Perspective-Taking in Communication: Representations of Others' Knowledge in Reference*

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Much social behavior is predicated upon assumptions an actor makes about the knowledge, beliefs and motives of others. To note just a few examples, coordinated behavior of the kind found in bargaining and similar structured interactions (Dawes, McTavish, & Shaklee, 1977; Schelling, 1960) requires that participants plan their own moves in anticipation of what their partners' moves are likely to be; predicting another's moves requires extensive assumptions about what the other knows, wants, and believes. Similarly, social comparison theory (Festinger, 1950; Festinger, 1954; Woods, 1988) postulates that people evaluate their own abilities and beliefs by comparing them with the abilities and beliefs of others -- typically with abilities and beliefs that are normative for relevant categories of others. In order to make such comparisons, the individual must know (or think he or she knows) how these abilities and beliefs are distributed in those populations. Reference group theory (Merton & Kitt, 1950) incorporates a similar set of assumptions.

In communication, the fundamental role of knowing what others know[1] is axiomatic (Bakhtin, 1981; Clark, 1985; Clark & Marshall, 1981; Graumann, 1989; Graumann & Herrmann, 1989; Krauss, 1987; Krauss & Fussell, in press-a; Krauss & Fussell, in press–b; Mead., 1934; Rommetveit, 1974). Messages are formulated

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[1]We will use "knowledge" as a shorthand that includes beliefs, suppositions, inferences, and the like.

to be understood by a specific audience, and in order to be comprehensible they must take into account what that audience does and does not know. As Brown observed, effective communication "… requires that the point of view of the auditor be realistically imagined" (Brown, 1965, p. 342).

The general idea that communicators must take each others' points of view into account is an old one--Mead referred to it as "taking the role of the other"--but modern theories of language use have detailed in a more explicit way the role such knowledge plays in message formulation and comprehension. For example, the assumption that speakers and listeners[2] are capable of assessing their conversational partners' knowledge with some precision is implicit in many pragmatic models of utterance or conversational understanding. In the Gricean model (Grice, 1975; Grice, 1957; Grice, 1969), the maxim of Quantity directs participants to make their contributions as informative as is required, but to avoid making them more informative than is required. Since addressees' informational requirements will vary as a function of the knowledge they bring to the situation, a message that contained more information than required by an expert might be insufficiently informative for a novice.

It should be stressed that the conversational maxims are not stylistic rules or guides to "good conversational usage;" rather they are assumed to play a fundamental role in the process by which meaning is attributed to an utterance. According to Grice, violation of a maxim may impel the addressee to draw an "implicature" (i.e., to conclude that the statement was intended to be understood nonliterally). The same statement that a novice would regard as helpfully detailed might be understood as ironically or sarcastically intended when

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[2]To facilitate exposition, "speaker" will be used to refer to the initiator of a message, and "listener" or "addressee" the intended recipient, regardless of the modality of communication (e.g., oral, written, electronic, etc.).

addressed to an expert.[3] thus, in order for utterances to conform to the maxim of quantity, speakers must be able to assess what their addressees do and do not know. A similar argument can be made with respect to complying with the other maxims.

We will argue that assumptions about what others know (and, hence, what is mutually known) are necessarily tentative and probabilistic. Because they are based on a variety of sources of information which will vary in credibility and relevance, they might best be thought of as hypotheses that participants continuously modify and reformulate on the basis of additional evidence (Krauss & Fussell, in press-a). And since there are no simple mechanisms for identifying common ground with certainty, speakers and listeners may come to different conclusions about what is "mutually" known.

As an illustration of how such processes operate in everyday interaction, consider a field experiment by Douglas Kingsbury (1968), who asked randomly-selected pedestrians on a Boston street for directions to a department store several blocks away. To one third of his subjects, he asked "Can you tell me how to get to Jordan-Marsh?" in a vaguely local dialect. To another third, he asked the same question in the same dialect, but prefaced it with the statement "I'm from out of town." To the remaining third, he asked the unprefaced question, but did so employing an dialect spoken in his native rural Missouri -- one seldom heard in downtown Boston. Kingsbury covertly recorded his subjects' responses and later transcribed them. Not surprisingly, when the request for directions was prefaced by the statement "I'm from out of town," the directions were longer and more detailed. From a Gricean point of view this should be expected: In order for the

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[3]Consider, for example, a surgeon who, in the midst of an operation, said to a surgical nurse "Hand me a hemostat--that's the pointy thing that looks like a barber's scissors except that the blades are flat and clamp together." Under normal circumstances, the utterance would be understood as more than a simple request for an instrument

statement to obey the maxim of relevance, it would have to be understood as bearing on the nature of the information that was requested. Announcing that he was out of town was pragmatically equivalent to the requester's stating that his level of local expertise was low.[4]

More interesting, however, is the fact that responses to the unprefaced request made in the exotic dialect were much like those to the requester who explicitly indicated that he was from out of town. Apparently, on the basis of his regional dialect, respondents assumed that the requester's level of local expertise was low and, without being asked, provided additional information. Although the behavior of Kingsbury's subjects seems unexceptional, it reflects a process of real complexity and sensitivity. Among other things, it required that subjects assign another person to a social category on the basis of his accent, infer what a typical member of the category was likely to know, and formulate a message that would be interpretable in light of such knowledge.

While it seems reasonable to assume that Kingsbury's subjects formulated their directions with what they understood to be their addressee's perspectives in mind, his data do not permit us to assess how successful they were. Respondents gave longer and more detailed directions to self-identified or apparent out-of-towners, but it is not certain that the average out-of-towner would have found such directions more informative than the briefer, less detailed directions given requesters with greater presumed local expertise. By using a task that permits an assessment of communicative effectiveness, it is possible to determine not only whether communicators formulate different messages for different addressees,

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[4]For example, it would be anomalous to say: "I'm from out of town. Can you tell me what time it is?" since understanding the time ordinarily does not require specifically local knowledge. Similarly, it would seem anomalous for someone born elsewhere, but who had lived in Boston for a long time and was quite familiar with the city, to identify himself as being from out of town when asking for directions.

but to assess how well the differences in such messages serve those addressees' informational needs. In the next section we will review some studies that examine this question.

Message Formulation in Referential Communication

Self v s. Others To begin with, we can ask how the kinds of distinctions communicators make between what they know and what others know are reflected in the structure of the messages they formulate. (Fussell & Krauss, 1989a) first had subjects name or describe innominate "nonsense figures" like those shown in Figure 1 in one of two ways: (1) so that another person could select it on the basis of the description *(Social naming condition);* or (2) so that the subject him or herself could select it *(Nonsocial naming condition).* Later, subjects attempted to match the stimulus figures to a set of descriptions. A third of the descriptions were ones that the subject him- or herself had formulated, a third had been formulated by another subject in the social naming condition, and the remainder had been formulated by another subject in the nonsocial naming condition. The three kinds of descriptions were differentially useful in identifying the figures. Subjects did best with names or descriptions that they themselves had produced (86 percent); but when using names or descriptions that were not their own, they were more accurate with descriptions that had been intended for the use of another person (60 percent) than those intended for the describer's personal use (49 percent). Danks (1970) and Krauss, Vivehananthan and Weinheimer (1968) report similar findings.

