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18 Context for Comprehension

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ABSTRACT

Although the notion of context plays a central role in most current explanations of language understanding, what can count as context is generally left undefined. If it includes any information a listener can make available to himself, then it loses much of its power to explain. After reviewing experimental attempts to elucidate context, we take up a more analytic approach. We first define the *intrinsic context* as that information available to a process that is potentially necessary for it to succeed. Our proposal is that the intrinsic context for understanding what a speaker means on some occasion is the common ground that the listener believes holds at that moment between the speaker and the listeners he or she is speaking to. By common ground, we mean the knowledge, beliefs, and suppositions that the two people share in a technical way. Finally, we review some of the evidence for this proposal.

INTRODUCTION

In the past 20 years, the word *context* has become a favorite in the vocabulary of cognitive psychologists. It has appeared in the titles of an astonishing number of articles. It has been used to describe phenomena under labels ranging from "environmental" and "pharmacological context" to "thematic" and "knowledge context." "Context effects" are everywhere. "Contextualism" has been coined as the name of a theory of memory (Jenkins, 1974).

What then *is* context? According to the dictionary, it is the "parts of a discourse that surround a word of passage and can throw light upon its meaning." We call this the *standard definition*. In psychology, its use has been extended far beyond the standard definition. And the further its uses have been extended, the murkier its denotation has become. Smith, Glenberg, and Bjork (1978) have complained that context has become "a kind of conceptual garbage can."

For most purposes in psychology, this may not matter. Context, one could argue, is a term that is useful precisely because it is vague and general and can accommodate many different ideas. In some areas, however, context has been used not merely to *describe* phenomena, where vagueness and generality could be virtues, but to *explain* them, where vagueness and generality are vices. One of these areas is language comprehension, in which the theories appeal directly to context to explain how people decide what a speaker means. Theories of how people decide between two meanings of a word like *bank*, for example, appeal to people's knowledge of the "context," which includes not only the "parts of the discourse that surround" the word but also a good deal more. In theories like these, the characterization of context must be precise before their predictions can be precise.

Our goal is to outline a theory of the context that is intrinsic to language comprehension. First, we review some of the uses of the term "context" in the experimental literature, concentrating on the literature in language comprehension, and draw out their essential features; that is, we try to summarize the *experimental approach* to the role of context in psychological processes. Second, we make our own proposal, which is based largely on an *analytic approach* to context. What we argue, briefly, is that for a listener to understand a speaker's meaning, he can confine himself to a certain limited domain of information, namely, the speaker's and his listener's common ground, that part of the speaker's and his listener's knowledge, beliefs, and assumptions that are shared. We then review some of the evidence for this proposal.

VARIETIES OF CONTEXT

Context has long been used in psychology to describe certain parts of the experimental subject's surroundings. In visual perception, it has been used for the content of the visual stimuli surrounding or preceding the object to be perceived or identified (Brigell, Uhlarik, & Goldhorn, 1977) and for the "contextual relations" among objects depicted in a scene (Biederman, 1972; Palmer, 1975). In learning and retention, it has been used in a broad sense both for "stimulation from the external environment, such as the furniture in the room, the experimenter, and the apparatus" (McGeoch, 1939, p. 347) and for the "inner states of

the experiencing person which affect the way he views or remembers the same stimulus material" (Reiff & Scheerer, 1959, p. 19). The inner states have been given such names as "pharmacological context" (Eich, 1980) and "mood contexts" (Bower, Monteiro, & Gilligan, 1978). Context has also been used in a narrower sense for the items presented along with the target item on each study trial in learning (Tulving & Thomson, 1973), as well as for larger units of organization, under such names as "list context" (Anderson & Bower, 1974).

