Coordination of Knowledge in Communication: Effects of Speakers' Assumptions About What Others Know

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Communication is assumed to rest on a foundation of shared understandings that are integral to both speaking and listening (e.g., Clark & Marshall, 1981; Krauss, 1987; Krauss & Fussell, 1990, 1991a, 1991b; Mead, 1934; Rommetveit, 1974). A central component in the construction of these mutual understandings is what Mead (1934) termed taking the perspective of the other—assessing the background knowledge, plans, attitudes, beliefs, outlooks, and so on, of one's fellow interlocutors. Here, we focus on one specific type of perspective taking: determining the background knowledge of one's co-communicators. Drawing on Clark and Murphy's (1982) terminology, we call the hypothesis that speakers create messages with their listeners' knowledge in mind the audience design hypothesis.

In the current studies, we examine audience design in one specific aspect of language use: reference. As Brown (1958) has noted, things may be named in many ways—at different levels of specificity as well as by different terms at the same level of specificity. An important consideration in choosing a referring expression is the knowledge shared between speaker and listener. For example, how one refers to one's occupation (e.g., professor, psychologist, social psychologist, or social psychologist with an interest in social cognition) depends on (among other things) one's perceptions of the addressee's familiarity with the field.

Perspective Taking in Communication

Clark and his colleagues (Clark, 1985; Clark & Carlson, 1982; Clark & Marshall, 1981) have demonstrated that over the course of a conversation speakers and hearers accumulate a body of shared knowledge that they draw on when formulating their subsequent messages. For instance, Isaacs and Clark (1987) found that speakers who were experts on New York City quickly adapted their references to New York City landmarks to their listeners' knowledge of New York City. However, effects were less strong than anticipated. Although communicators do take others' knowledge into account, the extent to which they do so involves a trade-off with other sorts of information in the communicative situation.

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1 We use the term speaker to indicate the initiator of a message and listener or hearer to indicate the intended recipient of a message, regardless of the modality of communication.
addressee's knowledge or lack thereof. Clark and Wilkes-Gibbs (1986) have developed a collaborative model of communication in which speaker and listener work jointly to establish that successful reference has occurred.

However, although interactional feedback is one important source of information about others' perspectives, it is neither necessary nor sufficient for audience design. Even in communicative contexts where feedback is available, speakers must create an initial message before they can make use of this feedback. On their first trial, speakers in Isaacs and Clark's (1987) study had to choose some referring expression—name, description, or a combination of the two—before they could use feedback to assess the listener's New York City expertise. In ordinary conversation, the things to which one refers are typically more diverse than the landmarks in Isaacs and Clark's study, and the addressee's background knowledge of a particular referent often will not be directly predictable from the success or failure of preceding acts of reference. Although speakers in such situations may use interactional feedback to determine whether they should expand or replace a particular referring expression, they must rely on their prior assumptions about others' knowledge to construct that referring expression in the first place.

Moreover, feedback signals are open to multiple interpretations. A simple back-channel response such as "uhuh" can be a sign of attention, understanding, and so on, and speakers may rely on prior expectations about the listener's knowledge to interpret these signals. Subtle judgments about the social distribution of knowledge are also important in projecting what listeners are likely to know from their vocal responses. Identifying the Empire State Building from its name will create weaker expectations about an addressee's ability to identify other New York City landmarks than identifying Grand Central Station or the Soldiers' and Sailors' Monument. Thus, an understanding of speakers' implicit theories of others' knowledge is important to an understanding of how they utilize feedback in message construction.

Finally, there are many communicative situations in which feedback is delayed or nonexistent: exchanging letters or electronic mail, teaching large lectures, and so on. In such situations, communicators must rely on their a priori beliefs about the social distribution of knowledge to create messages that follow the principle of audience design.

Several studies of communication in noninteractive contexts have shown that speakers' prior beliefs about others' knowledge affect both the form and communicativeness of their messages (Danks, 1970; Fleming & Darley, 1991; Fleming, Darley, Hilton, & Kojetin, 1990; Fussell & Krauss, 1989a, 1989b; Innes, 1976; Kaplan, 1952, cited in Werner & Kaplan, 1963; Krauss, Vivekananthan, & Weinheimer, 1968). For example, in one study (Fussell & Krauss, 1989a), we found that, on average, referring expressions for nonsense figures were more than twice as long when intended for another student than when intended for oneself. In a second study (Fussell & Krauss, 1989b), we found that messages directed to a specific friend communicated better to that friend than to other students. These studies suggest that prior knowledge or suppositions about others' characteristics are incorporated into communicators' hypotheses about information that is (mutually) known and information that is not (and, hence, must be stated explicitly). However, several issues remain unresolved.

First, the strongest effects are found when messages for the self and for another person are compared. Because these differences could result from sources other than audience design (e.g., a closer relationship between messages to the self and the language of thought), such comparisons offer only weak support for the audience design hypothesis.

Second, the audience design hypothesis should be evidenced in speech to a single individual—that is, referring expressions intended for a particular addressee should be more or less specific or detailed depending on that addressee's knowledge. Within-addressee effects would indicate that audience design is a basic "on-line" component of the message production system. However, these effects have not been demonstrated empirically; rather, previous studies have used paradigms in which the speaker could make a general categorization of the addressee at the outset and then tailor all messages according to this initial categorization.