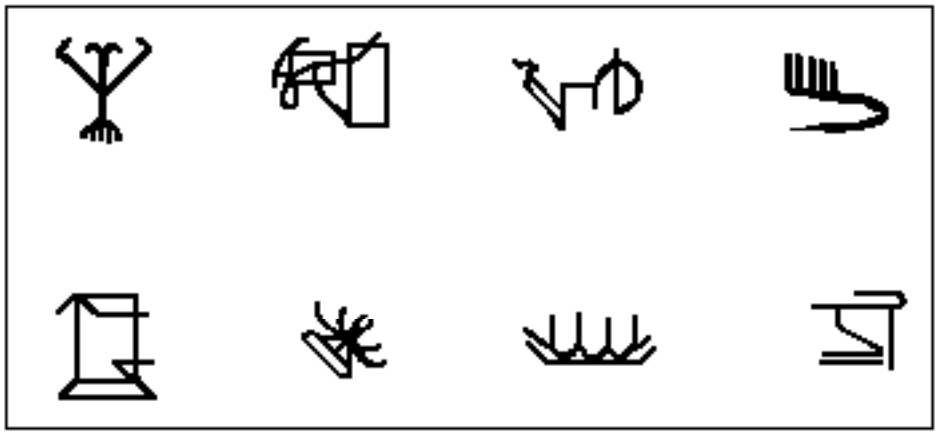

Figure 1. Some of the "nonsense figures" used as stimuli.

An examination of the lexical and semantic properties of Social and Nonsocial messages suggests that subjects in the two encoding conditions adopted different referring strategies. Social messages were more than twice as long, on average, as Nonsocial messages (12.7 vs 5.0 words), and they were considerably less diverse lexically. In addition, the two groups differed in the extent to which they described the figures "literally," that is, analytically, in terms of their geometric elements (lines, angles, etc.), as opposed to "figuratively" or in terms of the objects or images they suggest (e.g., a "Picasso nude" or a "spider on a dime"). The geometric elements that make up a literal description are familiar to virtually all college students, and hence part of their shared communicative environment. Figurative descriptions, however, can present a problem. Such descriptions are efficient when common ground exists, but communication will fail if the addressee is unfamiliar with the object to which the stimulus is being likened, or cannot see how the figure resembles it. Hence, we would expect social describers to rely more heavily on literal descriptions and less heavily on figurative descriptions in comparison to nonsocial describers, and this is precisely what we found. While the preponderance of messages in both conditions were figurative, social describers produced more literal descriptions (29 percent) and fewer figurative descriptions (62 percent) than nonsocial describers (8 and 84

percent, respectively).[5] Overall, the communication effectiveness of the different types of messages differed substantially. Subjects were most accurate using literal descriptions, next most accurate with figurative descriptions, and least accurate with symbol descriptions.

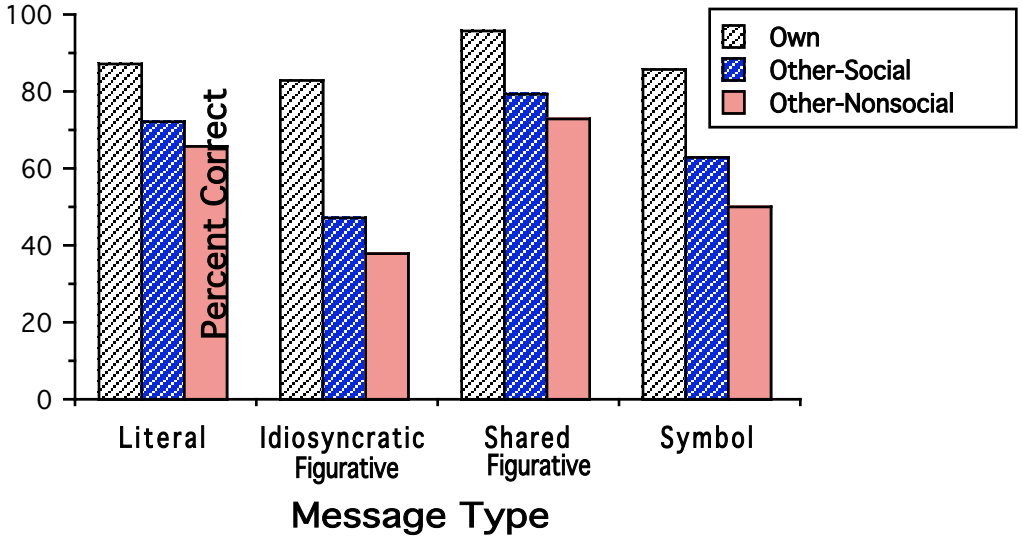

Figure 2. Identification accuracy for Literal, Idiosyncratic-Figurative, Shared-Figurative, and Symbol descriptions in the three identification conditions.

Some figurative descriptions reflect perspectives that are idiosyncratic to the describer, while others draw on widely shared images. To examine the descriptive strategies used by subjects in the two conditions, we categorized the primary concept or image each figurative description employed (typically reflected in its head noun), and then divided our messages into those in which the primary concept was *shared* (i.e., occurred in seven or more descriptions of a given stimulus) and those in which it was *idiosyncratic* (i. e., occurred in fewer than seven descriptions). Accuracy scores for the four types of messages are shown in Figure 2. Figurative messages reflecting shared perspectives communicated

[5]About eight percent of the messages in both conditions utilized a third strategy, which was neither literal nor figurative: characterizing a figure in terms of familiar symbols, specifically numbers or letters of the alphabet. The communicativeness of symbol-based descriptions should depend upon the degree to which the selected symbols are socially-shared. See Fussell and Krauss (1989) for details.

more effectively than those reflecting idiosyncratic perspectives; indeed, shared-figurative descriptions were as effective as literal descriptions. As Figure 2 illustrates, shared-figurative descriptions generated in the nonsocial naming conditions elicit about the same percentage of correct identifications as those generated in the social naming condition; however, idiosyncratic-figurative descriptions resulted in quite low accuracy rates for everyone except the person who had generated it.

Friends vs. Strangers Our results indicate that speakers formulate different kinds of messages for themselves and others. Moreover, the ways in which the two kinds of messages differ seem to reflect speakers' assumptions about knowledge that others are more or less likely to share. Still, the distinction between self and other is rather a primitive one, and the competent communicator is required to make more subtle distinctions. As Rommetveit (1980, p.126) points out, "An essential component of communicative competence in a pluralistic social world … is our capacity to adopt the perspectives of *different* 'others'." Messages typically are addressed to particular individuals or categories of individuals, and in formulating them communicators are forced to differentiate among addresses in terms of the knowledge they are likely to possess.

