meant, 'People who possess phonographs are very common.' Since the traditional parser would never list in its lexicon the nonce sence 'person who possesses a phonograph' for *stereo*, it could never come up with Bombeck's intended sense. It would discover an interpretation it would be willing to accept, but it is the wrong interpretation. This is what I will call the *mis-parsing problem*.

The difficulties underlying these two examples, however, are identical: *Electric typewriter* and *stereo* are both being used with nonce senses. The lexicons of traditional parsers list only the conventional senses of words, morphemes, and idioms, and rightly so. They couldn't possibly list—or store in memory—all the possible nonce senses a word, morpheme, or idiom might be used.with. As I will argue, there is no end to the nonce senses for words like *electric typewriter* or *stereo*; furthermore, these nonce senses cannot be enumerated by rule. As a consequence, these parsers will invariably fail to parse utterances like *Our typewriter got married* and will invariably mis-parse ones like *Stereos are a dime a dozen*.

THE UBIQUITY OF NONCE SENSE

For nonce sense like Bombeck's to pose a significant threat to traditional parsers, it must be more than a marginal part of language. I will argue both that nonce sense is ubiquitous and, more importantly, that it is a regular part of the language. When we encounter it, we perceive it to be natural and proper. We don't hear it as only partially acceptable or grammatical. Any

parser that is to handle ordinary language must therefore be able to interpret nonce sense in the natural course of processing.

Contextual expressions

It is well known that while some expressions have a fixed reference, others have a shifting reference. Those with a fixed reference are proper names, like *George Washington, the Second World War*, and *France*, which rigidly designate certain individuals. Those with a shifting reference are indexical expressions, like *I*, *now*, and *the bachelor over there*, whose referents depend on the time, place, and circumstances in which they are uttered. It has been virtually unrecognized, however, that while some expressions have fixed senses, others have shifting senses. Those with fixed senses might be called 'purely intensional expressions', like *bachelor, blue*, and *colorful ball*, each of which has a small number of conventional senses known to almost everyone in a speech community. Those expressions with shifting senses—what I am concerned with here—are called *contextual expressions*. Their senses depend entirely on the time, place, and circumstances in which they are uttered (Clark and Clark, 1979). Thus, we have the following two analogies:

sense : reference : : purely intentional expression : proper name

: : contextual expression : indexical expression

And:

fixed : shifting : : proper name : indexical expression

: : purely intentional expression : contextual expression

These two analogies lead to the four-way classification given in Table 9.1.

For the main properties of contextual expressions, which have shifting *senses*, let us first look at indexical expressions, which have shifting *references*. One such indexical expression is *he*, which has two important characteristics. First, it has an indefinitely large number of potential referents, and these

Table 9.1 Classification of expressions

Aspect of meaning	Alterability of aspect of meaning	
	Fixed	Shifting
Sense	Purely intensional expression (e.g., *bachelor*)	Contextual expression (e.g., *to teapot*)
Reference	Proper name (e.g., *George Washington*)	Indexical expression (e.g., *he*)

referents are not denumerable. *He* can be used to refer to any of an indefinitely large number of males, past, present, and future, real and imaginary. These males cannot be listed, even in theory, since someone can always imagine another male and refer to it with *he*. Let me call this property *non-denumerability*. Second, what *he* is actually used to refer to on a particular occasion depends on who uttered it, where, what he was pointing at, who had just been mentioned in the conversation, what his addressee knew and didn't know, and many other points of coordination between the speaker and addressee (see, e.g., Clark and Marshall, 1981). Let me call this dependence on moment-to-moment coordination *contextuality*. These two properties—non-denumerability and contextuality—are characteristic of indexical expressions but not of proper names.

Non-denumerability and contexuality should also be characteristic of contextual expressions but not of purely intensional expressions. Imagine that Ed and I have a mutal friend named Max, who has the odd occasional urge to sneak up behind people and stroke the back of their legs with a teapot. One day Ed tells me, *Well, this time Max has gone too far. He tried to teapot a policeman.* Ed has used the noun *teapot* as a verb with a nonce sense, namely 'rub the back of the leg of with a teapot'. As for non-denumerability, note that the verb *teapot* could have been preceded by an indefinitely large number of introductory scenarios and could have possessed an indefinitely large number of different meanings. Neither the distinct scenarios nor the distinct senses it could possess are denumerable. As for contextuality, note that what *teapot* means depends crucially on the time, place, and circumstances in which Ed used it. He couldn't have meant just anything by it, and he could only have intended it to mean 'rub the back of the leg of with a teapot' for addressees who had just the right background knowledge. The verb *teapot*, then, is a contextual expression, and so are innovative denominal verbs in general (Clark and Clark, 1979).

Some types of contextual expressions

Most contextual expressions are word innovations that are formed from well established words or morphemes. The verb *teapot* is a novel construction built on the noun *teapot* plus a change in form class from noun to verb. This sort of word formation is often called zero-derivation, as if the noun *teapot* is provided with a zero suffix to form the verb *teapot-Φ*. Not every innovation, however, is a contextual expression. Nouns formed from adjectives by adding *-ness*, as in *fakeness* and *chartreuseness*, aren't contextual expressions, as I will spell out later, whereas verbs formed from nouns by adding the zero suffix, as in *to teapot* and *to apple*, are. It is an important empirical question which constructions produce contextual expressions and which do not.

To give an idea of the range of contextual expressions, I will list some

construction types that I believe contain contextual expressions. Some of these types contain well-documented cases of contextual expressions. Others contain cases I only conjecture to be contextual expressions. My conjectures are based on examples that work like the verb *teapot* in exhibiting the properties of non-denumerability and contextuality. Since it would be impossible to give the whole range of such construction types, I will restrict myself to expressions formed from concrete nouns. I will list the categories of contextual expressions by the form class of the derived word—by whether it is a noun, adjective, or verb. There are undoubtedly many types of contextual expressions other than those listed here.[1]

1. *Indirect nouns*. The nouns in such expressions as *the horse, a car*, and *some water* appear to denote concrete things in an obvious way. Appearances, however, are deceiving. One way to ask for a glass of water in many contexts is to say *One water, please. Water*, of course, is a mass noun that denotes the substance water. To get it to denote a glass of water, one must take *one water* in the nonce sense 'one glass of water'. In other contexts, the same phrase could be used to denote one tub of water, one type of water, one drop of water, one teaspoon of water, one person who ordered water, and so on indefinitely. Other examples of indirect nouns include: *Last night they played a Beethoven; I saw a Henry Moore today; That ten minutes was too long for a commercial; Stereos are a dime a dozen*; and *Our electric typewriter got married*. These expressions have been studied under various names—beheaded noun phrases' (Borkin, 1970), 'shorthand expressions' (Clark, 1978), and 'deferred reference' (Nunberg, 1979). It is important to notice that on the surface they are often impossible to distinguish from purely intensional expressions. *The water* could be used in the conventional sense 'the substance called water' or in some nonce sense 'the glass, or pail, or drop, or the teaspoon, or . . ., of water'. One can only tell from context.

2. *Compound nouns*. In English, idiomatic compound nouns like *dog sled, tea garden*, and *apple pie* are common. Because they are idiomatic, their conventional senses are listed in the dictionary and, presumably, in most people's mental lexicons. Compound nouns with nonce senses, however, like *finger cup, apple-juice chair*, and *Ferrari woman*, are also common, and their meanings will not be found ready-made in the dictionary or in mental lexicons. Although Lees (1960), Levi (1978), and Li (1971) have all assumed that such compound nouns fall into a small number of paradigms, Downing (1977), Gleitman and Gleitman (1970), Jespersen (1942), Kay and Zimmer (1976), and Zimmer (1971, 1972) have argued that they do not. Both Downing, and Kay and Zimmer, have shown, in effect, that innovative compound nouns are contextual expressions since their possible meanings aren't denumerable and what they mean on any occasion depends on the close coordination of the speaker and addressee.

3. *Possessives*. We tend to think of the so-called possessive construction as

denoting possession and a small range of other things. *John's dog* means 'the dog John possesses'. Yet in the right contexts, *John's dog* could also mean 'the dog John is standing in front of', 'the dog John saw yesterday', 'the dog John always wanted', and any number of other things. The possibilities are in theory unlimited in number and cannot be enumerated, and what it is taken to mean on any occasion relies heavily on the coordination of the speaker and addressees. Possessives, in short, are contextual expressions.