Third, the effects of prior beliefs on message construction have generally been demonstrated in noninteractive settings in which such beliefs are the communicators' sole source of information about their partners' perspectives. It has yet to be demonstrated that prior beliefs affect communication in situations in which feedback is also available. An exception is a study by Schober and Clark (1989) in which speakers drew upon knowledge shared with addressees but not overhearers to make messages that were communicative only to the former. However, it is not clear precisely when and how speakers in this study utilized prior beliefs about their addressees' knowledge, because these beliefs were not ascertained independent of their messages.

Fourth, in most previous studies, speakers had no information about the message recipient beyond the fact that he or she was "another student." In everyday life, even when interacting with strangers, communicators often can identify each other's category memberships and use them to draw inferences about what is known (e.g., Schegloff, 1972). The Isaacs and Clark (1987) study provided indirect evidence that an addressee's category membership can influence a speaker's referring expressions; however, Isaacs and Clark did not establish that speakers actually classified their addressees on this basis, nor did they specify what speakers assumed about the addressee's knowledge on the basis of this classification.

A recurring problem in these studies is a circularity in identifying the particular shared knowledge the speaker is taking into account during message formulation. For example, the fact that speakers who are New York City experts create shorter messages when speaking to other experts cannot be used to show both that speakers classified their addressees as New York City experts and that the effect of this classification is a briefer message. To examine the effects of 'prior beliefs about others' knowledge' on message formulation, the nature of these beliefs must be established independent of the messages themselves.

**Perspective-Taking Process**

Suppositions about what others know are derived from a variety of sources varying along a continuum of directness of knowl-
bias in estimates of others' knowledge was studied by Nickerson, Baddeley, and Freeman (1987), who examined the relationship between a person's ability to answer a variety of general knowledge questions and his or her estimate of how many other people could answer these questions. Nickerson et al. also hypothesized that the presence or absence of such descriptive information would be related to the listener's ability to identify the referent.

**Present Paradigm**

To support the audience design hypothesis, one must use a paradigm that compares messages for different addressees or establishes in some other way what assumptions the speaker is making about the addressee, independent of the message (Krauss & Fussell, 1988). The referential communication task is one paradigm that permits this. In such tasks, communicators name or describe a set of stimuli so that they themselves, or another person, can select the correct referent from the full array. By varying characterizations of the intended message recipient, one can evaluate the audience design hypothesis. In the current studies, a conversational version of the task was used, in which speakers and listeners were allowed to communicate freely. Using this paradigm, we tested whether prior beliefs affected message construction even when feedback from the listener was also available.

In the present experiments, we used a two-step research strategy to demonstrate that messages are shaped by the principle of audience design. First, people's assumptions about the social distribution of knowledge were assessed by asking subjects to estimate others' knowledge of specific items. Second, these group judgments were then used to infer the assumptions individual speakers had as they created messages in a referential communication task. For this strategy to be successful, the social categories for which knowledge judgments are obtained must be psychologically real and salient to communicators, and people's perceptions of the social distribution of knowledge must be socially shared. In the studies presented below, the social categories used—undergraduates at a particular institution and men versus women—fulfilled these criteria.

The studies examined two sets of hypotheses. The first set concerned the accuracy and bias of people's inferences about others' knowledge. We hypothesized that subjects would accurately estimate the likelihood that others could identify particular public figures (Experiment 1) and the likelihood that they would know the names of everyday objects (Experiment 3), but we also anticipated that these estimates would be biased in the direction of the subjects' own knowledge.

The second set of hypotheses concerned the use of such attributed knowledge in communication. We expected that the amount of informative detail speakers provided in their messages would be a function of the perceived recognizability of that stimulus to the addressee: The less recognizable the stimulus, the more descriptive information would be provided. It was also hypothesized that the presence or absence of such descriptive information would be related to the listener's ability to identify the referent.

**Experiment 1**

By definition, public figures are recognizable to at least some subset of the population, but some public figures are more recognizable than others. For instance, almost everyone can identify ex-President Ronald Reagan, but only those with a special interest in politics may be able to recognize low-ranking members of his cabinet. In Experiment 1, students viewed pictures of public figures and rated how identifiable each was both for themselves and for other undergraduates. To estimate the actual proportion of people in the population who could name each target, subjects also indicated the names of those they knew.

**Method**

**Materials.** As stimuli we used pictures of 15 men (listed in Table 1) prominent in business, politics, or entertainment. The approximately 3/4 X 1 in. (1.905 X 2.54 cm) pictures were mounted on 3 X 5 in. (7.62 X
COORDINATION OF KNOWLEDGE IN COMMUNICATION