In word perception, most uses of context have been close to the standard definition. It has appeared in such notions as "context-conditioned" acoustic cues (Liberman, Cooper, Shankweiler, & Studdert-Kennedy, 1967), "syllable contexts" (Dorman, 1974), and "acoustic contexts" (Warren & Obusek, 1971). In the identification of words in printed texts, context has also been used in a sense close to the standard definition (Tulving & Gold, 1963). In other studies, the notion has been drastically extended under such labels as "sentence context," "word association context," "category contexts" (the name of a semantic category), and "letter contexts" (the first few letters of the word being identified) (Rubenstein & Pollack, 1963), and "semantic context" (associated words or incomplete sentences) (Meyer, Schvaneveldt, & Ruddy, 1975; Schuberth & Eimas, 1977). These uses refer, as Miller, Heise, and Lichten (1951) put it, to the subject's "knowledge of the conditions of stimulation." This tradition has been continued in Morton's (1964, 1969) "logogen model," in which there are word unit detectors, or "logogens," that are sensitive to information provided by the unspecified workings of a "context system" ("cognitive system" in later formulations). In this model, all information is treated equally, with no restriction on what is to count as context (Morton, 1970).

Contexts for Language Use

In studies of language use, context could have been limited to the standard definition, but even here it has been extended from the very beginning. In 1951, in his classic text *Language and Communication*, Miller said, "The verbal context of any particular verbal unit is made up of the communicative acts that surround it." But then he added, "What a man says cannot be predicted entirely from the verbal context. . . . A discussion of the complete context of a communicative act must include the talker's needs, perceptions, audience, and cultural background (pp. 81–82)."

In studies of the ongoing processing of sentences, most uses of context refer to selective parts of the context as specified in the standard definition, as in "semantic and syntactic context" (Marslen-Wilson & Welsh, 1978) and "prior semantic context" (Foss & Jenkins, 1973; Swinney & Hakes, 1976). What "syntactic and semantic context" refer to here are the constraints placed on a

word by the syntax and meaning of the sentence up to that point. Similarly, Carroll, Tanenhaus, and Bever (1978) have spoken of the "discourse context" provided by a preceding sentence. On the other hand, what Dooling (1972) meant by "context" was not just syntactic and semantic constraints but some sort of mental representation of the *content* of the previous discourse.

Two related uses of context can be found in the study of memory for utterances. In Brewer and Harris's (1974) study, they spoke of "deictic context"— the relation of an utterance to "the particular time, place, person, or discourse context." And in a study by Keenan, MacWhinney, and Mayhew (1977), memory for utterances was examined in "the context of natural, purposeful communication" or "interactional context," which includes "degree of previous involvement with the speaker, the formal identity of speech acts represented by particular statements, the organizational structure of the interaction . . . , and the amount of active participation on the part of the listener (p. 559)." For these to be considered part of the standard definition, discourse must be taken as including a good deal more than just the linguistic expressions that have gone before.

Context has also been used to refer to things that are clearly nonlinguistic. In studies of the verification of sentences against pictures, the pictures have sometimes been called the "context" (Tanenhaus, Carroll, & Bever, 1976). And in work by Huttenlocher and Weiner (1971), the physical situation in which children were to carry out instructions was called the "extralinguistic context" of the instructions. The idea of calling these context may be traced to Wason's (1965) classic study of the "contexts of plausible denial," in which he referred to the pictures that his assertions and denials were meant to describe as the "objective context." This he contrasted with the "subjective context," the speaker's beliefs about the listener's beliefs about a situation.

It is Bransford and his colleagues (Bransford & Johnson, 1972, 1973; Bransford & McCarrell, 1974) who have been most closely associated with the study of context in comprehension; yet they have been even less clear about what they meant by it. Bransford and Johnson (1972), for example, speak of the "context picture," "appropriate semantic structures," "appropriate context" as "part of the pre-experimental knowledge," and "the context underlying a stimulus," all in relation to their general claim that "relevant contextual knowledge is a prerequisite for comprehending prose passages." Doll and Lapinski (1974) attribute to Bransford and Johnson two additional terms, "thematic context" and "referential context." Later, Bransford and Johnson (1973) speak of "activated semantic context" or "activated knowledge structures," *arguing that in general* "the ability to understand linguistic symbols is based not only on the comprehender's knowledge of his language, but also on his general knowledge of the world (p. 383)." *Still later,* Bransford (1979) equates "context" with "appropriately activated knowledge." What knowledge is "relevant" or "appropriately activated" Bransford never says.

ESSENTIALS OF CONTEXT

There are six features of context that appear to be common to most of the uses we have reviewed.

1. Information.   Context is information in the sense used in "information-processing" psychology. It is information about objects, events, states, or processes. It may be generic, characterizing what, for example, trees are like in general, or particular, characterizing what a particular tree—say, the tree after which Palo Alto was named—is like. It may come from direct experience, from being told, or from inferences based on these sources. It may include, but is not limited to, a person's knowledge, beliefs, or suppositions.