4. *Denominal nouns.* Nouns like *Nixonite, bicycler*, and *saxophonist* are formed from concrete nouns like *Nixon, bicycle*, and *saxophone* by derivation. There is a plethora of idiomatic cases of this sort in English, but what innovative examples mean can vary enormously from one occasion to the next, depending on certain cooperative measures between the speaker and addressees. Each has an unlimited number of possible meanings, or so it appears. Denominal nouns, then, although they have stricter requirements than, say, possessives or compound nouns, are also contextual expressions.

5. *Denominal verbs.* It is easy to turn nouns into verbs, as in *to graphite the locks, to farewell the guests*, and *to Houdini one's way out of a locked closet*. Some denominal verbs are already well established in the language, but many are being invented all the time. Eve V. Clark and I (Clark and Clark, 1979) have argued in detail that innovative denominal verbs are contextual expressions. The denominal verb *teapot* has an unlimited set of potential senses, and what it means on each occasion depends on the coordination of speaker and addressees.

6. *Eponymous verbs.* In *The photographer asked me to do a Napoleon for the camera*, the expression *do a Napoleon* is being used innovatively. I will call this expression an eponymous verb—because it is built on the name of its eponym Napoleon—even though it consists of a pro-verb *do* and an indirect noun as direct object. Eponymous verbs can only be understood if the speaker and addressees coordinate their knowledge of the eponym, here Napoleon, so that the addressees can identify the act of the eponym that the speaker is alluding to. Since there are, in principle, an unlimited number of acts one could know and allude to about an eponym, there are also an unlimited number of senses that could be assigned to the verb. Eponymous verbs are never idiomatic. Each one we meet we are forced to treat as a contextual expression.

7. *Pro-act verbs.* In *Alice did the lawn, do* is what I will call a pro-act verb. It denotes an act like mowing, raking, fertilizing, or an unlistably large number of other things that one can do to lawns. Its senses are not denumerable, and what it is taken to mean depends critically on the time, place, and circumstances in which it is uttered. Pro-act verbs appear to be genuine contextual expressions.

8. *Denominal adjectives.* Adjectives derived from nouns, like *gamey, impish*, and *athletic*, from *game, imp*, and *athlete*, are common in English.

Although most such adjectives are idiomatic and have conventional senses, many of them can be innovative, with meanings dependent on the time, place, and circumstances of the utterance. *Churchillian*, for example, might mean 'with a face like Churchill', 'smoking a cigar like Churchill', 'with a speaking style like Churchill', or any number of other things. In principle, the list is unlimited; in practice, it is limited by what the speaker can assume the addressees know about Churchill and will be able to see that he is alluding to.

9. *Non-predicating adjectives.* Closely related to the first noun in noun compounds are the so-called non-predicating adjectives, like *atomic, manual*, and *marine* (Levi, 1978). These adjectives, formed from Latin and Greek roots, serve virtually the same purpose as the equivalent English nouns would serve in the same position. Just as there are *atomic bombs, manual labour*, and *marine life*, there are *atom bombs, hand labour*, and *sea life*. These adjectives are non-predicating in that one cannot say, with the same meaning as in *marine life*, that *life is marine*. For all these reasons, these adjectives share many properties with the first nouns of compound nouns and also with possessives (Levi, 1978). Innovative uses of non-predicating adjectives appear to possess both of the critical properties of contextual expressions—nondenumerability and contextuality. *Atomic*, for example, may indicate any of an indefinitely large set of unlistable relations between atoms and the things denoted by the noun that *atomic* modifies.

10. *Eponymous adjectives.* In examples like *She is very San Francisco* and *That is a very Picasso painting*, the adjectives are formed from the names of people or places—their eponyms—and allude to one of an indefinite number of unlistable properties of those eponyms, of San Francisco and Picasso. What the adjectives actually allude to depends on the time, place, and circumstances in which they are uttered. They too are contextual expressions.

Table 9.2   Ten types of contextual expressions

Category of derived word	Type of expression	Examples
Noun	Indirect nouns	*one water, a Henry Moore*
	Compound nouns	*finger cup, apple-juice chair*
	Possessives	*John's dog, my tree*
	Denominal nouns	*a waller, a cupper*
Verb	Denominal verbs	*to farewell, to Houdini*
	Eponymous verbs	*to do a Napoleon, to do a Nixon*
	Pro-act verbs	*to do the lawn, to do the porch*
Adjective	Denominal adjectives	*Churchillian, Shavian*
	Non-predicting adjectives	*atomic, manual*
	Eponymous adjectives	*very San Francisco, very Picasso*

The types of contextual expressions I have just laid out are summarized in Table 9.2.

Ubiquity and naturalness

With so many different types available, contextual expressions ought to be ubiquitous, and they are. They occur everywhere and generally without our being aware that their senses are nonce senses. Absolute numbers are difficult to estimate. One reason is that the line between contextual expressions and purely intensional expressions is difficult to draw (Clark and Clark, 1979). A sense may be conventional within one community, as among newspaper reporters or computer users, but it may be a nonce sense for the people being addressed. All I can do is give a feel for the numbers involved. As examples I will offer both deliberate uses by literary people trying for special effects and unpremeditated use by ordinary people trying to talk efficiently. Both types are common.

Many literary uses are designed for humour. When Bombeck has her daughter say, *We're looking for a size 10 with a steam iron*, meaning 'a person who wears dresses of size 10 and comes with a steam iron', she is making a point of her daughter's materialism. There is similar motivation behind the following examples (the obvious nonce uses in italics):

Subjected to the musical equivalent of 72 hours in a dentist's waiting room, Bradley was apparently in real danger of being the first tourist ever *Muzakked* to death. (*San Francisco Examiner*)

We've redone the entire living room in *Nelson Rockefeller* [alluding to Rockefeller's business of selling reproductions of art from his private collection]. (*New Yorker* cartoon)

I divide the world into two groups—the '*for me*'s and the '*against me*'s. (Mal cartoon)

The fire department capped the plug and the police department *jugged* the guest. (Herb Caen, *San Francisco Chronicle*)

J. W. Marriott Sr. and J. W. Jr. *Pan Am'd* out of here Sat. for Peking. (Herb Caen)

Tuesday is a good day for *noistalgics* who miss the daily noon siren sound from the Ferry Building. (Herb Caen)

Alexander Zinchuk, the USSR's consul General, inviting the local wretched *inkstains* to a reception May 3 in observance of—get set—'The Day of the Press'. (Herb Caen)

The bank's *buzzier guessips* tried to connect this odd coincidence with the Alvin Rice hoo-ha—Alvin being the former *No. 2* of B of A now being *grand-juried* for possible conflict in real estate loans—but at least two of the *Vanishing Bank of Americans* say coolly 'We resigned'. (Herb Caen)

Newspaper reporters and other writers rely on contextual expressions in

everyday expository writing. This is illustrated in the following examples:

Gold plunges to new *lows*. [the price of gold, new low levels] (headline, *San Francisco Chronicle*)

I stopped in Perry's for a *quick crab*. [dish of crab meat that could be consumed quickly] (Herb Caen)

The initiative is aimed at preventing the *New Yorking* of the San Francisco skyline. (TV news)

Twenty-two nations and five international agencies agreed here yesterday to send a delegation to Cuba to urge Fidel Castro to ease the plight of thousands of his countrymen seeking to leave the island, and to regularize their departure. [Representatives from 22 nations and five international agencies] (*Los Angeles Times*)

I had a *teletype* on the situation half a hour ago. [a message sent by the teletype machine] (novel)

The *telephone* managed to get a word in. [The person on the other end of the telephone line] (novel)

Service for 8 includes dinner plates, *salads*, cups, saucers, *soup/cereals* plus oval platter, oval *vegetable*, *sugar* with lid, creamer. (advertisement)

Only a few of these examples stand out as innovations—the telephone and New Yorking examples, perhaps. The rest strike us as mundane and quite unremarkable.

You don't have to be a professional writer to come up with contextual expressions, as illustrated in these attested spontaneous examples:

In this program I could either *and* it or *or* it. [Use the computer language connectives 'and' and 'or'] (computational linguist)

(Can you tell a person by his car?) I'm a *Dodge Power Wagon*. That's what I've got. (*San Francisco Chronicle*, 'Question Man')

(What's good cheap entertainment?) Today I'm going *gallerying*. ('Question Man')

He's home today *jetlagging*. [Recovering from the effects of jetlag] (a friend)

Having *porpoised* my way through the arguments, I gave them my conclusion. (A well known psychologist)

I know that it's across from a quarry. That's the only way I can *landmark* it. [Person talking about finding a beach]

Once again, there is nothing particularly remarkable about most of these contextual expressions. We may identify many of them as novel, but we take them as a legitimate part of English.