Table 1
Percentage Correct and Mean Identifiability Ratings for Public Figures

<table>
<thead>
<tr>
<th>Public figure</th>
<th>% correct</th>
<th>All observations</th>
<th></th>
<th>Named</th>
<th></th>
<th>Unnamed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Others</td>
<td>Self</td>
<td>Others</td>
<td>Self</td>
<td>Others</td>
</tr>
<tr>
<td>Woody Allen</td>
<td>93</td>
<td>6.4</td>
<td>6.5</td>
<td>6.8</td>
<td>6.9</td>
<td>—</td>
</tr>
<tr>
<td>Clint Eastwood</td>
<td>80</td>
<td>6.2</td>
<td>6.4</td>
<td>6.8</td>
<td>6.8</td>
<td>4.7</td>
</tr>
<tr>
<td>Paul Newman</td>
<td>73</td>
<td>6.3</td>
<td>6.1</td>
<td>6.8</td>
<td>6.9</td>
<td>5.0</td>
</tr>
<tr>
<td>Gary Hart</td>
<td>73</td>
<td>5.8</td>
<td>5.9</td>
<td>5.8</td>
<td>6.5</td>
<td>5.8</td>
</tr>
<tr>
<td>Lee Iacocca</td>
<td>73</td>
<td>5.7</td>
<td>5.7</td>
<td>6.4</td>
<td>7.0</td>
<td>3.8</td>
</tr>
<tr>
<td>George Bush</td>
<td>60</td>
<td>5.2</td>
<td>4.8</td>
<td>6.4</td>
<td>6.4</td>
<td>3.3</td>
</tr>
<tr>
<td>Ivan Boesky</td>
<td>47</td>
<td>4.1</td>
<td>4.1</td>
<td>5.6</td>
<td>6.7</td>
<td>2.8</td>
</tr>
<tr>
<td>Alexander Haig</td>
<td>47</td>
<td>4.9</td>
<td>4.8</td>
<td>5.6</td>
<td>6.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Howard Baker</td>
<td>40</td>
<td>4.1</td>
<td>3.5</td>
<td>5.3</td>
<td>6.0</td>
<td>3.3</td>
</tr>
<tr>
<td>Judd Nelson</td>
<td>40</td>
<td>4.0</td>
<td>4.1</td>
<td>5.7</td>
<td>6.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Donald Regan</td>
<td>40</td>
<td>3.9</td>
<td>4.3</td>
<td>4.3</td>
<td>6.2</td>
<td>3.6</td>
</tr>
<tr>
<td>Ted Turner</td>
<td>26</td>
<td>3.3</td>
<td>3.1</td>
<td>5.3</td>
<td>7.0</td>
<td>2.6</td>
</tr>
<tr>
<td>Kevin Kline</td>
<td>13</td>
<td>4.0</td>
<td>3.5</td>
<td>5.0</td>
<td>5.5</td>
<td>3.9</td>
</tr>
<tr>
<td>Carl Icahn</td>
<td>7</td>
<td>2.5</td>
<td>1.6</td>
<td>—</td>
<td>—</td>
<td>2.4</td>
</tr>
<tr>
<td>T. B. Pickens</td>
<td>0</td>
<td>2.0</td>
<td>1.6</td>
<td>—</td>
<td>—</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Note. Identifiability ratings were made on a scale of 1 (none) to 7 (high). Named indicates observations on which the target was correctly named; unnamed indicates observations on which the target was not named. Dashes indicate that there were no judgments of a particular type made for that public figure.

Results and Discussion

Correct identifications of the 15 public figures ranged from 0% to 93% (M = 48%, SD = 28%; see Table 1). Individual subjects correctly identified between 13% and 87% of the targets, with a median of 53%.

Mean ratings of identifiability to others (others) ranged from 2.0 to 6.4 (M = 4.6, SD = 2.1); ratings for identifiability to self (self) had a similar range (M = 4.4, SD = 2.6; see Table 1). Group estimates for others and self, formed by averaging all judgments for a particular target, were highly correlated with actual proportions correct (for others, r = .95; for self, r = .97; both p < .001).

Although these high correlations are consistent with the proposition that subjects are sensitive to others’ knowledge, they could also result from a strong false consensus bias: If all subjects who identified a given picture assumed that everyone else could identify it, and all who could not identify a picture assumed that no one could identify it, the correlation between the mean identifiability rating for each picture and the proportion in the population who could identify the person in the picture would be perfect. However, the correlation would derive from a primitive assumption of similarity rather than an awareness of the way knowledge is distributed socially.

To examine this possibility, correlations between mean identifiability ratings and actual percentages correct were calculated separately for observations in which subjects knew the stimulus person’s name (named) and for those in which they did not (unnamed). (Estimates of subjects who incorrectly identified the stimulus person were excluded, as were mean estimates based on a single subject’s estimate) Mean estimates from named and unnamed observations are shown in Figure 1, in which the solid lines represent the best fit to each set of estimates. Subjects were clearly sensitive to the relative identifiability of different targets, regardless of whether they themselves knew the person’s name (r = .82 for the named and .70 for the unnamed estimates, both p < .005; for the comparison, z = .66). However, although the regression lines for the two distributions have virtually identical slopes, their intercepts differ substantially (4.35 for named estimates vs. 2.32 for unnamed estimates). Subjects who could identify a stimulus person judged him to be more identifiable to others than those who could not.

Individual subjects’ correlations between estimates and percentages correct across the 15 stimuli showed the same pattern as the group values: The mean individual correlation was .67, and no subject’s correlation was less than .46. Even with the small number of observations, 12 of the 15 individual correlations exceeded the minimum required (.51, df = 13) for significance at the .05 level, and ten exceeded the minimum (.54) at the .01 level. When the analysis was limited to observations about which the subject was correct, correlations were still rea-
sonably high: Of 13 subjects with at least two correct observations, 8 had correlations above .40. Subjects may have relied on their own familiarity with the stimulus person in estimating their identifiability to others. Individual correlations between estimates for self and others were high, with 14 of the 15 values exceeding the minimum required (.51) for significance at the .05 level.