Person Relativity.   If context is information, it must be in someone's possession. In most of the uses we have reviewed, the context is usually relativized, not to people in general but to each particular person.

3. Process Relativity.   Not all information a person possesses is considered to be context. Investigators always speak of the context *of* something—of a word, of a list, or of the subject in an experiment. What they mean, we suggest, is that context is relative to a *process* a person is carrying out. In a sentence, the context of a word is really information a person has relative to his interpretation of that word.

4. Occasion Relativity.   For most investigators, context is information a person possesses in the carrying out of a particular process *on a particular occasion.* To be able to speak of the context changing from one pass through a list to the next or from one hearing of a sentence to the next, we must treat context as occasion relative.

With features 2 through 4, context can be thought of as a function with three arguments—the agent A, the process p, and the occasion or time t. Context is context(A, p, t), not just context(A, p), context(p, t), or context(A, t). This is another way of saying that when investigators talk about context, they talk about the context for a particular person doing a particular task at a particular time (see Bower, 1972).

5. Availability.   In most usages, context is only that information that is *available* to the person carrying out the particular process on that particular occasion. When Joe Bonnano was reading the word *today* in his newspaper at 9:13 A.M. on July 4, 1980, his memory was full of all sorts of information. He knew the map of Eastern Europe, knew how to change tires, knew the Catholic catechism, believed that at age 13 one day he saw a flying saucer, and so on. But only the part of this information that was *available* to Joe for the task at hand would be considered part of the context.

6. Interactibility.   For information to be called context in most usages, it must also be able to interact with the process at hand. Even if the catechism were available to Joe Bonnano as he was reading *today* in the newspaper, it wouldn't

be considered part of the context unless it could somehow interact with the reading and understanding of that word.

To sum up, context is information that is available to a particular person for interaction with a particular process on a particular occasion. From now on, we take this to be *the* definition of context.

Intrinsic and Incidental Context

Psychologists study context—in our now technical sense—because of its role in the processes they are interested in. Their accounts of those processes would not be complete without describing its role. Take the psychologists who study how people identify objects in visual scenes. The surroundings of an object in a scene are often crucial to people's identification of that object. One and the same visual configuration—say, a blacked-in circle—will be identified in one surrounding as a ball, in another as a tire, and in a third as a hole in a door. Most visual configurations are ambiguous in this way—look at Magritte. Psychologists recognize, therefore, that their theories of object identification must specify the role that the surroundings play.

Yet most psychologists try to distinguish between two parts of the context (still in our technical sense). For example, take Margaret in an experimental room viewing a slide and trying to identify an object in the middle of it. The process she goes through, and hence her identification, errors, and reaction time, can be influenced by many things. One category includes her identification of the surroundings of the object, her knowledge of the plausibility of the object in those surroundings, and her knowledge of the categories of objects the experimenter said she would be identifying. Another category includes her thoughts about the exam she has been studying for, her irritation with the experimenter, her perseveration on the mistake she made on the last slide, her awareness of her sore throat, her hunger, and her discomfort in the chair. Technically, both categories are part of Margaret's context in identifying the object. Both have been studied, and both continue to be worth studying.

These two categories, however, bear different relations to the task Margaret is carrying out. The things in the first category would generally be considered parts of the context that are *intrinsic* to the process of object identification. They belong to the process and, most psychologists would feel, need to be accounted for in any adequate theory of the process. The things in the second category would generally be considered *incidental* to the process as carried out on that occasion. They affect the process only indirectly, by limiting Margaret's attention to the task, interrupting the process, or making her less efficient. They do not belong to the process of object identification per se and do not need to be accounted for directly in a theory of that process. Let us call these two parts of the context the *intrinsic context* and the *incidental context*.

The intrinsic context, we stipulate, is that part of the context that, a priori, has the potential of being necessary on some occasion for carrying out the process in question. Although Margaret may sometimes be able to identify the typewriter in the middle of the slide without checking its visual surroundings, in general she could not. For the process of object identification to succeed *in general*, it must make use of the visual surroundings. The incidental context is what remains, the parts of the context that never need to be consulted.