Contextual expressions have to be legitimate in order to account for how new words come into English, which happens at an often alarming rate. Consider this example. In the *San Francisco Chronicle*, the 'Question Man'

one day asked 'What's good cheap entertainment?' One woman replied, *Bouldering is great*. For readers like me, *bouldering* was an expression with no conventional meaning. In context, we took it to mean 'climbing on boulders'. Yet it was clear from the rest of the woman's answer that she took *bouldering* to be a conventional term for that activity—perhaps within the community of rock climbers. We understood her even though that conventional sense hadn't yet spread to the larger community of readers. For her convention to spread to the larger community, the rest of us must be able to interpret her term readily and as a matter of course. We must be willing to accept its Janus-like character for a while—as a conventional term for some of us and as an innovation for others. A good deal of the conventional vocabulary appears to have entered the language by just this route—from contextual expressions solidifying and petrifying into purely intensional expressions (see Clark and Clark, 1979).

TRADITIONAL PARSERS

Which parsers in the literature run into trouble with contextual expressions? Most of them, I will argue, or so it appears. The caveat 'or so it appears' is critical. For parsers in the psychological tradition, there have been few characterizations of the lexicon—of what lexical entries would look like and how they would organized. Yet these parsers proceed as if they were making the sense-selection assumption and don't appear able to handle contextual expressions. In the artificial intelligence tradition, more attention has been paid to the lexicon, but only a few of the parsers have been spelled out in any detail (e.g. Winograd, 1972). Yet these parsers also appear to follow the sense-selection assumption, and so they too will fall victim to the problems of nonce sense. To handle contextual expressions, both types of parsers will need to undergo major revisions. I will illustrate this point by considering several of the psychological parsers that have been proposed.

Heuristic parsers

Psychological approaches to parsing have followed two main traditions. The first, which I will call the *heuristic tradition*, has its roots in Miller and Chomsky (1963) and Fodor and Garrett (1966). But it is most clearly identified with Bever (1970), who set out a series of processing strategies, or heuristics, to account for the difficulties of people trying to understand complex sentences. Later, Kimball (1973, 1975) put these strategies into a systematic framework, and his is still the best description of this tradition. He proposed seven 'principles of surface structure parsing' and showed how they accounted for the phenomena Bever had identified and more. Frazier and Fodor (1978) have since offered a version of Kimball's parser, called the 'sausage machine', but it is like Kimball's parser in the ways that matter to the point I want to make.

For Kimball, parsing meant dividing an utterance into its constituents and labelling these constituents with the correct syntactic categories. His parser proceeded word by word through an utterance, deciding when to begin and end each constituent as it went. The main information it needed was the form class of each word from the lexicon, rules about the composition of surface constituents, and Kimball's seven heuristic principles. Take the utterance *George managed to read the newspaper yesterday*. When the parser reached the word *to*, it would look it up in the lexicon and find it to be either a preposition or an infinitive marker. So it would mark *to* as the beginning of a constituent—either a prepositional phrase or an infinitive complement. When it reached *read*, it would look up *read* in the lexicon, find it to be a verb, and then eliminate the prepositional phrase interpretation. And so on. The parser didn't deal directly with word or constituent meanings, although at critical times it made reference to these meanings in selecting between alternative parsings.

The first place where Kimball's parser would get into trouble is with words that aren't in the lexicon. Take *George managed to porch the newspaper yesterday*. *Porch*, though only a noun in the lexicon, is being used in this utterance as a verb. The parser would automatically classify *porch* as a noun and then not be able to parse the rest of the infinitive complement. The problem might be handled by outfitting the parser with lexical rules that change nouns into verbs, verbs into adjectives, verbs into nouns, and so on. This solution, however, won't work because of the mis-parsing problem. For *porch*, the parser, not being able to parse the noun *porch*, could be made to go to a lexical rule that changes nouns to verbs. Then it could identify *porch* as a verb and parse the other constituents correctly. But consider *George set out to Jesse Owens down the street* in circumstances in which *Jesse Owens* is intended to mean 'sprint', after Jesse Owens the Olympic sprinter. In parsing this sentence, there is nothing to force the parser to go to a lexical rule, since the sentence makes good sense with *Jesse Owens* as a noun. To get the analysis right, the parser would have to consult the speaker's intentions in using *Jesse Owens*, which it might only be able to infer from non-linguistic context. Kimball's parser is not designed to do this.

Kimball's parser will run into other difficulties too. Imagine that Bombeck had written *The neighbour swore at our electric typewriter who got married*. Ordinarily, Kimball (1973, p. 25) argued, the parser would try to attach the relative clause *who got married* to the nearest noun phrase, here *our electric typewriter*. If the parser couldn't do this for semantic reasons, it would attach it instead to some earlier noun phrase, here *the neighbour*, so that the utterances would mean 'the neighbour who got married swore at our electric typewriter'. Kimball's parser would be forced to take the second option. All it would have to go on would be the senses of *electric typewriter* listed in the lexicon. These wouldn't include 'person who has an electric typewriter' or any

of the indefinitely large number of other nonce senses it could have. The parser, then, would misidentify the surface structure of this utterance and of all other utterances in which a nonce sense had to be consulted in order to get the right parse.

Augmented transition networks

The second main tradition in psychological approaches to parsing is the *augmented transition networks*, or ATNs. This tradition had its start with Woods (1970) and Kaplan (1972) and has since evolved in papers by Woods (1973), Kaplan (1973a, 1973b, 1975), Wanner and Maratsos (1978), and Kaplan and Bresnan (1982). ATNs consist of a set of interconnected operations. An ATN parses each utterance word by word, applying its operations in a well defined order and identifying the intended constituents and their functions as it goes along.

An ATN can be viewed, whimsically but pretty accurately, as a medieval game played by a king on the country roads around his castle. The object of the game is for the king to get from his castle to his rival's castle along these roads (called 'arcs') using only the words in the sentence to guide him. He must leave his castle by the road signposted with the first word in his sentence. That will take him to a nearby village (called a 'state') where he will take the road signposted with the second word, and so on, until he reaches his rival's castle. Often, he can't leave a village directly, since there isn't a signpost with the next word on it. Instead, he must take detours signposted with the category of the word he is looking for (say, 'noun') or with the category of a constituent that contains the category of the word he is looking for (say, 'noun phrase'). The king discovers the category of each word in his pocket lexicon. He can pass along the route signposted 'noun' only if the word he is looking for is listed in his lexicon as a noun.

ATNs run into the same two problems that heuristic parsers run into. The king will be stopped by *porch* in *George managed to porch the newspaper*. He will look for a road signposted 'porch' or 'noun' or 'noun phrase' or 'sentence' and find none. He will be condemned to remain in that wretched village forever. If he adds to his lexicon a set of lexical rules that change nouns into verbs, verbs into nouns, and so on, he will have a different problem with *George set out to Jesse Owens down the street* when *Jesse Owens* is intended to mean 'sprint'. Since *Jesse Owens* is in the lexicon as a noun, and since there is a noun-detour available, he will take it and not even try the verb-detour. The noun-detour will lead him to the wrong destination, which he will never realize. If, instead, he tries the lexical rule first and takes the verb-detour first whenever he encounters a noun, he will take many wrong roads that he will have to retrace before trying another route. And he will now get the *Jesse Owens* sentence wrong when *Owens* is intended as a noun. So because of

contextual expressions, the king will get stranded, or finish at the wrong castle, or wander around needlessly before arriving at the right castle.

ATNs also base certain parsing decisions on meaning. The king is often forced to select routes based on what the current word means. For decisions about word meaning, he still has only his pocket lexicon, and it doesn't contain nonce senses for Bombeck's *electric typewriter* or *stereos*, or for any other contextual expression. Adding lexical rules won't help. As I will show later, there would have to be an indefinitely large number of lexical rules to account for the possible senses of contextual expressions. So when the king needs to make choices based on meaning, once again he can become stranded (as with *Our electric typewriter got married*), or be led to the wrong castle altogether (as with *The neighbour swore at our electric typewriter who got married*). The king's lexicon could never be large enough to parse nonce sense.