Experiment 1 showed that people are reasonably sensitive to what others know, especially when they themselves are knowledgeable about the stimulus. Considering the small number of observations, the results were impressively strong. Furthermore, the fact that most subjects' correlations were significant suggests that theories or intuitions about the distribution of knowledge are shared, at least within the Columbia University student population. Hence, it is reasonable to use these judgments to estimate what a speaker would assume about an unknown addressee's likelihood of knowing a particular stimulus person's name. The next experiment examined the effects of these assumptions on message formulation.

Experiment 2

In Experiment 2, subjects communicated about the public figures used in the preceding study in a referential communication task. According to the audience design hypothesis, subjects using the name of a target should provide more identifying information (e.g., description of features and occupational category membership) with that name as the perceived likelihood of the listener's recognizing the target declines.

We also evaluated the success or failure of speakers' messages by examining the type of response given by the matcher. When descriptive content is omitted from lesser known targets, longer overall speaking exchanges should be required for speaker and hearer to agree that successful reference has occurred.

Method

Materials. Stimuli consisted of the pictures of the 15 public figures used in Experiment 1; pictures were mounted on notecards indicating their occupational categories. Postexperimental questionnaires were administered to collect personal data and reactions to the task.

Subjects and procedure. Twenty-eight undergraduates served as subjects. They were randomly assigned in pairs to either the role of director, (the person who described each of the pictures) or matcher (the one who tried to select the correct stimulus from the full array). In 6 of the pairs, both director and matcher were women, in 4 both were men, and in 4 there were mixed gender pairs. Their discussions were tape recorded.

Subjects were seated at desks separated by a small screen. Directors received the notecards in a prearranged order of three rows by five columns; matchers received the notecards in random order and were instructed to lay them out on the desk so that they were clearly visible. Directors were instructed to convey the pattern of cards to their partners one by one in the prescribed order, using any form of reference they liked (e.g., name, description, or occupational category). Speed and accuracy were stressed. Matchers were permitted to make brief comments or to ask questions as needed.

Subjects repeated the task three times with each set of stimuli. A different order was used for each trial, but the order of the cards within a trial was constant for all subjects. Errors made by the matcher were recorded by the experimenter, although very few mistakes were found. Afterward, subjects completed the follow-up questionnaire.

Preparation and coding of transcripts. All utterances (including speech disfluencies and pauses) were transcribed and checked by Su-

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2 Speed was stressed because we found in pilot studies that speakers would not only refer to the target person but discuss everything they knew about him when there were no time restrictions. From casual observation, this restriction did not appear to alter the naturalness of the dialogues.

3 To obtain a large corpus of utterances generated under as similar circumstances as possible (i.e., with the same alternatives in mind), we decided to present the stimuli in the same order for all subjects. This strategy allows one to estimate the effects of both order and attributed knowledge, as long as they are not confounded, and it should help reduce extraneous variance that makes it difficult to uncover the effects of attributed knowledge. It is also consistent with other sorts of communication tasks, such those that require the speaker to relate a presupposed sequence of events or propositions (e.g., Kraut, Lewis, & Swezey, 1982).
san Fussell and trained assistants. The transcribed texts were punctuated in conventional fashion, with greater than 90% agreement.

The texts of directors' first turns were divided into idea units (e.g., Butterworth, 1975) that were defined in terms of their content matter: Each major attribute of a target—including clothing, body position, and facial expression—counted as a separate unit regardless of whether it was produced in the same phrase as other attributes. Agreement on the number of idea units was greater than 92%. Six types of idea units were distinguished: occupational category, proper names (correct and incorrect), description (the physical features of the person in the picture), personal information (e.g., specifics of the person's occupation, such as movies in which he had appeared), other information that might less directly aid identification (e.g., statements about familiarity), and noninformation (e.g., repetitions, repairs, or extraneous comments). Units were coded by Susan Fussell. All Trial 1 messages (624 units) were also independently coded by an assistant, with excellent agreement (95%).

The majority of units belonged to one of the first 3 categories—name, occupational category, and description. These three categories plus personal information and other information were considered content units. We tallied the number of content units and the number of words of description for directors' first-turn messages. To determine the time it took pairs to establish reference, we tabulated the number of speaking turns by both partners required after the director's first message until the pair moved on to the next target. Because the distributions for all dependent measures were positively skewed, values were truncated to three standard deviations above the mean.

Results and Discussion

Because the overall pattern of results across the three trials is of limited importance for testing the current hypotheses, it is described here only briefly (full details are provided in Fussell, 1991). Directors provided significantly less information, both in terms of content units and words of description, on later trials, and fewer speaking turns were required to establish reference. This pattern held for both messages in which the target was named correctly (named) and those in which the target was not named (unnamed), although the unnamed messages tended to be substantially longer than the named ones (mean content words for Trials 1–3 were 3.18, 1.95, and 1.44, respectively, for named observations; and 12.19, 10.45, and 9.27, respectively, for unnamed observations). Similarly, fewer speaking turns were required to establish reference when names were used (mean turns for Trials 1–3 were 2.95, 2.35, and 2.14, respectively, for named observations; and 3.57, 2.67, and 2.37, respectively, for unnamed observations). These results are in accordance with previous studies of this type (e.g., Clark & Wilkes-Gibbs, 1986; Krauss & Weinheimer, 1966).

To examine the effects of communicators' prior theories about the social distribution of knowledge on message construction, one must look at messages constructed on the first trial, before the director has received any feedback from the matcher. According to our hypotheses, as the addressee's perceived familiarity with the target declines, the director will accompany the target's name with more information.