An adequate theory for any psychological process must make reference to the intrinsic context, without which the process won't generally succeed. An important goal in studying such a process, then, is to distinguish the intrinsic from the incidental context. Indeed, in the study of comprehension, psychologists have tried to identify those parts of the discourse, broadly conceived, that a listener appears to have to consult in order to succeed in understanding what the speaker meant. Most of this effort has been experimental. Psychologists have tried out this and that part of the context to see which parts are potentially needed in comprehension. We now turn to a more analytic approach to intrinsic context. We argue that there are certain a priori grounds for characterizing the intrinsic context for comprehension in one particular way.

INTRINSIC CONTEXT IN COMPREHENSION

Most of the characterizations of context we have reviewed allow almost anything a person knows to belong to the context in comprehension. This is implied by such terms as "interactional context," "appropriate semantic context," "relevant contextual knowedge," "thematic context," "referential context," "activated knowledge structures," "appropriate knowledge structures," and "cognitive system." The modifiers that might limit this range—"relevant," "activated," and "appropriate"—have been left undefined. As characterizations of intrinsic and incidental context together, these descriptions may be accurate, but they aren't very helpful as characterizations of intrinsic context alone, which is what we are seeking. The problem is a practical one. When a listener tries to understand what a speaker means on some occasion, it would be advantageous if the process he uses could limit what it retrieves from memory to some portion of the total information that could be made available. In particular, it should limit itself to the intrinsic context, that portion of the information that may be needed for the process to succeed.

Our proposal is straightforward: *The intrinsic context for a listener trying to understand what a speaker means on a particular occasion is the common ground that the listener believes holds at that moment between the speaker and the listeners he or she is speaking to.* There are two technical notions here that need explaining. The first is *what the speaker meant*, or *speaker's meaning* (Grice, 1957, 1968; Schiffer, 1972). Our proposal is about how a listener tries to

determine what the speaker intended him to determine, in part by means of his recognition of the speaker's intentions. Our proposal is *not* about the further inferences that a listener carries out on the basis of what the speaker meant; that is, it is about the "authorized" and not the "unauthorized" inferences made by the listener, two sorts of inferences that listeners ordinarily keep quite distinct (Clark, 1977).[1] The second technical notion is *common ground*.

Common Ground

As a first approximation, the common ground between two people can be thought of as the information the two of them share. When Ann and Bob, for example, are standing together in a gallery looking at a Picasso painting, they share a good deal of information—about the objects depicted in the painting, about its colors, about its position on the wall, about Picasso, about modern painting, about each other, and so on. When Ann and Bob are later discussing their opinions of the painting with each other, they also share information about what each other has just said, meant, and implied. The common ground between them consists, roughly, of the knowledge, beliefs, and even suppositions shared in this way.

The obvious first problem is that what Ann takes to be the common ground between them won't exactly match what Bob takes to be the common ground between them. Discrepancies of this sort are a major source of misunderstanding between people. Furthermore, we can speak of a third party's beliefs in the common ground between Ann and Bob—say, the beliefs of Connie. In general, Connie's beliefs about Ann's and Bob's common ground will be less veridical and less complete—often very much so—than will either Ann's or Bob's. Non-veridicality and incompleteness are two major sources of misunderstandings by third persons.

As we will see, however, this first approximation to common ground will not do. It isn't enough for both Ann and Bob to know or believe certain things. They must each know or believe that they both know or believe these things—and they must know or believe that the other knows or believes that they both know or believe these things, and so on. What is required is the technical notion of "common" or "mutual" knowledge, beliefs, and suppositions (Lewis, 1969; Schiffer, 1972). Mutual knowledge of a proposition *p* is defined by Schiffer as follows:

A and *B* mutually know that $p =$ def.

1. *A* knows that *p*.
1'. *B* knows that *p*.
2. *A* knows that *B* knows that *p*.
2'. *B* knows that *A* knows that *p*.
3. *A* knows that *B* knows that *A* knows that *p*.
3'. *B* knows that *A* knows that *B* knows that *p*.
etc., ad infinitum

Mutual beliefs and mutual suppositions are like mutual knowledge but with the verb *know* replaced everywhere by the verb *believe* or the verb *suppose*. In short, the common ground between two people consists of their mutual knowledge, mutual beliefs, and mutual suppositions.[2]

Sources of Common Ground.   An immediate problem with the definition of common ground is that it is infinite in length. For *A* and *B* to mutually know something, it appears that they must represent in memory an infinite number of knowledge statements—namely, 1, 1', 2, 2', etc., ad infinitum. This is clearly impossible. Clark and Marshall (1981), however, have argued that the problem is only apparent.