Lexical access

Aside form the heuristic and ATN traditions, there has been much experimental work on 'lexical access', the process by which people 'access' words in their mental lexicons in long-term memory. A significant problem for lexical access is ambiguity. Consider *The man was not surprised when he found several bugs in the corner of his room* (from Swinney, 1979). When a listener hears *bugs*, he has to access *bug* in his mental lexicon. There, it has been assumed, he will find, say, two senses—'insect' and 'listening device'. He must decide which of these two senses was intended on this occasion. In a long series of experiments, it has been shown that resolving ambiguities takes time and effort (for reviews, see Clark and Clark, 1977; Fodor, Bever and Garrett, 1974; Foss and Hakes, 1978).

Lexical access of ambiguous words has almost invariably been characterized in accordance with the sense-selection assumption. Fodor, Bever, and Garrett (1974) talked about listeners 'selecting among readings of ambiguities'. Foss and Hakes (1978) argued that the findings by Foss and Jenkins (1973) demonstrated 'that listeners always retrieve both interpretations of an ambiguous word from the mental lexicon and that the context then operates to help them decide among them'. Clark and Clark (1977) characterized the same findings in similar language: 'When listeners encounter an ambiguous construction, they compute multiple readings'; 'using the context, listeners then attempt to select the most plausible reading'.

These characterizations of lexical access ought to be inadequate for contextual expressions, and they are. Consider Swinney's (1979) 'post-decision model' of lexical access. As Swinney put it, his results 'support the existence of a postaccess decision process which acts to select a single meaning from those originally and momentarily accessed for involvement in further proces-

sings'. Listeners access all senses of *bug*, and only then do they use the context to select one from among them. Swinney argued against a 'prior decision model' in which listeners use the semantic context to guide lexical access—in which, for example, listeners use the prior context to access or activate only one sense of *bug*, the one appropriate to context.

Taken literally, the post-decision model has to fail on contextual expressions. When it encounters *porch* in *George managed to porch the newspaper yesterday*, it will have no lexical entries to access for the verb *porch* and hence no senses to select from. The model predicts that the verb *porch* cannot be understood. If lexical rules are added to derive the possible senses of the verb *porch* from the noun *porch*, the model has the opposite problem. The lexical rules, as I will show later, generate an indefinitely large number of possible senses for the verb *porch*. No model with a finite memory could access all of these senses, as the post-decision model requires, nor could any model select from among the possible senses in a finite amount of time.

With certain revisions, however, the post-decision model might be made to work. It would proceed roughly as follows. When it encountered the verb *porch*, it would access the senses for *porch* in the lexicon. These would consist entirely of *conventional* senses, such as the noun senses 'covered entrance to a house' and 'verandah'. The model would then select from among these senses the one on which it could create the intended verb sense. After all, the meanings of the verb *porch* are based on the meanings of the noun *porch*. How the model would decide which noun sense is the right one, and how it would create the intended verb sense from it, however, are matters that go beyond the assumptions of the post-decision model. They will be considered later. Yet with these emendations, the model could retain its most important property, the selection process that correctly predicts that ambiguous words should be difficult to understand.

Since virtually all current models of lexical access make the sense-selection assumption either explicitly or implicitly, they are open to the same criticisms as the post-decision model. These include the models of Cairns and Kamerman (1975), Forster (1976), Garrett (1978), MacKay (1970), Marslen-Wilson and Welsh (1978), Morton (1969, 1970), and Tanenhaus, Leiman, and Seidenberg (1979), to name just a few. Like the post-decision model, many of these models could perhaps be revised to handle contextual expressions. But these revisions would require a view of parsing that is rather different from the one on which all these models are based.

Sentence meanings

Most traditional parsers and models of lexical access are based on what I will call the *traditional view of sentences*, a view that has been held, explicitly or implicitly, by most investigators in these areas. According to this view, the

grammar of English, including its lexicon of conventional senses for words, morphemes, and idioms, assigns readings to each string of words. If a string of words is assigned one or more senses that aren't semantically anomalous, as *Stereos are a dime a dozen* would be, it is adjudged to be a sentence of English. The readings assigned to it are called its *sentence meanings*. If a string of words can *not* be assigned any such readings, and *Our electric typewriter got married* could not be, it is adjudged *not* to be a sentence of English. In one terminology (e.g., Chomsky, 1965; Katz, 1964), it would be marked as 'ungrammatical'. In another terminology (e.g., Katz, 1972, 1977), it would be marked 'semantically anomalous'. For convenience, I will adopt the first terminology.

The traditional view of sentences, then, is this. What the speaker meant in uttering a string of words is identical to, or derivable from, one of its sentence meanings—one of the readings assigned to it by the grammar. What a speaker could mean by *Stereos are a dime a dozen* is derivable from its only sentence meaning 'Phonographs are very common'. And what a speaker could mean by *Our electric typewriter got married* is nothing, since this string of words yields no sentence meanings—since it isn't assigned any sensible readings by the grammar. (It might be treated as a 'semi-sentence', à la Katz (1964); I will discuss this possibility later.) This view of sentences fails to do justice to six of Bombeck's eight utterances. For those that are grammatical, what Bombeck meant is *not* derivable from any of the sentence meanings. For those that are not grammatical, Bombeck meant something that has no chance of being derived from a sentence meaning, since these strings don't *have* any sentence meanings.

Put in its strongest form, what a speaker means bears no direct relation to the sentence meanings assigned to it in the traditional view of sentences. Grammaticality as defined in this view bears no direct relation to ordinary language use. Consider these four types of utterances:

(1) A grammatical sentence used in one of its sentence meanings (like Bombeck's *We've just had a streak of bad luck*).
(2) A grammatical sentence used in something other than one of its sentence meanings (like her *Stereos are a dime a dozen*).
(3) An ungrammatical string used in one of the semantically anomalous readings assigned to it by the grammar (like *The rock cried*, meaning 'the stone wept', a made-up example).
(4) An ungrammatical string used in something other than one of the semantically anomalous readings assigned to it by the grammar (like Bombeck's *Our electric typewriter got married*).

According to the traditional view of sentences, speakers should only use sentences of type (1). These alone have sentence meanings from which one can derive the speaker's meaning. If a speaker used sentences of types (2), (3), or (4), they would be judged as mistakes. But as I argued earlier, cases

(2) and (4) are ubiquitous. Furthermore, they sound perfectly natural. They are as much a part of ordinary English as case (1) is.

So long as parsers and models of lexical access are based on the traditional view of sentences, they will be inadequate. They will miss every utterance that falls into cases (2) and (4), misparsing the first and failing to parse the second. They will fail to handle a significant portion of what ordinary people consider to be ordinary English.

TWO FALSE SOLUTIONS

Two mechanisms that have been proposed and at first appear able to handle contextual expressions are the lexical rule and the semi-sentence. Yet neither of these mechanisms offers any real solution. It is important to see why.

Lexical rules

The way a traditional parser would handle innovations is via *lexical rules* or via Miller's (1978) *construal rules* (which for present purposes are indistinguishable from lexical rules). Imagine that such a parser is confronted with the word *chartreuseness*, which is not in its lexicon. Nevertheless, the parser has in its lexicon the adjective *chartreuse*, the suffix *-ness*, and the following lexical rule:

X_{Adj} + *-ness*$_N$ has these and only these possible senses:

(a) state of being X
(b) quality of being X
(c) condition of being X
(d) instance of the state of being X
(e) instance of the quality of being X
(f) instance of the condition of being X

With this rule, the parser will generate six senses for *chartreuseness* and then select from among the readings just as it would for a word already in its lexicon. The difference between the listed senses and the senses generated by such a rule is that whereas the first are actual, the second are virtual. Otherwise, the two types of senses function in the same way.

For lexical rules to be sufficient, they must be capable of generating every sense of every innovation. For words like *chartreuseness*, which are assigned a fixed number of senses, lexical rules do a good job. But similar rules have been offered for other types of expressions. For denominal verbs, McCawley (1971) suggested a rule that would go like this (where Φ_V is the null verb-forming suffix of what is technically called 'zero-derivation'):

X_N + Φ_V has this (and other) possible senses:

(a) causes an X to hold onto

With this rule, *John nailed the note to the door* is interpreted as 'John caused a nail to hold the note onto the door.' The rule would also capture the sense of *to tack, to scotchtape, to glue*, and many other like verbs. Green (1974) suggested another lexical rule for denominal verbs to handle cases like *to hammer*:

(b) as by using X (on) in the usual manner, for the purpose for which it was designed

For denominal verbs like *to porch*, as in *George managed to porch the newspaper yesterday*, there would also be this rule:

(c) cause to be on an X

Rule (c) would also generate the right senses for *to bench a player, to beach the boat*, and *to shelve the books*.