In a second study (Fussell & Krauss, 1989b) we recruited pairs of subjects who described themselves as friends, and had them formulate descriptions of our nonsense figures intended specifically for their friend. Several weeks later, all subjects returned and attempted to identify the nonsense figures on the basis of three types of descriptions: those that the subject him- or herself had generated; those that the subject's friend had generated; and those that a randomly selected other subject had generated for his or her friend. Subjects were more accurate selecting the correct figures from their friends' descriptions, which had been formulated specifically for them (61 percent), than from descriptions that had

been formulated for another person (57 percent). Although this difference is relatively small, it is reliable statistically, and given the homogeneity of the subject population--university students of approximately the same age, taking the same introductory psychology course--and the fact that most of the friendships were of recent vintage and relatively superficial, the results provide good evidence that our subjects formulated messages compatible with the interpretive framework their "friend" would employ in understanding them. We would expect an experiment in which subjects knew each others really well (for example, married couples) or in which there was substantial diversity in background knowledge in the population (for example, subjects from different cultural backgrounds) to produce larger differences.

These two studies demonstrate that speakers attempt to adapt their messages to the background knowledge and perspectives of their addressees, and that these efforts have consequences for the messages' comprehensibility. At the same time, the results suggest that our subjects are only moderately successful at taking one another's perspective. In the first of the two studies we reported, for instance, recipients correctly identified the intended referents of messages for "another student" only 60 percent of the time, but correctly identified the referents of their own messages 86 percent of the time. A considerable number of the messages intended to communicate to others employed idiosyncratic perspectives that were poorly understood by the recipients. Some of these probably resulted from speakers' miscalculation of the common ground that existed between themselves and their addressees--from a belief that others would view the figure from the same perspective as they did.

The Perspective-Taking Process

Recently we have begun to look more closely at some of the elements that enter into communicators' prior hypotheses about their addressee's background

knowledge. While many conceptualizations of the communication process assume that speakers and listeners can and do take each others' background knowledge and perspective into account (e.g., (Clark & Marshall, 1981; Krauss, 1987; Rommetveit, 1974; Volosinov, 1986), there has been remarkably little discussion of the process by which this might be accomplished. We will describe briefly some of the issues involved, and then discuss some research which addresses these issues. Our focus will be on the coordination of *knowledge*, but similar problems arise when one considers attitudes, beliefs, points of view, and other sorts of perspectival coordination on which communication rests.

One approach to the "perspective taking" question is provided by (Clark and Marshall (1981), who describe several heuristics speakers and listeners might use to establish their "mutual knowledge" or "common ground"—the knowledge that they share, and know that they share, and know that they know that they share, etc. *ad infinitum*.[6] For example, communicators can invoke the "physical copresence heuristic," assuming the physical environment they share to be mutually known. They may also use the "linguistic copresence heuristic": during the course of a conversation, anything said at time T can be assumed mutually known at time T + 1.[7] Finally, they may identify their shared group or social category memberships, from which they can infer that the body of knowledge common to this group or social category is mutually known.

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[6]There has been considerable discussion of the theoretical problems of the mutual knowledge hypothesis, especially the need for infinite regress in the definition (e.g., Johnson-Laird, 1981; Sperber & Wilson, 1986), but we will not pursue these questions here. Rather we will use the terms "common ground" and "mutual knowledge" in a less restricted sense, to refer to a basis for communication that is shared and (at least partially) known-to-be-shared.

[7]As with the other heuristics Clark describes, some measure of qualification is in order. Surely it is not the case that one expects his conversational partner to remember *everything* that was said in the course of a long conversation, but just how to characterize in a formal way what it is and is not reasonable to expect another to remember is not a simple job.

As we have argued elsewhere (Krauss & Fussell, in press-a), the reasoning communicators employ in their attempts to assess what they and their coparticipants mutually know must be much more complex than these simple heuristics suggest. Consider, for example, the use of an addressee's social category memberships to infer what he or she is likely to know. While it makes sense in principle to take category information into account, applying the heuristic in practice may be difficult. Identifying another's group or category memberships in the absence of explicit statements of them can be problematic. In some cases such cues as dress, accent, and the setting of the interaction may be informative, but even the most patent social cues do not map perfectly onto social categories, and the path from cue to categorization is hardly straightforward..

Even less straightforward is the process by which a speaker who has identified an addressee's social category membership establishes the boundaries of that person's category-related knowledge? Intuitively. it seems reasonable to suppose that a typical member of the category "New Yorker" will have some information about such landmarks as the Empire State Building or St. Patrick's Cathedral (e.g., their approximate location, their appearance and function), and will be less familiar with such arcanae as the Soldier's and Sailor's Monument or the Museum of Colored Glass and Light, but it is less clear how one reaches this conclusion. Some boundaries may be rooted in experience, but in most cases the relationship between knowledge and category membership is indirect—inferred from suppositions about the typical behaviors and interests of category members. Although social psychologists have devoted considerable energy to studying how people infer personality trait and emotional state from behavioral or categorical information (Cantor, Mischel, & Schwartz, 1982; Fiske & Taylor, 1984; Markus & Zajonc, 1985), rarely they have addressed the mechanisms that allow shared knowledge, beliefs, or perspectives to be inferred.

Reasoning About the Social Distribution of Knowledge

The task of assessing knowledge from community co-memberships is a complex one, involving a variety of inferential and judgmental processes. Nevertheless, despite the difficulty of the process, communicators do appear to tailor their speech to what their addressee can be expected to know, employing, we believe, implicit theories or intuitions about the social distribution of knowledge.

As with other forms of social reasoning, people may utilize a variety of knowledge structures (e.g., schemata, stereotypes, inference heuristics) to estimate what others know. Such structures facilitate the task of drawing inferences, but they also can induce systematic errors or biases (Kahneman, Slovic, & Tversky, 1982; Nisbett & Ross, 1980), resulting in errors in the calculation of what is mutually known. For example, one reason subjects use idiosyncratic, communicatively ineffectual figurative expressions to describe nonsense figures may be that they employ the availability heuristic (Tversky & Kahneman, 1973) to assess what others know. The ready availability of their own perspective on a nonsense figure (and the unavailability of alternative perspectives) may lead them to overestimate the likelihood that the perspective will be shared by others. In a similar way, people's insensitivity to inter-subjective differences in the way such things as computer files and recipes are labelled (Furnas, Landauer, Gomez, & Dumais, 1987) may result from the ease with which they can think of their own labels for such items.

The "false consensus" effect, in which subjects assume that others are more similar to themselves than is actually the case (Ross, Greene, & House, 1977), is a form of bias particularly relevant to the perspective-taking process. Steedman and Johnson-Laird have proposed that "The speaker assumes that the hearer knows everything that the speaker knows about the world and about the

conversation, unless there is some evidence to the contrary" (Steedman & Johnson-Laird, 1980). If speakers do, indeed, make this assumptions, we should expect them to commit systematic errors in calculating the extent to which their knowledge is shared by others.