The central idea is that mutual knowledge is an elementary mental representation that is inductively inferred from certain special kinds of evidence. Imagine that Ann and Bob are standing together looking at the Picasso painting and that each is aware of the other doing this; that is, Ann sees Bob looking at the painting, and she sees him noticing her doing this at roughly the same time. If she assumes that Bob is rational and that he is attending to both her and the painting, it is easy to show that she can immediately jump to the conclusion that they mutually know about the painting. The evidence Ann requires is an event in which she, Bob, and the painting are "co-present," that is, openly present together in a certain way. She can jump to this conclusion by using this evidence along with certain auxiliary assumptions in a "mutual knowledge induction schema." She can then add to her beliefs about the common ground between her and Bob certain beliefs about the Picasso painting. For the induction schema to apply, the evidence has to be of just the right kind. Clark and Marshall identified three major types of evidence: physical co-presence, linguistic co-presence, and community membership.

Among the strongest evidence that something is common ground is *physical co-presence*. An example of this is Ann and Bob viewing the Picasso painting at the art gallery. The two of them are experiencing it together, simultaneously, in the near-certain awareness that the other is experiencing it too. What better

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[1]So in the understanding of what the speaker meant, one could also define two further notions of context. One is the *intended context*, the information that the speaker intended the listener to consult in understanding his utterance on a particular occasion. The second is the *actual context*, the information that the listener actually did consult. Ideally, the actual context should be identical to the intended context, and both should be part of the intrinsic context. In everyday performance, these relations doubtless fall short of the ideal.

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[2]As Gerald Gazdar has pointed out to us, this definition is probably insufficient, because there are almost certainly mixtures of knowledge, belief, and suppositions in which 3, for example, might read *A supposes that B believes that A supposes that p*, or *A knows that B knows that A believes that p*, etc. This is not the place to take up these complications.

evidence could Ann want that she knew about the painting, knew that he knew about the painting, knew that he knew that she knew about the painting, and so on? The auxiliary assumptions she needs are minimal—mainly that Bob is rational and is paying attention, just as she is. This experience constitutes an *event of physical co-presence*, and it is that event, along with the assumptions, that allows her to infer mutual knowledge of the picture. The experience, of course, can be visual, auditory, tactile, and so on, or any combination of the senses.

In contrast with physical co-presence is *linguistic co-presence*. Imagine that Ann had seen the painting and Bob hadn't, and Ann says to Bob *I saw an extraordinary painting by Picasso today*. In mentioning the painting in this way, she is bringing it into linguistic co-presence with Bob; that is, whereas in physical co-presence Ann, Bob, and the picture are openly present together in a single event, in linguistic co-presence Ann, Bob, and Ann's *mention* of the picture are what are openly present together. If Ann assumes that Bob understands her correctly and is otherwise rational and paying attention, she can infer that they now mutually suppose the existence of the Picasso painting. Whereas physical co-presence relies on "natural" evidence of the joint presence of Ann, Bob, and the painting, linguistic co-presence relies on "symbolic" evidence of their joint presence. In this way, the two types of evidence are distinct.

The last major type of evidence for common ground is *community membership*. Once Ann and Bob mutually establish that they both belong to a particular community, they can infer that what is universally known within that community is mutually known to the two of them. Imagine, for example, that Ann and Bob mutually discover that they are both on the Stanford University faculty. Ann can then infer that they mutually know where the Stanford Post Office is, who the president of the university is, and so on. Ann and Bob, of course, each belong to many communities and subcommunities, some in common and others distinct. To assume mutual knowledge for anything known by some community, they must first establish that they mutually know that they are both members of that community. If Ann knew that Bob was on the Stanford University faculty but knew that he didn't know that she was, she couldn't assume mutual knowledge of the post office, the president, and so on.