The descriptive content of all Trial 1 messages containing names (n = 80) was examined as a function of perceived stimulus identifiability (identifiability here defined as the proportion of correct identifications in Experiment 1). As we anticipated, the amount of information provided with the name of a stimulus increased as perceived identifiability declined (for content units, r = −.38, p < .01; for description words, r = −.28, p < .01). These findings were examined by regressing the number of content units per message onto presentation order, identifiability, and a set of dummy-coded subject variables. Significant effects in the expected direction were found for identifiability, \( t(64) = 3.99, p < .001, B = -2.19 \); order, \( t(64) = 2.92, p < .005, B = -0.8 \); and subject, \( F(3, 64) = 2.54, p < .01 \). In addition, there was a significant Order × Identifiability interaction, \( F(1, 63) = 5.38, p < .05 \). The lengthening effects of lower recognizability decrease as the speaker gets to the end of the sequence of stimuli. When number of words of description is similarly analyzed, significant effects are found only for identifiability, \( t(64) = 2.36, p < .05, B = -0.25 \), and the Order × Identifiability interaction, \( F(1, 63) = 3.98, p < .05 \).

To examine the adequacy of directors' first messages as a function of the amount of information provided with a target's name, we counted the number of speaking turns required to establish reference (as indicated by the pair moving on to the next stimulus). Correlations between both measures of message content (content units and words of description) and the number of turns required were low and nonsignificant. Multiple regressions confirmed that the amount of information speakers provided with the targets' names did not have a substantial impact on the haper's ability to identify the target, at least by the measure used here.

On the whole, these findings provide some support for the hypothesis that speakers use their prior beliefs about the addressee's knowledge in constructing their messages, even in communicative contexts where feedback is available. However, the effects of these prior beliefs were weaker than we had anticipated. In many cases, directors added little descriptive information to the target's name regardless of his recognizability. Just over half of the messages contained the occupational category of the target, and only 21% of these messages contained other descriptive information. In contrast, when names were not used, 91% of the messages indicated the occupational category of the target, and 68% of them contained descriptive information. On the whole, speakers seemed to feel that the name alone was sufficient for identification.

It is possible that we would have found stronger effects of attributed knowledge with more observations. The small set of

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4 Mean estimates from correct observations in Experiment 1 were also used as a measure of perceived stimulus recognizability, with virtually identical results. However, because these mean estimates were based in some cases on very few estimates, and because the distribution of actual proportions correct was more diverse, we used this value instead.

5 Here and in all regression analyses reported in this article, significance tests were performed on individual factors only when the overall regression equations were found to account for a significant proportion of the variance. The effects of interactions were examined after the main effects had been entered simultaneously into the equation (cf. Cohen & Cohen, 1983). In the interest of conserving space, statistics for the overall regressions and for interactions failing to attain significance at the .05 level are not discussed in the text.
observations was a consequence of unanticipated changes in the recognizability of some of the stimulus persons. During a summer school break in which the experiment was temporarily halted, some of the targets changed dramatically in their identifiability. The next two studies used a different sort of stimuli, everyday objects, that were less likely to vary in recognizability over time, permitting better tests of the hypotheses.

Experiment 3

In Experiment 1, subjects' judgments about others' expertise were correlated with their own familiarity with the stimulus person. Because the target population was Columbia University undergraduates, this strategy made good sense—the subject's own knowledge should be a reasonable guide to what other members of the same category will know (cf. Dawes, 1989). However, members of different social categories often have particular domains of expertise. To create successful referring expressions, a speaker must go beyond his or her own familiarity with the referent and take such group differences into account.

To examine the effects of social category membership on message production, one must find social categories that are socially shared, that elicit differential amounts of attributed knowledge, and that can be made relevant to communication. One such category is gender: Gender is or can be easily made salient to the interactants (e.g., Taylor, Fiske, Etcoff, & Ruderman, 1978), it elicits shared expectations about implications for others' characteristics (e.g., Deaux, 1976), and it can be made relevant to performance in referential communication tasks by using stimuli that are of differential familiarity to men and women. One source of such differential knowledge is household activities. Evidence indicates that household tasks such as cooking and maintenance are allocated differentially to the two sexes (Nyequist, Slivken, Spence, & Helmreich, 1985; Robinson, 1988), and these differences in experience should lead to sex differences in domain-related expertise. If people are aware of these discrepancies in knowledge, there should be differences in their expectations about what men and women know.

In Experiment 3, subjects estimated separately the percentages of male and female undergraduates who could correctly identify pictures of everyday things. Some of the objects were hypothesized to be more familiar to men, some more familiar to women, and some equally familiar to both. As in Experiment 1, population knowledge was estimated by asking all subjects to provide the name of the item (if they knew it) prior to making their judgments. It was anticipated that subjects would be sensitive both to overall proportions of men and women able to identify each of the objects and to the differences in proportions of men and women able to do so.

In addition, to assess bias more accurately, we obtained judgments on a rating scale that was comparable to the scale on which performance was measured. By having subjects estimate the proportions of students able to identify each stimulus, estimates and actual values could be compared directly, permitting a quantitative assessment of accuracy and bias.