Studies of knowledge judgments.

Surprisingly little research has investigated the processes by which people estimate what others know. Nickerson, Baddeley & Freeman (1987) examined how subjects' ability to answer general knowledge questions was related to their judgments of how many others people could answer the same questions. Estimates made by "knowledgeable subjects" (subjects who knew the correct answer) were significantly higher than those made by "unknowledgeable subjects" (subjects who did not know the correct answer). The fact that subjects' estimates show a bias in the direction of their own knowledge is interesting. Equally important for our purposes is the question of how accurate these estimates are. Nickerson et al. do not report correlations between estimates and actual values, but an examination of data plots in their paper indicates that accuracy was quite good for the knowledgeable subjects, and less good, but probably better than chance, for the unknowledgeable ones.

To further investigate the properties of these estimates, and to explore their effects on communication, we (Fussell & Krauss, submitted) employed a two-step procedure: First, we ascertained people's assumptions about what others were likely to know; then, using an independent group of subjects, we examined the effects these assumptions had on message construction in a referential communication task. Two sets of experiments were run, one using public figures and the other everyday objects as stimuli.

Public Figures

It is in the nature of being a celebrity or "public figure" to be recognizable at least to some subset of the population, but some public figures are more recognizable than others. Nearly everyone can identify ex-President Ronald Reagan, but only people with a special interest in public affairs will recognize the Secretary of the Treasury or the Secretary General of the United Nations. We had 15 subjects rate the recognizability of pictures of 15 public figures. They rated each picture twice: once for themselves and once for the "average student." They were also asked to name each of the target persons they could identify. From these names, we could estimate the proportion in the population who knew each target's name.

Group estimates of a target persons' identifiability (formed by averaging all subjects' estimates for a particular target) were highly correlated with the actual proportion of subjects who could identify the target (r = .95). However, such a correlation is not clear evidence for the proposition that subjects are sensitive to others' knowledge; it could also result from a strong false consensus bias. If subjects who could identify a given picture assumed everyone else could identify it, and subjects who were unable to identify it assumed no one else could, the correlation between each picture's mean identifiability rating and the proportion in the population who could it identify would be perfect. However, the correlation would derive from a primitive assumption of similarity, rather than a sensitivity to the social distribution of knowledge.

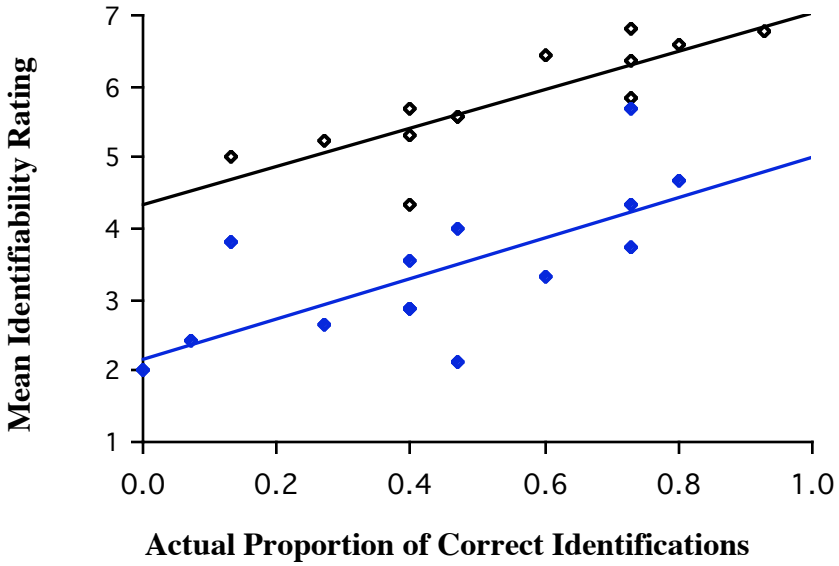

Figure 3. Percentage of correct identifications plotted against mean identifiability rating (on a seven point scale) for subjects who know the name of the person (open diamonds) and subjects who do not know the name of the person (closed diamonds). The lines represent the best fit to the data for subjects who know the name (top) and subjects who do not know the name (bottom).

To examine this possibility, we calculated correlations between mean identifiability ratings and actual percentages correct separately for observations in which two or more subjects did not know the name ("Unnamed")[8] and observations in which two or more subjects knew the name ("Named"). As Figure 3 illustrates, subjects are clearly sensitive to the relative identifiability of different targets, regardless of whether or not they themselves know the person's name (r = .82 for the Named and .70 for the Unnamed estimates). However, although the regression lines for the two distributions have virtually identical slopes, their intercepts differ substantially. Subjects who can identify the person in a picture assume it to be more identifiable to others than those who cannot.

[8]Cases in which respondents gave the wrong name were excluded.

It is not surprising that subjects' estimates are in the direction of their own knowledge, since, as Dawes (1989) points out, in many situations such knowledge will be a serviceable guide to what others know. Over all observations, ratings of how identifiable a picture was to the rater him- or herself was highly correlated with that rater's estimate of the picture's identifiability by others ($r = .81$). We suspect that the identifiability to self ratings reflect the rater's feelings of familiarity with the person depicted, which would explain how unknowledgeable subjects were able to provide reasonably accurate estimates despite their inability to name the target person. This is consistent with Nickerson et al.'s (1987) finding that ratings of "feeling of knowing"--that is, subjective feelings that one could answer the question at a later point--were significantly correlated with estimates of others' knowledge. Nevertheless, proportion of correct identifications in the sample was found to have a significant effect on subjects estimates even when their self-ratings are taken into account. *t*-tests confirmed that subjects rated the target as more identifiable to themselves than to others when they knew the target's name; when they did not, the target was rated as more identifiable to others than to themselves.

The results indicate that subjects are sensitive to the recognizability of these public figures to the undergraduate population, and, given the small number of observations, the phenomenon appears to be quite robust. Furthermore, most of the individual subjects' correlations were reliably greater than zero, suggesting that our subjects' theories or intuitions about the distribution of knowledge are shared. As anticipated, subjects' estimates were biased in the direction of their own knowledge.

Referring Expressions for Public Figures. In the second phase of the experiment, a new group of subjects was asked to refer to these same fifteen public figures, either in a conversational version of the referential communication

task ("Dyad condition") or on tape to be played to a partner at a later time ("Solo condition"). If intuitions about the social distribution of knowledge do play a role in communication, we would expect the amount of identifying information (e.g., description of physical features, mention of category membership, etc.) in messages to vary inversely with the perceived recognizability the target person. We would also expected prior suppositions about others' expertise to play a greater role in message construction when feedback from the addressee was unavailable, as was the case in the Solo condition.