As evidence for common ground, physical and linguistic co-presence constitute single time-bounded events, whereas community membership constitutes an enduring state of affairs. Once Ann and Bob have mutually established that they are both members of some community, they can return again and again to that membership as a basis for inferring what is in their common ground. With physical and linguistic co-presence, in contrast, the single events are generally of limited use. Ann can later refer to the painting she and Bob had just seen or talked about, but only so long as the events are still fresh in memory. Evidence of physical and linguistic co-presence is generally pretty transitory.

Most inferences of common ground are based on a combination of these three types of evidence. After Ann tells Bob *I saw an extraordinary painting by*

Picasso today, she can infer that they mutually believe not only that she saw the painting but also that it was modern. She can draw the second inference because they both belong to the community of educated people who almost universally know that Picasso was a modern painter. Similarly, after Ann and Bob view the painting together, she can infer mutual knowledge not only of its existence but also of the manner in which it was probably created—from oils applied to canvas with a brush. This inference is also justified and drawn quite naturally on the basis of their joint membership in the community of educated people. If Bob had been a child or a stone-age food gatherer, Ann would not have been willing to draw this inference.

A Classification of Contexts

If the intrinsic context for comprehension is the speaker's and addressee's common ground, then the contexts mentioned in the literature as relevant to comprehension should be classifiable into one or more of the three main sources of common ground. And they are.

A major source for common ground in comprehension is, naturally enough, linguistic co-presence. The listener takes as common ground between him and the speaker all of their conversation up to and including the utterance currently being interpreted. Likewise, the reader takes as common ground between him and the narrator of the written discourse all the text up to and including the utterance he is currently considering. So linguistic co-presence quite naturally subsumes such types of context as "prior linguistic context," "semantic context," "discourse context," "syntactic context," and even "interactional context."

A second source for common ground is physical co-presence. The listener takes as common ground what he and the speaker are currently experiencing and have already experienced. This subsumes such notions as "extralinguistic context," "perceptual context," and Wason's "objective context." As they stand, these earlier notions are untenably broad, because they include perceptual information that is available to the listener but is known, believed, or supposed by the listener *not* to be part of his and the speaker's common ground. By reference to common ground, we can cut these gargantuan contexts down to size.

The least understood source of evidence is community membership. If something is universally known in a community, then two people in that community can assume that they mutually know it. This will cover, while narrowing down, a good deal of Bransford's allusions to "preexperimental knowledge," "appropriate knowledge framework," and "relevant contextual knowledge." It will also subsume other notions often included under the rubric of context, such as frames (Minsky, 1975), scripts (Schank & Abelson, 1977), schemata (Rumelhart & Ortony, 1977), and story grammars (Mandler & Johnson, 1977). These notions are each too inclusive as they now stand. An American wouldn't assume

that an Egyptian has the script for what happens in American fast-food restaurants. The mutuality of such knowledge is essential for understanding the speaker's intent.

WHY COMMON GROUND?

What evidence is there that common ground is the right notion of intrinsic context? Most of it is formal. There are, for example, formal demonstrations that common ground is the necessary ingredient in conventions (Lewis, 1969), in speech acts (Schiffer, 1972), and in definite reference (Clark & Marshall, 1981). Other investigators have appealed to these demonstrations in their own arguments in favor of common ground. Yet most of the argument depends on a common sense analysis of language use. In our review, we try to convey as much of this common sense analysis as we can.

Conventions

The first formulation of mutual knowledge was proposed by Lewis (1969) to account for conventions. Consider the convention of using *chien* to denote dogs. For Ann to use *chien* with Bob to denote dogs, she must know that he knows it means "dog." But what if he knows it means "dog," but believes *she* thinks it means "cat"? Then Ann must suppose that he knows that *she* knows it means "dog." But what if he knows that she knows that it means "dog" but believes that *he* thinks it means "cat"? Ann must therefore suppose that he knows that she knows that *he* knows it means "dog." And so on, as Lewis demonstrated, ad infinitum. More generally, Lewis showed that for any convention to be usable by two people, it has to be mutually known (in the technical sense) by those two people.

If mutual knowledge—one aspect of common ground—is an essential part of conventions, then it must also be an essential part of language use because so much of language is conventional. The relations between most words and their meanings are conventional and so are phonological, morphological, and syntactic rules, the rules of semantic composition, and even, some would argue, much of pragmatics. What is represented in a person's mental lexicon and mental grammar are conventions that are common ground for that person and any other person who speaks the same language or dialect.