As noted above, one heuristic judges might use, especially when they do not know the name of the stimulus, is their subjective feeling of familiarity. In Experiment 1, subjects' estimates of identifiability to self were significantly correlated with their estimates of identifiability to others; however, it is not clear exactly what these identifiability-to-self ratings measure. An intuitively more meaningful index is one's feeling of knowing—the subjective feeling that one could recognize the name or retrieve it at a later point (Brown & McNeill, 1966; Tulving & Pearlstone, 1966). Nickerson et al. (1987) found that subjects' ratings of feeling of knowing were significantly correlated with estimates of others' knowledge. To see if similar effects would be found with these stimuli, subjects were asked to rate their feeling of knowing if they did not know the name of the object.

Method

Materials. The stimuli consisted of black and white line drawings of 10 objects in each of eight categories: sports equipment, household appliances, car parts and tools, kitchen utensils, tools, electronic equipment, vegetables, and musical instruments. Categories were chosen that were expected to be more familiar to women (e.g., kitchen utensils), more familiar to men (e.g., tools), or equally familiar to both (e.g., musical instruments). Each set of 10 pictures (with each picture labeled with an identifying letter) was arranged in arbitrary order on one sheet of paper; these eight pages of pictures were then randomly arranged in 12 orders.

Answer sheets contained a response slot, in which subjects wrote the name of the stimulus if they knew it, and three ratings scales for each picture: an 8-point scale for rating feeling of knowing and two scales ranging from 0% to 100%, marked at 10% intervals, for estimating the percentages of men and women who would know the name of the item. A postexperimental questionnaire collected pertinent background information.

Subjects and procedure. Fifty subjects (28 women and 22 men) participated in groups of up to eight. They were instructed to go through the 80 pictures one at a time. They first determined whether they knew the name of the pictured item and, if they did, wrote it in the space provided. If they did not know the name, they rated their feeling of knowing—the likelihood that they could retrieve the name at a later point or would recognize the name if they saw it written. Then, all subjects estimated the percentages of undergraduate men and women who would know that item's name. They worked at their own pace; when they were finished, they completed the follow-up questionnaire.

Results and Discussion

Proportions of subjects able to name the stimuli ranged from 0 to 1.00 (M = .74, SD = .32 for male subjects; M = .67, SD = .35 for female subjects). Differences between proportions of correct identifications ranged across items from -.23 (women > men) to .44 (men > women), with a mean of .06 (SD = .14). Because the categories were of a somewhat ad hoc nature and the variability within categories was great, we treated the stimuli as 80 individual items for the purposes of our analyses.

As in Experiment 1, there was good correspondence between mean estimates of identifiability and actual proportions of correct identifications for both male and female targets. Results from regressions of estimates onto actual proportions correct are shown in Table 2. Although the overall correlation was somewhat lower for male targets than for female targets, the two values were not significantly different (z = -1.23). These relationships are not simply the result of averaging over subjects with different intuitions about the social distribution of knowledge: Individual subjects' correlations across the 80 stimuli
Coordinating Knowledge in Communication

Table 2
Summary of Regressions of Estimated Proportions Correct Onto Actual Proportions Correct

<table>
<thead>
<tr>
<th>Observations regressed</th>
<th>Intercept</th>
<th>B</th>
<th>r</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>All targets (n = 80)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>.54**</td>
<td>.33</td>
<td>.73**</td>
<td>.53</td>
</tr>
<tr>
<td>Women</td>
<td>.49**</td>
<td>.40</td>
<td>.81**</td>
<td>.65</td>
</tr>
<tr>
<td>Men - women</td>
<td>.00</td>
<td>.46</td>
<td>.59**</td>
<td>.34</td>
</tr>
<tr>
<td>Named (n = 78)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>.55**</td>
<td>.34</td>
<td>.76**</td>
<td>.58</td>
</tr>
<tr>
<td>Women</td>
<td>.55**</td>
<td>.35</td>
<td>.83**</td>
<td>.68</td>
</tr>
<tr>
<td>Men - women</td>
<td>-.01</td>
<td>.45</td>
<td>.61**</td>
<td>.37</td>
</tr>
<tr>
<td>Unnamed (n = 55)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>.47**</td>
<td>.15</td>
<td>.40**</td>
<td>.16</td>
</tr>
<tr>
<td>Women</td>
<td>.43**</td>
<td>.17</td>
<td>.39**</td>
<td>.15</td>
</tr>
<tr>
<td>Men - women</td>
<td>-.02</td>
<td>.68</td>
<td>.57**</td>
<td>.32</td>
</tr>
</tbody>
</table>

Note. Men - women = Estimated difference in percentage of correct identifications of objects by men and women versus actual difference in percentage of correct identifications by men and women.

*p < .005. **p < .001.

ranged from .31 to .71 for the male targets (M = .51, SD = .10) and .47 to .77 (M = .62, SD = .07) for the female targets—all greater than the minimum value required (29, df = 78) for significance at the .01 level.

To ensure that these high correlations did not result from a false consensus bias or simple assumptions of similarity, estimates over correct and incorrect observations were examined separately. In Figure 2, the actual percentages of men and women who knew each item’s name were plotted against the estimated percentages of men and women who would know it, separately for observations on which the target was correctly named (named) and those on which it was not named (unnamed). The solid lines represent the best fit to the two sets of estimates. Estimates on named observations show substantial sensitivity to level of knowledge in the target populations (see Table 2), and sensitivity did not vary by target gender (z = -1.14). Estimates on unnamed trials were significantly correlated with actual values but were also significantly less accurate than those of the named group (r = 3.03 and 4.11 for comparisons of correlations for male and female targets, respectively, both ps < .005). This pattern of results not only holds for the population means, but for individual subjects as well. Mean within-subject correlations were, for male targets, .02 and .53 for unnamed and named observations, respectively; the corresponding values for female targets were .23 and .58.