The problem is that for contextual expressions, there would have to be an indefinitely large number of such rules (Clark and Clark, 1979). Take Ed's remark to me about Max, the man with the teapot compulsion: *He teapotted a policeman*. As a denominal verb, *teapot* would add still one more lexical rule to the list for $X_N + \Phi_V$, namely:

(d) rub the back of the leg of with an X

But since there are an unlimited number of other nonce senses that *teapot* (or any other novel denominal verb) could have had, there must also be an unlimited number of such rules for generating them. There would have to be rules like these:

(e) strike on the back of the leg of with an X
(f) rub on the back of the ankle of with an X
(g) scratch on the back of the neck of with an X
(h) turn into an X

And so on indefinitely. That is, since *teapot* can have a different nonce sense in each different situation, it would have to have associated with it a different lexical rule for each situation. This undermines the reason for having lexical rules in the first place.[2]

The same problem arises for all other contextual expressions. In the domain of compound nouns, Levi (1978) has proposed lexical rules too. She has argued that all the possible interpretations of novel noun–noun compounds like *horse chair* are captured in the following twelve rules:

$X_N + Y_N$ has these and only these possible senses:

(a) Y that causes X (as in *tear gas*, 'gas that causes tears')
(b) Y that is caused by X (as in *birth pains*, 'pains caused by a birth')
(c) Y that has X (as in *apple cake*, 'cake that has apples')
(d) Y that X has (an in *lemon peel*, 'peel that lemons have')
(e) Y that makes X (as in *honeybee*, 'bee that makes honey')
(f) Y that X makes (as in *daisy chains*, 'chains that daisies make')

    (g) Y that uses X (as in *voice vote*, 'vote that uses voices')
    (h) Y that is X (as in *soldier ant*, 'ant that is a soldier')
    (i) Y that is in X (as in *field mouse*, 'mouse that is in a field')
    (j) Y that is from X (as in *olive oil*, 'oil from olives')
    (k) Y that is for X (as in *wine glass*, 'glass for wine')
    (l) Y that is about X (as in *tax law*, 'law about taxes')

An important feature of these rules is that they rely on only nine different predicates—*cause, have, make, use, be, in, for, from*, and *about*—which appear to capture the major relations that hold in English compound nouns.

    It is easy to see that these rules don't capture the *full* meanings of innovative compound nouns. Consider Downing's (1977) example of a friend being asked to sit at the *apple-juice seat*, meaning 'the seat in front of which a glass of apple-juice had been placed'. Levi would probably generate the meaning of this compound by Rule (i), giving it the analysis 'seat that is located with respect to apple juice'. This paraphrase, however, hardly does justice to the meaning that was intended. It may offer a broad category into which the nonce sense fits, but it doesn't explicate the nonce sense itself. The intended sense would require a lexical rule something like this:

    (i′) Y in front of which there had been X.

This rule would be a subrule of Levi's rule (i), and there would be other subrules as well. If Downing, and Kay and Zimmer (1976), are correct, novel compound nouns like this have an indefinitely large number of possible senses, and so there would be an indefinitely large number of such subrules. The problem with Levi's rules is that they are stated at an arbitrary level of abstraction; therefore, they capture an arbitrary amount of the sense of compound nouns like *apple-juice seat*. It is an illusion that there are only a small number of lexical rules. At the correct level, there would have to be an indefinitely large number of them (see also Carroll and Tanenhaus, 1975).[3]

    For other categories of contextual expressions, the problem is just as serious. With eponymous verbs like *do a Napoleon*, there are a few broad categories of senses one might identify:

<p align="center">do a X$_{PN}$ has these possible senses:</p>

    (a) do what X did (as in *I want you to do a Napoleon for the camera*)
    (b) do what was done to X (as in *They did a Manhattan to downtown San Francisco*)
    (c) do what happens in X (as in *The horse did a Pimlico*, or *a Derby, down the road*)

And so on. Yet the same problem arises as before. These categories are hardly fine enough to capture, for example, what a photographer meant in saying *I want you to do a Napoleon for the camera*. *Do a Napoleon* here doesn't mean 'do what Napoleon did' but 'pose with your hand inside the flap

of your coat, as Napoleon did'. We would need a specific lexical rule to distinguish this meaning from other possible meanings of *do a Napoleon*, as in *The lawyer was asked to do a Napoleon for the legal system of Oahu, Hitler tried to avoid doing a Napoleon in attacking Russia in the winter*, and any number of other uses. Once again, the number of lexical rules is indefinitely large. No parser could manage that many.

Lexical rules, therefore, cannot solve the problems of nonce sense. Certain types of nonce sense, as in expressions like *chartreusness*, may be adequately captured with lexical rules, but other types are not. The types not captured are the contextual expressions. For them, there would have to be a new lexical rule for each new sense in which they were used. For them, lexical rules solve nothing at all.

Semi-sentences

Bombeck's utterance *Our electric typewriter got married* is an example *par excellence* of what in the traditional view of sentences would be called an 'ungrammatical string'. Yet Katz (1964) has argued, and many others have followed suit, that a string of words doesn't have to be grammatical to be comprehensible. For this purpose, Katz has proposed a theory of *semi-sentences*. *Our electric typewriter got married* would be such a semi-sentence in that it is a string of words that isn't grammatical but can nevertheless be understood. Katz seems to have intended his theory to account for utterances like Bombeck's, for he offered as examples of semi-sentences *It happened a grief ago, I have over-confidence in you*, and *He expressed a green thought*, all of which contain innovations, although they don't all sound as natural as Bombeck's utterance.

The basic idea of the theory is this. When a listener is confronted with a semi-sentence, he associates with it a set of fully grammatical sentences called the *comprehension set*. The members of the comprehension set, in effect, enumerate all the possible meanings the semi-sentence could have. For *Man bit dog*, the comprehension set would be as follows:

Man bit dog is associated with this comprehension set:

(a) The man bit the dog
(b) The man bit a dog
(c) A man bit the dog
(d) A man bit a dog

Sentences (a) through (d) each represent a possible reading of the semi-sentence *Man bit dog*. They are created by what Katz called *transfer rules*, although he offered only the sketchiest examples of what these rules might look like (see also Ziff, 1964). Katz's claim is that the listener's understanding of a semi-sentence is 'nothing other than his understanding of the sentences in

the set with which the semi-sentence is associated' (p. 411), namely the comprehension set. The proposal is as ingenious as it is simple. It reduces the problem of understanding semi-sentences to the problem of understanding grammatical sentences, a problem that will presumably submit to the scientist's scalpel sooner or later.

For this scheme to work, the comprehension set associated with each semi-sentence must contain a finite number of sentences. As Katz put it (p. 411), 'the notion *sufficient structure to be understood* is analyzed as *structure that suffices to permit a semi-sentence to be associated with a finite number of sentences, each of which is a possible reading of the semi-sentence*' (all emphases are Katz's). This follows from Katz's general approach to semantics, which is to be able to enumerate for each sentence a finite number of readings. He wants to be able to do the same for each semi-sentence too. The requirement in this case has further value, according to Katz, since it distinguishes genuine semi-sentences like *Man bit dog*, which will have a finite comprehension set, from nonsense strings like *The saw cut his sincerity*, which will not.

Katz's theory of semi-sentences, however, cannot work for contextual expressions. The reason is simple. As I noted earlier, *Max teapotted a policeman* has an indefinitely large number of potential readings. It could mean 'rub the back leg of with a teapot', 'rub the back of the shoulder of with a teapot', 'rub both ankles and knees of with a teapot', and so on indefinitely. In the theory of semi-sentences, each of these readings would correspond to a grammatical sentence in the comprehension set associated with the ungrammatical string of words *Max teapotted a policeman*. Thus, the comprehension set for *Max teapotted a policeman* is not finite in size. But because the set isn't finite, the theory predicts that *Max teapotted a policeman* isn't comprehensible—that it doesn't have 'sufficient structure to be understood'. This prediction, of course, doesn't hold. For the same reasons, the theory also predicts as incomprehensible Bombeck's *Our electric typewriter got married*, Herb Caen's *I stopped in Perry's for a quick crab*, and *The photographer asked me to do a Napoleon for the camera*. These predictions obviously don't hold either.

The most glaring defect in this theory is that it requires each string of words to have a finite number of readings in order to be comprehensible. By definition, contextual expressions have an indefinitely large number of potential readings and, as we have seen, are taken to be a regular part of English. Conclusion: contextual expressions cannot be accounted for by the theory of semi-sentences.