The source of common ground for conventions, then, is community membership. Trivially, to use English phonology, syntax, and semantics, the speaker must establish that he and his listener mutually know that they are both members of the community of English speakers. For many aspects of language, even the subcommunities to which the speaker and listener belong are critical. Words like *Jacobian, Bessel function,* and *quark,* for example, have conventional meanings

only for the subcommunity of physicists, and ordinary words like *bug, tea,* and *attention* have additional conventional meanings in the subcommunities of computer workers, drug users, and psychologists. Whenever a speaker from one of these subcommunities talks to someone outside it, he can take as common ground only the vocabulary of the larger communities to which they both belong (Nunberg, 1978).

Speech Acts

In uttering sentences like *It's raining out* and *Who is coming tonight?,* a speaker is performing certain speech acts. He has certain attitudes he wants to express for certain listeners—for example, his belief that it is raining out or his desire to know from his addressees who is coming that night—and in uttering these sentences, he intends those listeners to recognize these attitudes by means of their recognition of his intentions (Grice, 1957; 1968; Searle, 1969; Bach & Harnish, 1979). Our working assumption is that understanding what the speaker meant consists largely in trying to recognize the attitudes the speaker intended his listeners to recognize—the speech acts he performed.

How do listeners recognize the attitudes the speaker is expressing? According to a formal demonstration by Schiffer (1972), they do so by means of certain evidence—the words the speaker used and certain other "contextual" information. The critical point in Schiffer's demonstration is that this evidence has to be mutually known or believed by the speaker and his addressees. If it isn't, the speech act can fail, and it will be only accidental if the listeners manage to recognize the speaker's attitudes. What Schiffer's demonstration shows, then, is that the intrinsic context for understanding speech acts is mutual knowledge or beliefs—that is, common ground.

One source of evidence listeners use here is community membership, which leads them to the conventions governing the phonology, syntax, and semantics of the sentence uttered. The interrogative mood of *Who is coming tonight?,* for instance, can conventionally be used for asking questions (although it can also be used for other speech acts). The two other main sources of evidence for common ground—physical and linguistic co-presence—are also important. With *Who is coming tonight?,* they are needed for identifying when "tonight" is and where the people are "coming" to. Identifying the speech act being performed generally requires some combination of the three main sources of evidence for common ground.

Every conversation can be viewed as a series of speech acts that each increment the common ground of the parties in the conversation (Gazdar, 1979; Stalnaker, 1978). The idea, roughly, is this: Before Joe says in the middle of a conversation *Bill left for New York yesterday,* he will have assessed the common ground of his conversational partners and found it to be common ground who Bill is but not that he left for New York yesterday. Joe, of course, believes

that Bill left for New York the day before (if he is being sincere) and perhaps that a few others might believe it but that not all the parties believe that all the parties believe it. Joe makes his assertion, therefore, in an attempt to increment the common ground among the parties—otherwise, there would be no point to it. They now *all* believe—indeed, mutually believe—that he believes that Bill left for New York yesterday. Once this is common ground, the next speaker, Sally, can say, for example, *Did he go by plane?*, in which she presupposes that it is common ground that Bill left for New York the day before.

Common ground is essential to speech acts that are indirect too. Imagine that Joe says to Sally *Do you know what time it is?* In the right situation, he could mean, literally, that she is to say whether or not she knows what time it is. He could also mean, indirectly, that she is to go to an appointment she has forgotten. What is the intrinsic context for Sally's recognition of this reminder? All the evidence suggests (Clark, 1979; Cohen & Perrault, 1979) that it is once again common ground. To be able to make this reminder, Joe must know about the appointment, know that she knows about it, know that she knows that he knows about it, and so on. Joe cannot expect her to refer to information that is not part of their common ground.

Definite Reference

Imagine Judy saying to David at a party *The woman in the blue dress is the mayor of San Francisco*. In uttering *the woman in the blue dress*, Judy is making a definite reference. She is trying to enable David to identify the person to whom she is referring—a particular woman—and with the rest of her utterance she is asserting something about that woman.