Messages created on the first speaking turn for each target stimulus were first divided into "idea units," and then coded for the type of information they contained. We distinguished between "content units" (units containing such identifying information as the name, description, personal information about the target) distinguished from "non-content units" (those containing such things as repairs or repetitions of previous remarks. The number of content units and words of description in speakers' first messages for each stimulus were counted. We also examined the efficiency of exchanges in the Dyad condition by measuring the length in words of the addressees' first responses, and the total number of turns it took the dyad to establish reference.

For present purposes, we focus on messages in which the speaker used the correct name of the target person. Of particular interest are the effects of attributed knowledge on speakers' first messages in Trial 1, that is, before input from the addressee had been obtained. We found that the amount of information speakers included was inversely related to the perceived likelihood that the addressee would be familiar with the target. However, this relationship was affected to some degree by presentation order: the effects of lower recognizability are reduced as the speaker nears the end of the sequence of stimuli, and the number of alternatives remaining become few. In Figure 4 the

number of words of category and descriptive information is shown as a function of the target's identifiability., and, as can be seen, the effects of target identifiability are not especially marked. Overall, subjects add little category or description information to their names, irrespective of the target's recognizability. Surprisingly, speakers added descriptive information to the target names on only 22% of their Trial 1 utterances, and category information on just over half. In contrast, when names were not used 68% of messages contained descriptions and 91% contained category information.

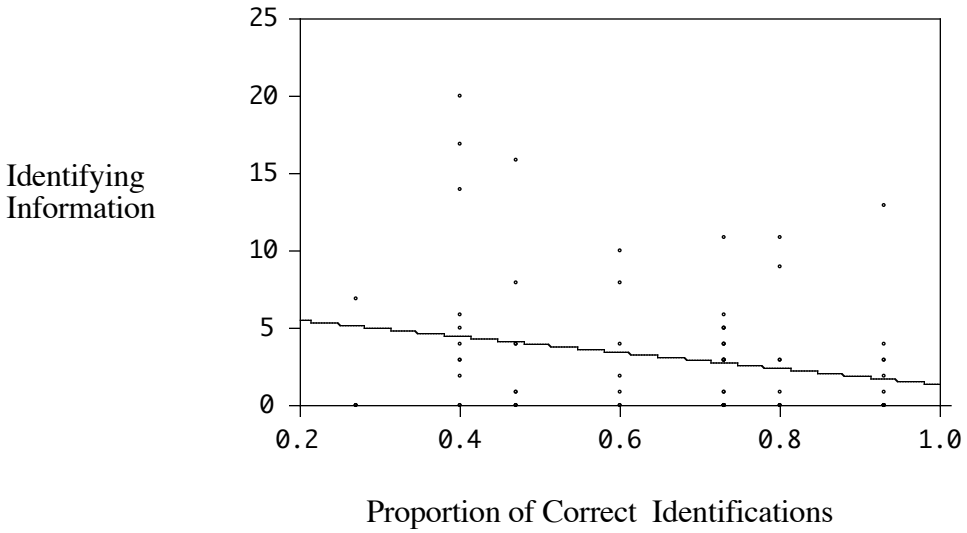

Figure 4. Number of words of identifying information (category and description) plotted against proportion of correct identifications in the previous experiment. (Some points represent more than one observation.) The regression line represents the best fit to the data.

On the whole, speakers in this study seemed to believe that the target's names alone would be sufficient for identification, and for the most part they were correct: the amount of information provided had little effect on the length of the addressee's first turn or the overall number of turns required to establish reference.

Solo Condition. The amount of information provided by speakers is heavily dependent on whether they are interacting directly with an addressee or

recording their messages on tape. Both Named and Unnamed messages in the Solo condition were significantly longer than corresponding messages in the Dyad condition, and message length did not decline over trials or over items within trials. Similar results have been reported in other studies in which speakers were not provided with feedback (Krauss & Weinheimer, 1966). When messages containing names were examined, no effects of attributed knowledge were found.

Everyday Objects

The previous experiment provide clear evidence that people have shared intuitions about the social distribution of knowledge, but the role that these intuitions play a role in message construction appears relatively minor. Because these observations were based on small number of data points and our dissatisfaction with some properties of the stimulus materials,[9] we decided to replicate the general procedure using a new set of stimuli and many more subjects.

We also expanded the design to include an additional factor: category membership of the addressee. In the previous study it made sense for speakers to use their own familiarity with a target as a basis for estimating what another student was likely to know (cf. Dawes, 1989). However, members of different social categories often have particular domains of expertise or ignorance, and to create successful referring expressions, a speaker must use more than his/her own familiarity with the referent as a guide to the addressee's level of knowledge, and take such differences into account.

For category membership to affect message formulation in our paradigm, the categories would have to be ones that are socially shared, are widely presumed to have implications for members' domains of expertise, and can be made relevant to communication. Gender serves these purposes well, because it is (or can easily be made) salient to the interactants (e.g., Taylor, Fiske, Etcoff, & Ruderman, 1978), and can readily be made relevant to performance in referential

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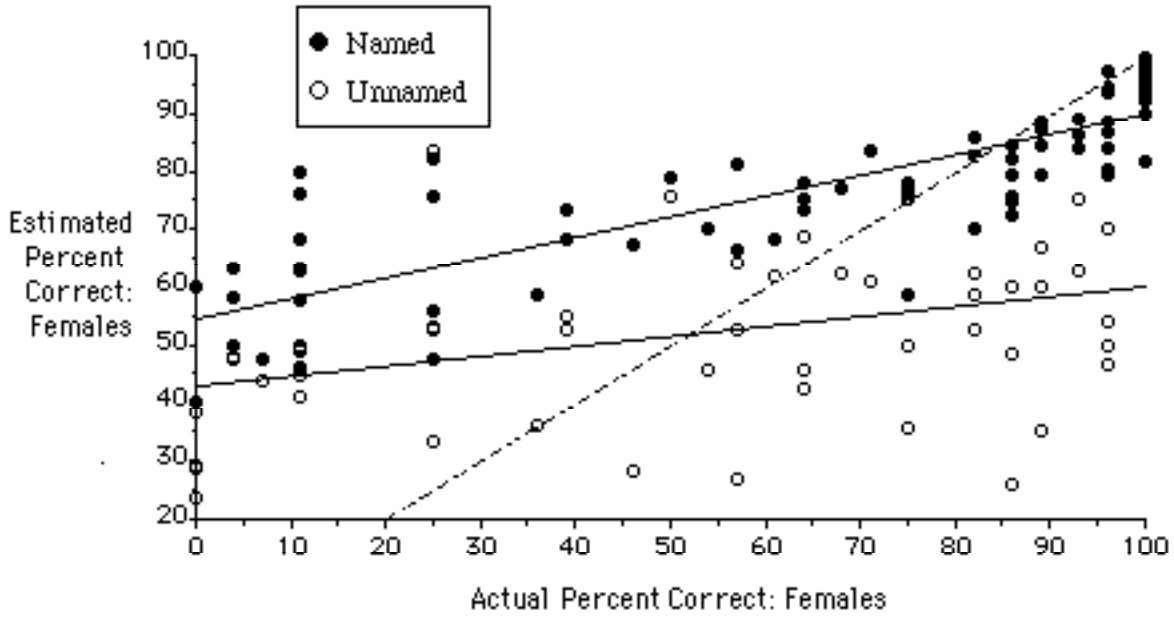
[9] We had planned to run many more subjects, but failed to appreciate the fleeting nature of fame. During a summer school break in which the experiment was temporarily halted, the identifiability of some of the targets changed dramatically. For example, one of the pretest targets, not used in the experiment because no one identified him, was Michael Dukakis, whose recognizability changed dramatically over the summer. The celebrity of others (e.g., Gary Hart) began to wane. For this and other reasons, we decided to use stimuli less likely to vary in recognizability over time.