A less obvious defect goes as follows. The basic assumption of the theory is that each meaning of a semi-sentence can be *precisely* and *completely* captured by at least one grammatical sentence of English. This assumption isn't really warranted. The *raison d'être* for the use of many contextual expressions

is to say things that could not be said any other way. Consider *Harry managed to Richard Nixon the tape of his conversation with the chief of police.* Here *Richard Nixon* cannot be paraphrased by *erase*, or *erase with malice and conniving*, or *erase as Richard Nixon would have done*, without losing something of the original. The point of the utterance is to compare Harry's actions and motives, in all their complexity, with those of Nixon, and no paraphrase can do that comparison justice. If this is so, a theory that requires each reading of every sentence with a contextual expression to correspond exactly to a sentence of English is doomed to failure.

An additional complication for the theory of semi-sentences is that it would require two distinct accounts of contextual expressions—one for those found in 'ungrammatical strings', the true semi-sentences, and another for those found in 'grammatical sentences'. Let us return to Bombeck's *Stereos are a dime a dozen*, in which *stereos* is being used innovatively to mean 'people who have stereos'. The sentence itself is grammatical on Katz's criteria, but the meaning Bombeck intended is not one of those enumerated by Katz's rules of composition. *Stereo* is being used in something other than one of its conventional meanings. Since the theory of semi-sentences would not identify this utterance as a semi-sentence, it would need a new device to identify *stereo* as a contextual expression and to compute its possible meanings. It would interpret *electric typewriter* via the theory of semi-sentences and *stereos* via some other theory, when they ought to be handled by the same process. The underlying problem is that sentences that contain contextual expressions are sometimes grammatical and sometimes not. It was pure accident that *stereos* appeared in a grammatical sentence and *electric typewriter* didn't. As noted earlier, any theory that ties the interpretations of these expressions to grammaticality seems misdirected from the start.

In the end, the theory of semi-sentence fails for much the same reasons that lexical rules do. It is easy to see that Katz's transfer rules, which generate the comprehension sets for semi-sentences, have the same consequences as lexical rules. Both require the meanings of a sentence to be denumerable and to be definite in number. Both run afoul of contextual expressions, whose possible meanings are neither denumerable nor definite in number.

INDIRECT USES OF LANGUAGE

Contextual expressions, one could say, are ordinary words that are used indirectly for momentary purposes. Another type of expression that might be described this way are indirect illocutionary acts. When I use *It's raining out* to remind my wife to take her umbrella, or to request her to close the window, or to offer to bring her a raincoat, I am using an ordinary sentence indirectly for some momentary purpose. This analogy gives a clue to the approach I will take to parsing utterances with contextual expressions. I will argue for a

general procedure for computing indirect uses of language. To see how the process might work, I will first review some characteristics of indirect illocutionary acts.

Indirect illocutionary acts

By now there is a good deal known about indirect illocutionary acts (Gordon and Lakoff, 1971; Sadock, 1974; Searle, 1975; Morgan, 1978; Bach and Harnish, 1979; Clark, 1979; Cohen and Perrault, 1979). There is even something known about how they are understood (Clark and Lucy, 1975; Clark, 1979; Clark and Schunk, 1980; Munro, 1977; Schweller, 1978; Gibbs, 1979). I will concentrate on five of their properties in order later to show a correspondence with contextual expressions. As my example, I will use the sentence *Do you know what time it is?*

1. *Simultaneous meanings.* In the right situation, I could use *Do you know what time it is?* to ask someone to give me the time. In this instance, I would mean two distinct things at once. I would mean 'I ask you whether or not you know the time', a yes/no question, which I will call the *direct meaning*. I would also mean 'I request you to tell me the time', a request, which I will call the *indirect meaning.* Genuine cases of indirect illocutionary acts all involve more than one meaning—a direct meaning and one or more indirect meanings.

2. *Logical priority.* In my use of *Do you know what time it is?*, the yes/no question is *logically prior* to the request. I perform the request by performing the question, and not vice versa. It is this that allows us to call the question the direct meaning and request the indirect meaning.

3. *Literalness of direct meaning.* The direct meaning of my utterance—the yes/no question—follows pretty directly, via conventions of language, from the literal meaning of the sentence *Do you know what time it is?* This is one reason that the speaker's direct meaning is often called the literal meaning. In the traditional view of sentences at least, one needs to know little more, often nothing more, than the sentence's literal meaning to know the speaker's direct meaning.

4. *Non-denumerability of indirect meanings.* Given the sentence *Do you know what time it is?*, there is no way to enumerate the possible indirect meanings a speaker could have in uttering it. In the right circumstances, I could use it to mean 'Please tell me the time', 'Don't forget your dentist appointment', 'You are late in getting home again', 'The party started an hour ago', and so on indefinitely. Whereas the direct meaning is pretty well determined by the literal meaning, if any, of the sentence uttered, the indirect meaning could be any number of things.

5. *Contextuality of indirect meanings.* What I mean indirectly in saying *Do you know what time it is?* is critically dependent on the circumstances in which I utter it. In particular, if I directed this utterance at my wife, I would expect

her to recognize that I was indirectly performing an illocutionary act that I had good reason to believe on this occasion she could readily compute uniquely on the basis of our mutual knowledge such that my direct meaning played some role. Thus, unlike my direct meaning, which is tied pretty closely to the literal meanings of the sentence I uttered, my indirect meaning is often completely dependent on my wife's recognition of my plans and goals in using that sentence on this occasion.

Indirect uses in contextual expressions

The five characteristics of indirect illocutionary acts bear a close, though not exact, resemblance to five corresponding characteristics of contextual expressions. I will illustrate these for the denominal verb in my earlier example *Max teapotted a policeman.*

1. *Simultaneous meanings.* In the circumstances I outlined earlier, Ed used the verb *teapot* to mean 'rub the back of the leg of with a teapot'. Without stretching things too much, we could say that Ed used the word *teapot* to do two things at the same time. He used it directly to denote teapots—those pots for brewing tea. He also used it indirectly to denote the act of rubbing someone's leg with a teapot. In other words, we can speak of a direct and an indirect meaning of the word *teapot*. These correspond, though are not exactly equivalent, to the direct and indirect meanings in my use of *Do you know what time it is?*

2. *Logical priority.* In uttering *teapot*, Ed denoted the rubbing of someone's leg with a teapot by denoting teapots themselves. That is, he performed the act of denoting the leg rubbing by performing the act of denoting teapots, and not vice versa. The direct use is logically prior to the indirect use, and this too corresponds to what happens in indirect illocutionary acts.

3. *Literalness of direct use.* Ed's direct use of *teapot*—his denoting of teapots—follows directly from one of the conventional meanings of the noun *teapot*. This is analogous to my direct meaning in uttering *Do you know what time it is?* which follows fairly directly from the literal meaning of this sentence. In both instances, the direct use of the expression is tied to the conventional meaning of the expression in the language.

4. *Non-denumerability of indirect uses.* There is no way of enumerating the possible indirect uses a speaker could have in using the noun *teapot* as a verb. This is a defining characteristic of contextual expressions: for something to be a contextual expression, its possible senses must be *non-denumerable*. Once again, there is a parallel with indirect illocutionary acts.

5. *Contextuality of indirect uses.* What Ed meant indirectly in using the word *teapot* is critically dependent on the circumstances in which he uttered it. Indeed, Eve V. Clark and I (Clark and Clark, 1979) have argued that there is a convention that governs how a speaker and addressee coordinate their use and understanding of innovative denominal verbs. The convention goes as follows:

The innovative denominal verb convention. In using an innovative denominal verb sincerely, the speaker means to denote:

(a) the kind of situation
(b) that he has good reason to believe
(c) that on this occasion the listener can readily compute
(d) uniquely
(e) on the basis of their mutual knowledge
(f) in such a way that the parent noun denotes one role in the situation, and the remaining surface arguments of the denominal verb denote other roles in the situation.

Here 'situation' is a cover term for states, events, and processes.

Once again, there is a striking parallel with indirect illocutionary acts, which also depend on a convention that refers to reasonableness in context, ready computability, uniqueness, and mutual knowledge of the speaker and addressee. The point at which indirect speech acts differ from denominal verbs is in condition (f). With denominal verbs, condition (f) makes reference to the conventional meaning of the parent noun (e.g., *teapot*) and the meanings of its surface arguments (e.g., *Max, a policeman*). With indirect illocutionary acts, condition (f) would make reference to the speaker's direct meaning, so that it perhaps would read 'in such a way that the speaker's direct meaning establishes a necessary condition for the speaker's indirect meanings'. In both cases, condition (f) makes reference to the direct use of the expression uttered, whether it is the whole sentence *Do you know what time it is?* or just the single noun *teapot*.