What information is necessary for David's identification of that woman? According to a formal demonstration by Clark and Marshall (1981), it is once again mutual knowledge or beliefs. If Judy's definite reference is sincere, she has good reason to believe that on this occasion David can readily and uniquely infer mutual knowledge of the identity of her referent. Most often, that means that the referent itself is *already* mutually known, and it is a matter of picking out the right referent from a mutually known array of possible referents. Describing the referent as the woman in a blue suit will do the trick. On other occasions, the referent *isn't* yet mutually known, but its identity can be inferred on the basis of mutual knowledge, beliefs, or suppositions. In short, the part of the context that David is intended to use as intrinsic to understanding Judy's reference is his and her common ground.

The three traditional types of definite reference—deixis, anaphora, and proper names—generally reflect the three main sources of mutual knowledge by which they are interpreted (Clark & Marshall, 1981). With deixis, as in *this woman, that box over there*, or *you*, the speaker prototypically depends in part on the physical co-presence of the speaker, addressee, and referent, which he often

secures by gestures and eye contact. With anaphora, as in *the woman, the box I just mentioned*, and *itself*, the speaker depends primarily on the *linguistic* co-presence of the speaker, addressee, and referent. And for proper names, as with *George Washington, Napoleon*, and *World War II*, the speaker relies mainly on community membership—that he and his addressee belong to a community in which it is universally known who George Washington and Napolean were, and what World War II was. What listeners take as intrinsic context for interpreting definite reference is just the evidence that allows them to infer common ground.

Contextual Expressions

Contextual expressions are constructions whose senses vary indefinitely depending on the occasion on which they are used (Clark & Clark, 1979). Imagine that Ed and Joe have a mutual friend named Max, who has the odd habit of carrying a teapot and occasionally sneaking up and rubbing the back of people's legs with it. One day Ed says to Joe, "Well, Max did it this time. He tried to teapot a policeman." On this occasion, the verb *teapot*, based on the noun *teapot*, has the meaning "rub the back of the leg of with a teapot." However, with a change in the story about Max, it could have meant something else entirely. Because there are indefinitely many distinct stories one could tell about Max and teapots, there are indefinitely many distinct senses one could ascribe to the constructed verb *teapot*.

The main defining feature of contextual expressions is that, like the verb *teapot*, they have indefinitely many potential senses. They are different from ordinary ambiguous constructions like *virtualness*, which have a small finite number of distinct senses that either are conventional and are listed separately in the mental lexicon or are identifiable from conventional rules of composition applied to the conventional meanings of their parts (here, *virtual* and *-ness*). It is only in context that listeners can create the intended senses of expressions like *teapot*, hence the name *contextual expression*. Contextual expressions are not on the periphery of language, linguistic oddities to account for in a special way. They are ubiquitous and are thought to be a natural part of language (Clark, 1981).

The point is that for contextual expressions the intrinsic context is the speaker's and the target audience's common ground. Ed could not have said *Max tried to teapot a policeman* to just anyone and expected him to recognize the meaning "rub the back of the leg of with a teapot." Ed had to be sure that his addressee knew about Max's odd habits, knew that Ed knew about them, knew that Ed knew that he knew about them, and so on. It is easy to demonstrate that, like definite reference, contextual expressions have interpretations that require, in general, reference to the speaker's and audience's mutual knowledge, beliefs, and suppositions. The intrinsic context is their common ground.

CONCLUSIONS

What we have proposed is that when a listener tries to understand what a speaker means, the process he goes through can limit memory access to information that is common ground between the speaker and his addressees. At the very least, it must distinguish between information that is and is not part of the common ground, because otherwise in certain situations it will systematically misinterpret conventions, direct and indirect speech acts, definite reference, and contextual expressions. So the comprehension process must keep track of common ground, and its performance will be optimal if it limits its access to that common ground. Whether its design is actually optimal in this respect is a question that can only be answered empirically.

The intrinsic context for comprehension is different in one fundamental way from most other notions of intrinsic context. In areas like visual perception, the notion of common ground isn't even definable, because there are generally no agents involved other than the perceiver himself. Defining the intrinsic context in terms of common ground appears to be limited to certain processes of communication. Context, therefore, cannot be given a uniform treatment across all psychological domains. In language comprehension, indeed, the intrinsic context is something very special.

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