communication tasks by using stimuli that are perceived as differentially familiar to males and females. In the first of two experiments, subjects estimated the percentages of males and females who could correctly identify a variety of everyday things from their pictures. Then, in the second experiment, the effects of this attributed knowledge on the construction of referring expressions was examined.

Identifiability Ratings. Fifty subjects estimated the proportions of male and female undergraduates able to identify by name a variety of everyday objects (ten objects in each of eight categories). We tried to include some categories of objects that seemed likely to be more familiar to females (e.g., kitchen implements), some that seemed likely to be more familiar to males (e.g., tools) and some that were equally familiar to both (e.g., musical instruments). Subjects were asked to supply the object's name if they knew it, so we could estimate the actual proportions of males and females who knew the each item's name. We were interested in subjects sensitivity both to the overall proportions of males and females able to identify each object, and to differences in the proportions of males and females who could identify it.

To better assess bias, subjects' estimates were made on the same scale as performance was measured (proportions correct), allowing us to compare estimates and actual proportions directly. Since the zero intercept in such a comparison is meaningful, the extent to which estimates depart from the actual proportion can be assessed quantitatively. Finally, to investigate whether subjects were using their subjective feelings of familiarity as a guide to others' knowledge, we asked subjects who did not know the name to rate their "feeling of knowing" (Brown & McNeill, 1966; Tulving & Pearlstone, 1966) --their estimate of the likelihood that they could retrieve the name at a later point or would recognize the name if they saw it.

We found good correspondence between mean estimates of identifiability and actual proportions of correct identifications, both for males (r = .73) and for females (r = .81).[10] To ensure that these high correlations did not result from a "false consensus" bias or simple assumptions of similarity, we again examined separately estimates over correct and incorrect observations. In Figure 5, the actual percentage of females who know each item's name is plotted against the estimated percentage of females who know the name for observations on which the target was correctly named (Named) and those on which it was not named (Unnamed). The distribution for males is essentially identical. Named estimates show marked sensitivity to level of knowledge in the target populations, (for male targets, r = .76; for female targets, r = .83). Unnamed estimates were significantly correlated with actual values (for males, r = .40; for females, r = .39), but these estimates were substantially less accurate than those of the Named group.



[10]Note that these are estimates of the likelihood that males and females would know the object's name, not estimates made by males and females. Generally speaking, estimates made males and females did not differ systematically.

Figure 5. Mean estimated percentage of correct identifications by females versus actual percentage of correct identifications by females. Closed circles represent estimates from subjects who knew the name of the item and open circles represent estimates from subjects who did not know the name of the item. Regression lines represent the best fit to the estimates by knowledgeable and unknowledgeable subjects. The dashed line represents the unit line.

Notwithstanding their sensitivity to differences in degree of knowledge in the student population, subjects who know an item's name still display a bias in the direction of their own knowledge. When the distributions of estimates are examined with respect to the unit lines (the dashed line in Figures 5), it is clear that subjects do not simply over- or underestimate all values. On items that are correctly named by the majority of respondents, most estimates are lower than the actual values, but on items correctly identified less than half the time, the pattern is the opposite. Even for items that seldom are correctly identified, estimates made by subjects who know the name are above .40. Thus, although subjects who know an object's name are aware that certain items are less likely to be known than others, and make reasonably accurate estimates of which items these are, they substantially overestimate the actual proportion of people who know the names of the lesser-known items.

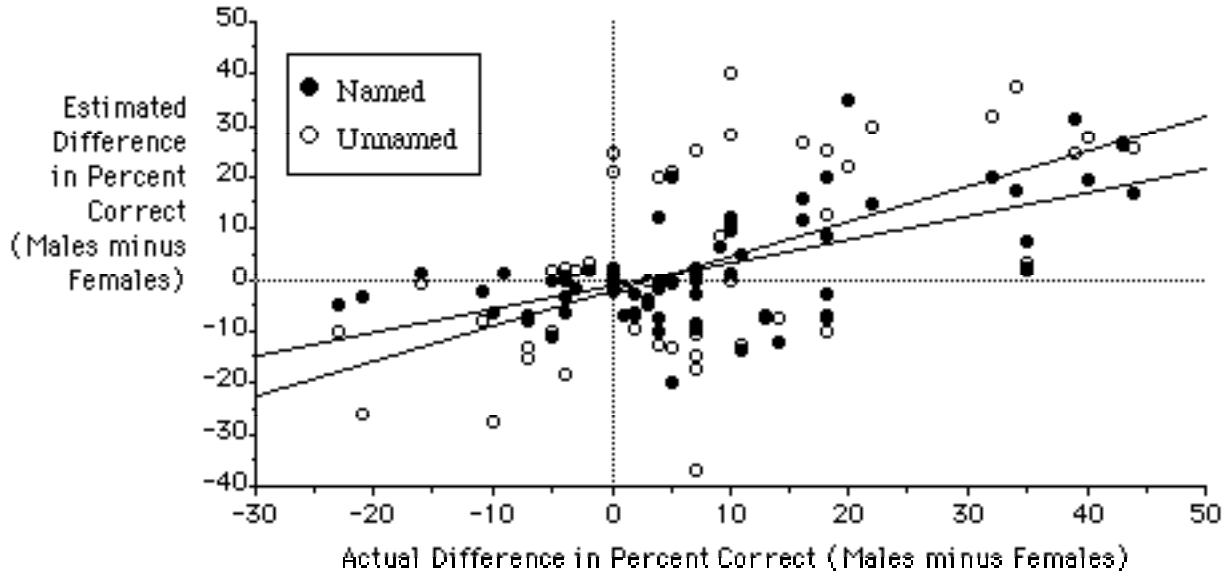


Figure 6. Mean estimated difference in percent of correct identifications vs. actual difference in percent of correct identifications by males and females. Closed circles represent estimates from subjects who knew the name of the item and open circles represent estimates from subjects who did not know the name of the item. Regression lines represent the best fit to the estimates by knowledgeable and unknowledgeable subjects.