Despite their sensitivity to differences in degree of knowledge in the student population, subjects who know an item’s name might be biased in the direction of their own knowledge (cf. Nickerson et al., 1987). If estimates are compared to the broken lines in Figure 2, which represent the unit lines, it is clear that subjects who knew the name of less recognizable objects substantially overestimated the number of others who could identify that object. Even items that were identified by 10% or less of the subjects were estimated by those who knew its name to be identifiable to 40–80% of the population (also see Table 2). Thus, although subjects who knew an item’s name were aware that certain items are less likely to be known than others, they substantially overestimated the proportion of people who would know the names of the lesser known items.

To examine whether subjects attributed knowledge differentially to the two sexes, we plotted the mean difference between estimates for men and women against the actual difference in proportions correct for men and women (see Figure 3 and Table 2). The values are again plotted separately for named and unnamed observations. Both groups of subjects appear to be sensitive to gender differences in item knowledge, and equally so (z = .32); their judgments also do not appear to be biased toward one or the other sex, as indicated by the zero intercept. Thus, although subjects who did not know what something was called were poor judges of the relative proportion of people who would know the name of that item, they were nonetheless sensitive, as a group, to which, if either, sex would be better at identifying it.

In contrast to estimates of overall expertise, there was substantial variability in individual subjects’ sensitivities to gender differences. Individual correlations ranged from .14 to .64 (M = .44), and, although all but three of these reach the minimum required (22) for significance at the .05 level, many were low. Subjects’ perceptions of the rating task may have contributed to this variability: Some stated that they thought it was a stereotyping experiment and gave the same estimates for men and women to avoid appearing sex-biased.

When subjects did not know an item’s name, they rated their feeling of knowing. For most subjects, these ratings were highly correlated with estimated percentages correct for both male and female targets. Mean individual correlations for male judges were .64 and .46 for male and female targets, respectively; the corresponding values for female judges were .26 and .81**. 4 Although it appears in Figure 3 that subjects may be sensitive to the size of the discrepancy in performance by men and women, this is true only to a limited extent. When estimated versus actual absolute values of the difference between sexes were plotted against one another, the correlation for named observations was .63 and that for unnamed observations was .35. When these correlations were obtained separately for male- and female-advantage stimuli, there was little effect of the absolute size of the discrepancy for female-advantage items (r = .01 for named and .33 for unnamed) and a slightly larger effect for the male-advantage items (r = .56 for named and .37 for unnamed). Hence, a cautious interpretation of the findings would be that subjects are primarily sensitive to which sex would be better at identifying the stimuli, rather than to the size of the gender advantage.

4 Although it appears in Figure 3 that subjects may be sensitive to the size of the discrepancy in performance by men and women, this is true only to a limited extent. When estimated versus actual absolute values of the difference between sexes were plotted against one another, the correlation for named observations was .63 and that for unnamed observations was .35. When these correlations were obtained separately for male- and female-advantage stimuli, there was little effect of the absolute size of the discrepancy for female-advantage items (r = .01 for named and .33 for unnamed) and a slightly larger effect for the male-advantage items (r = .56 for named and .37 for unnamed). Hence, a cautious interpretation of the findings would be that subjects are primarily sensitive to which sex would be better at identifying the stimuli, rather than to the size of the gender advantage.
Fig. 2. Mean estimated percentage of correct identifications of objects versus actual percentage of correct identifications for women (top) and men (bottom). (Solid regression lines represent the best fit to each set of estimates. The broken lines represent the unit lines.)

.67. Although the majority of these individual correlations were significant at the .05 level, there was substantial variability among subjects' individual correlations, with some subjects' correlations negative or near zero. Individual correlations between feeling of knowing and estimated male–female difference were even more variable. It appears that some judges rely more heavily on subjective feelings of recognition than others but that all consider additional information when determining others' knowledge.

In summary, people's estimates of others' knowledge of every-

Fig. 3. Mean estimated difference in percentage of correct identifications of objects by men and women versus actual difference in percentage of correct identifications by men and women. (Solid regression lines represent the best fit of each set of estimates.)
day objects are reasonably accurate, and these assumptions about the way such knowledge is distributed appear to be shared, as evidenced by the fact that most individuals' estimates were highly correlated with actual values. In Experiment 4, these judgments were used to estimate what speakers assume about their addressee's knowledge.

### Experiment 4

To examine the effects of addressee gender on referring expressions, we crossed two classes of addressees (men and women) with three types of stimuli (female-oriented, male-oriented, and neutral). By using this paradigm, the audience design hypothesis could be tested both within subjects (i.e., across items of greater or lesser recognizability) and between subjects (i.e., across categories of addressees who are more or less familiar with a particular item category).

As in Experiment 2, we expected that speakers would include more descriptive information with the name of a stimulus as the perceived recognizability of that stimulus declined. We also expected the amount of descriptive content accompanying a name to affect the matcher's ability to identify the referent, as indicated by the total number of turns required to establish reference.

Finally, the hypothesis that people's intuitions about what others know are socially shared, so that an individual speaker's presumptions about the audience's expertise can be approximated by group means, was tested by asking each subject to perform, after completing the referential communication task, a knowledge attribution task very similar to that in Experiment 3. If agreement between studies is good, then the use of mean judgments from Experiment 3 as an estimate of speakers' presumptions about their addressees is further validated.