The parallels between indirect illocutionary acts and contextual expressions suggest that it ought to be possible to extrapolate from models of the understanding of indirect illocutionary acts to models of the understanding of contextual expressions. But how are indirect illocutionary acts understood? For an answer, we must consider the notion of *goal hierarchy*.

Goal hierarchies

In interpreting complete utterances, listeners ordinarily infer a hierarchy of goals they believe the speaker is trying to attain, and they interpret the speaker's current utterance as a step in the plan for attaining one or more of those goals. This is the conclusion of a number of studies of indirect illocutionary acts—studies of their formal properties (Gordon and Lakoff, 1971; Searle, 1975), studies of their understanding in natural settings (Clark, 1979; Merritt, 1976; Goffman, 1976), and studies of simulations in computer models (Cohen, 1978; Cohen and Perrault, 1979).

Consider an example from a study of my own on indirect requests for information (Clark, 1979, Experiment 5). I had an assistant call up restaur-

ants in the Palo Alto, California, area and ask whether they accepted credit cards. Two of the questions she asked were these:

Do you accept American Express cards?

Do you accept credit cards?

(I will abbreviate these as *American Express cards?* and *Credit cards?*) My assistant would call up a restaurant and ask either *American Express cards?* or *Credit cards?*, listen to the restaurateur's reply, say *thank you*, and hang up. The interest was in the replies and what they implied about the restaurateur's interpretation of what my assistant had asked.

The restaurateurs apparently imputed my assistant with a different hierarchy of goals depending on which question she asked. For *American Express cards?*, the hierarchy was something like this:

(1) She wants to decide whether or not to patronize this restaurant.
(2) She wants to know how to pay for her meal.
(3) She wants to know if she can pay with the credit cards she owns, which consists (almost certainly) of just the one card, the American Express card.
(4) She wants to know if the restaurant accepts American Express cards.

The question *Do you accept American Express cards?* directly reflects the lowest subgoal, number (4), but an answer to it would also fulfil the next higher subgoal, (3). Hence the only thing the restaurateurs needed to do, if they did accept American Express cards, was say *Yes* or *Yes, we do*. Indeed, 100 per cent of the restaurateurs who were asked this question and were able to say *yes* gave this response. They interpreted the utterance as a direct question and nothing more.

For *Credit cards?*, the restaurateurs inferred a very different hierarchy of goals. It was something like this:

(1) She wants to decide whether or not to patronize this restaurant.
(2) She wants to know how to pay for her meal.
(3) She wants to know if she can pay with one of her credit cards, which (probably) include most or all of the major credit cards.
(4) She wants to know if any of the credit cards acceptable to the restaurant are among the cards she owns.
(5) She wants to know if the restaurant accepts credit cards.

The question *Do you accept credit cards?* directly reflects the lowest subgoal, number (5), and hence the restaurateurs should ordinarily answer that question. In fact, 84 per cent of those who could have answered in the affirmative did. However, the caller's reason for asking the question couldn't have been just to attain subgoal (5), since that isn't sufficient information for subgoal (4), the next goal up in her hierarchy. She must be indirectly requesting the restaurant's list of acceptable credit cards. In fact, 46 per cent of the

restaurateurs inferred the next higher subgoal and gave the caller a list of the credit cards they accepted. They took *Credit cards?* to be both a direct question and an indirect request for the list of credit cards they accepted.

The contrast between *American Express cards?* and *Credit cards?* is striking, for the two questions are identical except for the object of the verbs. It was the content of those noun phrases that forced the restaurateurs to infer very different goals and to construe *American Express cards?* as merely a direct question while construing *Credit cards?* as both a direct question and an indirect request for a list of acceptable credit cards. Conclusion: it is the hierarchy of imputed goals that enables listeners to decide whether or not the speaker is performing an indirect speech act, and if so, what it is.

There are two main sources of evidence that listeners are intended to use in inferring the speaker's hierarchy of goals. The first is the utterance itself. It is pertinent whether or not a request is made via a conventional form like *Can you tell me the time?* or via a non-conventional form like *Do you happen to have a watch on you?*, whether or not a request is accompanied by *please*, and whether or not other 'linguistic' factors are present (Clark, 1979). The second source of information is the remainder of the knowledge, beliefs, and suppositions that the speaker and listener share—called their *common ground* (Clark and Carlson, 1981). It was pertinent in the experiment reported earlier that my assistant was telephoning the restaurateur at his restaurant and not at his home, that the restaurant's telephone number was public and intended to be used for enquiries about the restaurant's services, and that other such 'non-linguistic' factors were present (Cohen and Perrault, 1979). Listeners generally cannot, nor are they expected to, infer the speaker's hierarchy of goals accurately without consulting both the utterance and their common ground.

INTENTIONAL PARSERS

Parsing an utterance can itself be viewed as reconstructing a hierarchy of goals. When a friend tells me *Julia is a virologist*, I realize that he has specific goals. In making an assertion, he wants me to believe, and to recognize that he believes, some state of affairs. One of his subgoals is to specify that belief. However, he can't do this in one step. First, he designates the thing the belief is about, which he does via the word *Julia*. Next, he predicates what it is that he believes about that object, which he does with the words *is a virologist*. He makes this predication in two parts. He specifies that the predication is equative and that it holds at the time of utterance by using the word *is*. He specifies the predication proper with the words *a virologist*. This, too, is accomplished in two steps. He specifies the category of interest with the word *virologist*, and he indicates that he is predicting membership in that category with the word *a*.

Described this way, my friend is performing a series of acts, each of which accomplishes a subgoal along the path to getting me to believe that Julia is a

virologist. Furthermore, he performs each of these acts by means of a constituent in the utterance. With the noun phrase *Julia*, he is performing the act of referring to Julia. With the verb phrase *is a virologist*, he is performing the act of predicating something about her. With the verb *is*, he is performing the act of designating the predication as one of equation and the time it holds as the present. With the noun phrase *a virologist*, he is designating the predication as membership of the category of virologists. With the noun *virologist*, he is designating the concept of virologist as the category being predicated. And with the article *a*, he is specifying that the predication is membership in the so-designated category. All I have done here is expand on Strawson's (1959) and Searle's (1969) notions of reference and predication as speech acts.

These acts, with their goals, form a hierarchy that corresponds to the hierarchy of constituents in the sentence. In uttering *a* and in uttering *virologist*, my friend has two separate goals. But these are subgoals in his uttering the construction that contains those two constituents, the noun phrase *a virologist*. Likewise, his goal in uttering *is* and his goal in uttering *a virologist* are both subgoals in his act of predicating with the construction of *is a virologist*. And finally, his goal in referring with *Julia* and his goal in predicating with *is a virologist* are subgoals of the 'propositional act' that he performs with the whole utterance (see Searle, 1969), the act in which he specifies the proposition to be believed, that Julia is a virologist. In general, the speaker's hierarchy of goals in uttering a sentence appears to have a many-to-one mapping onto the constituents of that sentence.

Parsing, therefore, can be viewed not simply as dividing a sentence into its parts—the traditional view—but as identifying the goals and subgoals the speaker had in uttering each part of the sentence, what I will call the *intentional view of parsing*. These two views might at first appear to be simple variants of one another—'notational variants' to use the jargon of the field—but they are not. In the traditional view, the aim of the parser is to yield one of the (traditional) sentence meanings, presumably the one the speaker intended. In the intentional view, the aim is to yield the speaker's intentions in uttering what he did. And for utterances such as Bombeck's *Our electric typewriter got married* and *Stereos are a dime a dozen*, the speaker's intentions are not derivable from any of the (traditional) sentence meanings.

These two views lead to different parsing implementations. Traditional parsers have been designed to rely totally, or almost totally, on the linguistic properties of the utterance. But recall that in order to understand indirect requests, listeners use *two* main sources of information. The first is the utterance itself, as in traditional parsers. The second is the speaker's and addressee's common ground. The speaker's intentions can be inferred only through the *joint* use of these two sources. What is missing in traditional parsers is any systematic reference to the common ground.