Mean estimates for males and females are on the whole very similar, although each is fitted best by the estimates for that gender. To examine whether target sex affected subjects' estimates, the mean difference between estimates for males and females was plotted against the actual difference in the proportions males and females who knew the item's name (see Figure 6). As before, the values are plotted separately for Named and Unnamed observations. Both groups of subjects appear to be sensitive, and equally so, to actual gender differences in item knowledge (*r*s= .61 and .57 for Named and Unnamed observations, respectively), and their judgments do not appear to be biased toward one or the other sex as indicated by the zero intercept. Thus, while subjects who do not know what something is called may be poor judges of the relative proportion of people who know the name of that item, they are nonetheless sensitive, as a group, to which if either sex would be better at identifying it.

Individual subjects' estimates across the set of stimuli were significantly correlated with actual values, again providing evidence that these perceptions of the way knowledge is distributed are shared. The mean feeling-of-knowing ratings of subjects who did not know an item's name were highly correlated with their estimates of the proportion of people in the population who did know it's name. However, there was substantial variability; some subjects' correlations were negative or near zero.

In sum, people's inferences about others' knowledge of everyday objects are reasonably accurate, and these assumptions appear to be shared, as evidence by the fact that most individuals' estimates were highly correlated with actual values.

Effects of Attributed Knowledge on Communication. To examine the effects of attributed knowledge on messages constructed in a referential communication task, we crossed two classes of addressee (male and female) with three types of stimuli -- female-oriented, male-oriented, and neutral. If knowledge attributions are made on an utterance to utterance basis, then each referring expression should be tailored (in length, explicitness, use of proper names, etc.) to the listener's probable knowledge of the name as inferred from his/her gender category. We would expect the referential expressions directed to male and female addressees to differ for the categories seen as "gender biassed" (i. e., for which differential knowledge is attributed to the males and females), but not to differ for the control categories.

The stimuli consisted of two sets of 21 pictures, selected from those used in the previous study. Each set consisted of 7 items in 3 categories, one perceived by subjects to be more familiar to males, one more familiar to females, and one equally familiar to both. Forty pairs of subjects participated in the experiment, ten in each sex x experimental role combination; they repeated the task three

times with each set of cards. speakers' first messages per stimulus, and the efficiency of the exchange were scored as for the Public Figures experiment.

To check on the reliability of our previously obtained knowledge estimates, we also asked subjects to make identifiability ratings at the end of the session. Their data were essentially identical to the previously obtained results. As in the previous studies, estimates were biased in the direction of one's own knowledge, and more accurate estimates were made when judges knew the name of the depicted object. Thus values from the earlier study can be used to model speakers' assumptions in the current one.

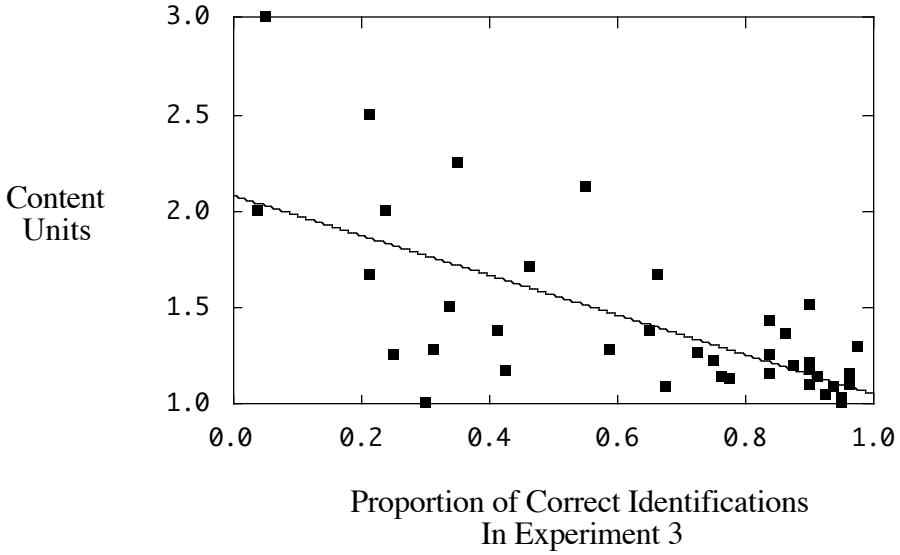


Figure 7. Mean number of content units in Speakers' Trial 1 messages in which names were used plotted against actual proportion of correct identifications in Experiment 3. The regression line represents the best fit to the data.

We were primarily interested in two effects of attributed knowledge: a general effect of overall expertise (averaged over males and females), and an effect of the addressee's gender. To examine the former effect, means for each dependent variable were calculated by item.[11] Multiple regressions confirmed

[11] Several measures of attributed knowledge were examined: overall percent correct and mean estimated percent correct (by subjects knowing the name) in the previous or the current study. These values were obtained by averaging over male and female targets. Since results did not vary depending on which of these estimates was used, those using mean judgments on correct observations

that messages are significantly shorter and contain fewer content units for more identifiable targets. The data for content units is shown in Figure 7. However, contrary to our expectations, no significant effects of addressee gender were found when means were calculated by item and addressee sex. As in the Public Figures experiment, the amount of information provided along with a name had little effect on the efficiency of the exchange.

The preceding analysis includes several data points based on a single message, which have substantial impact on the regression line. An alternative way of examining these data is by calculating mean message lengths for targets perceived to be above average, average, and below average in recognizability (here defined as ≥ 90%, 80-90%, and < 80%, respectively.[12] Analyses of variance confirmed that number words of description per message was significantly effected by Identifiability Level (the means were 1.33, .94 and .24 for the Low, Average, and High levels, respectively). Post-hoc comparisons indicated that only the distinction between the most recognizable and two less recognizable levels was significant. Results for content units and additional turns required were similar.

As was the case when they communicated about public figures, subjects' shared assumptions about stimulus recognizability were only modestly reflected in their messages, and no effects of the partner's gender were found. The stimulus's estimated identifiability has a significant effect on the number of content units and words of description in a message, the proportion of variance

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in the previous study are presented in the text, and the phrase "attributed knowledge" is used to indicate this set of judgments.

[12] Subjects who knew an item's name tended to provide rather high estimates (the intercept is about 50%), so the least recognizable category had to include a wide range of values in order to contain enough observations to enable us to compute means for each subject. With this definition, all but one subject, who was dropped from the analysis, had at least two observations in the lowest category.

accounted for is small. Curiously, even for the least recognizable targets, only 20% of the messages include any description,. It seems clear that our subjects' preferred strategy is to identify a stimulus by name and wait to see what happens.

General Discussion

The studies we have described show clear evidence of perspective-taking or "audience design" (Clark & Murphy, 1982) in a referential communication task. Speakers formulated different kinds of messages for themselves and others, and the ways in which the two kinds of messages differ seemed to reflect speakers' assumptions about knowledge that others were more or less likely to share. Moreover, the two kinds of messages were not equally effective communicatively: messages addressed to the self communicated poorly to others, but well to the self; messages addressed to others communicated well to those others. Messages addressed to a friend communicated more effectively to that friend than to some other person. Perspective taking presumes that communicators can assess the knowledge of their co-participants with some accuracy. We have found that people's estimates display considerable sensitivity to the way knowledge is distributed socially. However, these judgments also display a systematic bias: people tend to overestimate the prevalence of things they know and to underestimate the prevalence of things they don't know.

Although the results of these studies lend support to the general notion that speakers take their addressees' knowledge and perspectives into account when they formulate messages, the effects seem clearest in what might be termed "static simulations" of communication—i.e., non–interactive situations in which messages are written and addressees cannot respond. In situations that employ a format more like normal conversation, speakers' assumptions about the social distribution of knowledge seem to play a less important role in message

construction. Apparently, the availability of listener responses both during and after message construction permits speakers to employ strategies that are not possible in the non-interactive situation., making the task of analyzing perspective-taking in language considerably more complex and challenging.

Speakers in interactive contexts may feel less need to consider their addressees' knowledge in detail prior to message formulation because they know that the listener can ask questions to clarify meanings where necessary (cf. Clark & Wilkes-Gibbs, 1986; (Kraut, Lewis & Swezey, 1982); when feedback is unavailable, the role of prior suppositions may be more important. Unfortunately, attempts to run the current task non-interactively (in the Public Figures experiment and several pretests) resulted in unnaturally long and redundant messages, regardless of target recognizability. This may in part be a consequence of the ease with which speech can be produced; effects of attributed knowledge in non-interactive contexts are found for written messages, which are more effortful to produce (e.g., Krauss et al., 1968; Fussell & Krauss, 1989a, 1989b).

Complicating this analysis is the subtle nature of the process by which speakers seek, and listeners provide, feedback, which makes it difficult to distinguish effects of feedback from those of prior beliefs. For example, speakers often pause between clauses, allowing their listeners an opportunity to insert the kind of brief confirmatory responses (Yngve, 1970) has termed "back channels." A delay in responding to a "within turn signal" (Duncan, 1972) eliciting a back channel can be interpreted as a lack of comprehension., and speakers encountering such delays are likely to expand their messages (Krauss & Bricker, 1966). However, the duration of between-clause pauses varies widely among speakers (Krauss, unpublished data), and it often is difficult to distinguish between pauses that are employed to elicit feedback and pauses that occur

naturally as part of the process of speech production (Butterworth, 1980). Conversely, in response to listener back channels indicating comprehension, a speaker may abbreviate or terminate what was initially intended to be a lengthier message.

The real-time nature of the information processing involved in conversation, coupled with the richly informative feedback the listener can provide, can affect the results of referential communication studies such as ours in several ways. Lacking time to formulate their addressee's perspective with any precision, speakers may employ simplifying assumptions and heuristics that yield approximate outcomes. Steedman and Johnson-Laird's proposal that, barring evidence to the contrary speakers assume their addressees know everything they themselves know, may be part of a strategy in which the burden of defining what is mutually known is shifted from speaker to addressee. Or speakers may resort to simplified judgment heuristics that generate a few discrete types of outcomes (e.g., "generally known" or "not generally known" rather than a continuous scale of likelihood of being known). If a stimulus exceeds some threshold of recognizability, speakers may feel justified in using its name without any supporting information. There is some indirect support for this in the Objects Names experiment, where a distinction seemed to be drawn between the most recognizable stimuli, which were virtually always communicated by name only, and the others, for which additional supporting information was sometimes included.

These and other considerations suggest that communicators' draw on two distinct sources of information -- prior beliefs and current feedback -- when formulating their messages. However, the two informations sources are dynamically related: prior expectations guide message production and the elicitation and interpretation of feedback; at the same time, the information

obtained from feedback modifies beliefs about the addressee, and general theories of knowledge.

Prior expectations can shape the elicitation and interpretation of feedback at several points in interaction. The precise points at which feedback is elicited will be guided by the speaker's theories of what is more or less likely to be known. Suppositions about a partner's expertise may also form the context in which his or her responses are interpreted. Much feedback in conversation is ambiguous: simple backchannels such as "uh-huh" or "umm" can have multiple and contradictory functions (e.g., attention vs. agreement; mishearing vs. lack of comprehension), and to interpret these listener responses and modify their messages appropriately speakers must draw upon social knowledge. For instance, what is taken as the criterion that a message has been adequately understood (cf. Clark & Wilkes-Gibbs, 1986) may depend upon the speaker's *a priori* expectations that it will be understood. When the listener is expected to have little knowledge of the referent, greater evidence of comprehension may be required. Conversely, experience can also modify prior beliefs in at least two general ways: by changing one's perceptions of the communicationally-relevant characteristics and social category memberships of the addressee, and by modifying the content or use of theories about what others know or do not know.

Perceptions of the Addressee. One way interaction can influence suppositions about others is through the elicitations of categorizations that can then be used to draw further conclusions about a person. In Kingsbury's (1968) study, accent and brief prefatory phrases were found to elicit more details of a route than an unembelished inquiries, presumably because the respondent classified the speaker in a certain way and drew inferences from this classification. Similarly, Isaacs and Clark (1987) found that speakers (who did not know in advance how

familiar their addressees were with New York City) quickly adapted their messages to the listener's expertise. The data suggest that speakers used listeners' initial responses to classify them as New York City experts or novices, and then based subsequent messages on this categorization.

Modification of Theories. Experience can also modify the content or use of theories about what others do or do not know. During the course of interaction, each participant's apparent understandings and failures to understand the partner's messages provide feedback about the appropriateness of the assumptions upon which these messages are based. For messages that incorporate category-based assumptions about what is known, this feedback can be interpreted in two ways. It may be understood as an indication that the initial attribution of knowledge to the category was in error -- that such knowledge is not in fact characteristic of members of that category. If this conclusion is reached, feedback from the current interaction should affect one's theory of how category and knowledge are related, and should be reflected in future communication with other members of the same social category. Alternatively, the speaker may conclude that the co-participant is an atypical member of the category, or perhaps not a member at all (Schegloff, 1972). One's initial assumptions about the likelihood of knowing and the extremity of the error made may help determine when this latter conclusion is drawn.

Conclusion

Despite the centrality of perspective-taking to communication, the mechanics by which people assess one another's perspective and the ways in which these assessments are realized in communication are poorly understood. The studies reviewed here demonstrate that speakers can and do take others' knowledge into account when they create a message. However, much remains to be explained. As we have noted elsewhere (Krauss & Fussell, in press-b), the

shared communicative environment is, at any moment, a tentative hypothesis constructed by communicators from two interrelated types of social knowledge: their theories or intuitions about one another, and such conversational resources as verbal and nonverbal feedback. An understanding of the role of perspective-taking in communication requires an understanding of the ways people use these two sources of information, both alone and in interaction, to determine others' perspectives, as well as how this process is shaped by other aspects of the communicative situation.

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