Even though common ground has not been welcomed at the front door of

traditional parsers, it has sometimes been sneaked in through the servants' entrance. Many parsers have been designed to parse discourse and therefore to resolve anaphoric reference (see Charniak, 1972; Lockman and Klappholz, 1980). In the sequence *Ned went home for dinner; he got lost on the way*, such a parser would identify Ned as the referent of *he*, and the route Ned was taking home as the referent of *the way*. These two referents are resolved in the second utterance mostly by referring to that part of the reader's and writer's common ground that was established in the first utterance. Indeed, some utterances could not be parsed correctly without knowledge of such referents. In the sequence *Ned was introduced to a woman at the party; he whispered to the woman that he knew*, the phrase *that he knew* would be identified as the complement of *whispered*, since *the woman* presumably refers to the woman Ned just met, who couldn't possibly be 'a woman that he knew'. Here again, the first utterance establishes certain common ground that is used in parsing the second.

Yet in resolving reference, as in these two examples, traditional parsers exploit common ground only to a limited extent. A genuine intentional parser would need to consult the common ground systematically. Nowhere is this easier to demonstrate than in the parsing of contextual expressions.

Contextual expressions

With contextual expressions, reference to the speaker's and addressee's common ground is mandatory. When Bombeck wrote *Our electric typewriter got married*, she intended us readers to make use of the fact that she had just written about roommates and their possessions. She intended us to use this common ground in conjunction with the fact that she was uttering the phrase *our electric typewriter* and was predicating of its referent, that it got married. She intended us to use both sources of information in inferring her hierarchy of goals.

As an illustration of such a goal hierarchy, consider Ed's assertion to me *Max teapotted a policeman*. Ed's goal hierarchy in using *teapot* might be described as follows:

(1) Ed wants me to recognize that he is using *teapot* to denote 'rub the back of the leg with a teapot'.
(2) Ed wants me to recognize that what he is asserting Max did to a policeman is the kind of action that he has good reason to believe that on this occasion I can readily compute uniquely on the basis of our common ground in such a way that teapots play one role in the action, Max is the agent, and the policeman is the patient.
(3) Ed wants me to recognize that he is using *teapot* to denote teapots.

I am to infer the lowest subgoal, (3), from the fact that Ed is using the noun

teapot. I am to infer the next subgoal up, (2), from the fact that he is using it as a verb too. And I am to infer the highest subgoal, (1) from the computations required in (2).

The main addition to traditional parsers is subgoal (2). For contextual expressions, the speaker always intends the addressees to compute the novel meaning on the spot. As subgoal (2) makes clear, this requires the listener to consult the speaker's and addressee's common ground. But when does this addition need to be made? If *teapot* were actually in the lexicon as a verb with the sense 'rub the back of the leg of with a teapot', then I wouldn't have needed any goals but (1). I wouldn't have had to go beyond the conventional meaning listed in the lexicon. In Ed's utterance, it was partly because the verb *teapot* wasn't in my lexicon that I was forced to infer Ed's subgoals (2) and (3).

It need not work this way. Subgoals such as (2) and (3) need not be forced by a semantic anomaly. In Bombeck's *Stereos are a dime a dozen*, the noun *stereos* has a proper noun lexical entry meaning 'phonographs' that makes perfectly good sense in the sentence Bombeck uttered. Nothing in Bombeck's sentence *per se* forces us to look for a non-conventional interpretation. So subgoals such as (2) and (3) must always be present—or almost always. Virtually every word can be used with a nonce sense in at least some situations. It is just that in conventional cases, the computation required to capture these goals is trivial.

To see how this would work, imagine Arlene telling Bill *Stereos are dime a dozen*, by which she means 'Phonographs are very common'. The goal hierarchy for *stereos* would look like this:

(1) Arlene wants Bill to recognize that she is using *stereos* to denote phonographs.
(2) Arlene wants Bill to recognize that what she is asserting are a dime a dozen are the kind of thing that she has good reason to believe that on this occasion he can readily compute uniquely on the basis of their common ground such that this kind of thing has something to do with phonographs.
(3) Arlene wants Bill to recognize that she is using *stereos* to denote phonographs.

The use of *stereos* by Bombeck, in contrast, would have this goal hierarchy:

(1') Bombeck wants us to recognize that she is using *stereos* to denote people who possess phonographs.
(2') Bombeck wants us to recognize that what she is asserting are a dime a dozen are the kind of thing that she has good reason to believe that on this occasion we can readily compute uniquely on the basis of our

common ground such that this kind of thing has something to do with phonographs.

(3′) Bombeck wants us to recognize that she is using *stereos* to denote phonographs.

The difference between Arlene's and Bombeck's uses of *stereos* lies entirely in goals (1) and (1′). For Arlene, the kind of object she intended to have something to do with phonographs are phonographs themselves. The relation to be computed in subgoal (2) is the identity relation. For Bombeck, the kind of object she intended to have something to do with phonographs are people who possess phonographs, a more complicated and indirect relation.

The point is that Bill, in parsing Arlene's utterance, can't ever be content with subgoal (1) alone. He can't ever know for certain, ahead of time, which words Arlene is using in their conventional senses, and which she is using in contextually innovative senses. How does he know she isn't using *stereos* to mean what Bombeck meant, or to mean something still different, as in *Nowadays monaural recordings are rare, but stereos are a dime a dozen*? Only by consulting his and her common ground can Bill recognize when *stereo* is to be construed as the identity relation and when as something else. Subgoals such as (2) and (3) are implicitly required wherever there is the possibility of a nonce sense.

Intentional parsers create senses and don't just select them from a predetermined list of senses. Subgoal (2) is an injunction to listeners to use the common ground, plus certain guidelines about rationality, to create the sense the speaker intended. The listeners need never have thought of the intended sense before, either as a sense of the word the speaker uttered or, for that matter, as a sense of any word they have ever heard before. When we first hear *The photographer asked me to do a Napoleon for the camera*, most of us have never before thought of 'tuck one's hand into one's vest' as the sense for any word, let alone for *do a Napoleon*. We create this sense for this occasion alone. It is truly a nonce sense.

How intentional parsers can be made to work, and how they create the speaker's intended senses, are questions for future research. The argument is that parsers need to take account of the speaker's intentions in every step they take. Their goal must be to create the speaker's hierarchy of intentions in uttering the words he uttered on that occasion.

CONCLUSION

Nonce sense is a genuine puzzle for traditional parsers, for they don't even recognize its existence. It exists all right. In everyday speech, it is ubiquitous, sometimes taking shapes that are easily recognized as innovative expressions, but other times sounding no different from anything else in language. Parsers

can no longer pretend that nonce sense doesn't exist. They must make sense of nonce sense or fail.

The failure of traditional parsers to handle nonce sense, I have argued, reveals a fundamental problem in their design. Traditional parsers generally do their job without regard to who uttered the sentence or to whom. Any concern that they show for the interlocutors is indirect and limited, as when they identify referents from the surrounding discourse. Yet understanding ultimately requires listeners to decide what the speaker meant—to reconstruct the speaker's intentions, or goals, in uttering what he did. The traditional assumption is that parsers need to take account of these intentions only after they have parsed the sentence uttered. The existence of nonce sense makes this assumption untenable. Parsers must worry about the speaker's intentions at every turn.

The current conception of parsing needs revision. It ought to be thought of not as the analysis of the sentence uttered, but as the analysis of the speaker's intentions in uttering the sentence. All that counts in the end is the speaker's meaning, even if it is only for the nonce.

NOTES

1. Novel metaphors are one such type. They appear to pose the same problems for traditional parsers as do the contextual expressions I will discuss, and they appear to require the same new view of parsing that I will propose. In this paper, however, I will stick to expressions that are ordinarily considered non-metaphorical.
2. Lexical rules (a) through (c) may appear to be more general than rules (d) through (h), but this isn't really so. Rules (a) through (c) are incomplete. *To glue a stamp to an envelope* ordinarily means something more specific than rule (a)'s 'cause glue to hold a stamp to an envelope'. There are many extraordinary ways of causing glue to do this that wouldn't be called 'gluing'. Rule (a) is really a collapsing over a large set of related rules. This point is made later for the compound *apple-juice chair*. The broad types that do emerge in denominal verbs, and in other constructions, do so not because they reflect lexical rules, but because they reflect general categories of experience, of encyclopedic knowledge (see Clark and Clark, 1979, pp. 787–92).
3. Jespersen (1942, p. 137) said this about noun compounds: 'Compounds express a relation between two objects or notions, but say nothing of the way in which the relation is to be understood. That must be inferred from the context or otherwise. Theoretically, this leaves room for a large number of different interpretations of one and the same compound, but in practice ambiguity is as a rule avoided.'

ACKNOWLEDGEMENTS

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