### Method

**Materials.** Two sets of 21 pictures were selected from those used in Experiment 3. Each set consisted of 7 items in three categories, one perceived by subjects in Experiment 3 to be more familiar to men, one more familiar to women, and one equally familiar to both: Set A consisted of tools, kitchen utensils, and musical instruments; Set B consisted of car parts, vegetables, and electronic equipment. Mean difference in estimated percent correct by gender (men minus women) for the male-, female-, and neutrally oriented categories were .20, -.11, and .01 for Set A; and .18, -.08, and .01 for Set B. The direction and size of difference was consistent within each category. Pictures were mounted on notecards, the color of which indicated their category.

For the identification questionnaire that followed the referential communication task, the response sheet used in Experiment 3 was modified to include two additional ratings for subjects who knew the name of an item: a 7-point scale on which they rated their confidence in the name and a place to indicate whether they knew the name prior to the experiment.

Follow-up questionnaires tailored to the subjects' experimental roles were designed to elicit reactions to the referential communication and knowledge judgment tasks and to obtain pertinent background information.

**Subjects and procedure.** Forty pairs of subjects participated in the experiment, 10 of each sex by experimental role combination. Subjects were seated at small tables facing their partners and were separated by a cardboard barrier 53 in. long by 23 in. high (134.6 X 58.42 cm). Their conversations were tape-recorded.

Instructions were identical to those used in Experiment 2, except that directors were not allowed to refer to the notecard's color. Pairs repeated the task three times with each set of cards (half received Set A first, and the other half received Set B first). As in Experiment 2, the cards were presented in a different random arrangement on each trial, but the order within a trial was kept constant for all subjects. Afterward, subjects independently performed the identification task and completed the postexperimental questionnaire.

Audiotapes were transcribed and punctuated, and directors' first-turn utterances were divided into idea units and coded, in the same manner as in Experiment 2 (interrater reliability exceeded 90% for each of these tasks). The content units and words of description in the director's first messages were counted (because very few subjects used category information in this study, it was included in the description word totals), as were the additional speaking turns by both partners required to establish reference. Values were truncated to three standard deviations above the mean.

### Results and Discussion

#### Communication task

As in Experiment 2, the overall pattern of results replicated those reported in the other studies and hence are described briefly (complete analyses are available in Fussell, 1991). Communicators became more efficient at describing the stimuli over trials, both in terms of the length of initial messages (mean content words for Trials 1-3 were 1.7, 1.3, and 1.2, respectively) and the number of turns required to establish reference (mean turns for Trials 1-3 were 2.9, 2.2, and 2.1, respectively), and this was true regardless of whether they knew the name of the target.

To test our hypothesis that prior beliefs about addressees' knowledge affect message production, we examined speakers' Trial 1 messages that contained the name of the target. To ensure that speaker uncertainty was not confounded with attributed knowledge, we excluded all messages in which the name was preceded or followed by a hedge or stated in terms of resemblance. Our hypotheses predicted two effects of attributed knowledge: a general effect of overall identifiability of the target (to men and women combined) and an effect of the listener's gender.

To examine the effects of overall identifiability, we calculated means for each dependent variable by item, collapsing over sex of speaker and sex of addressee. (Names from both stimulus sets were combined for the analyses.) These values were contrasted with the mean ratings of recognizability for each stimulus, averaged across male and female targets, provided by subjects who knew the correct name in Experiment 3 (which we term attributed knowledge in the discussion below).

As anticipated, speakers provided more information as the...
judged recognizability of the stimulus declined, when we used both content units and words of description as dependent measures ($r = -.62$ and $-.66$, respectively, both $p < .01$). These findings were confirmed by multiple regression of each dependent variable onto set (A or B), presentation order, two category variables (hereinafter to be called category as a group), and attributed knowledge. Messages contained significantly less identifying information with the name of the target as perceived recognizability declined; for content units, $t(34) = 4.38$, $p < .001$, $B = -.27$; for words of description, $t(34) = 4.91$, $p < .001$, $B = -1.49$. None of the other factors showed any sign of an effect in either analysis, including presentation order (all $t < 1$).

To examine the effects of gender category membership on message construction, means for each dependent measure were calculated by stimulus and partner sex. All stimuli with at least two observations per partner sex were analyzed in a repeated measures analysis of variance; however, no differences were found. The absence of an effect may have been due to the generally small differences between estimates for male and female targets (see Figure 3), or to the limited number of observations in each cell.

The effects of the amount of descriptive information added to a name on matchers' abilities to identify the target was examined by calculating the number of additional turns it took a pair to settle reference and regressing this value onto content units, presentation order, category, and stimulus recognizability (the proportion of correct identifications in Experiment 3). Main effects were found for order, $t(34) = -2.56$, $p < .02$, $B = -.05$; and for stimulus recognizability, $t(34) = -2.96$, $p < .006$, $B = -1.72$: Fewer turns were required later in the sequence and for more recognizable stimuli. However, contrary to our predictions, the number of content units provided had no effect on the number of turns required to establish reference. Results are much the same when number of words of description is substituted for number of content units in the regression.

As in Experiment 2, shared assumptions about stimulus recognizability were evidenced in subjects' messages for each stimulus: Speakers provided more identifying information as the perceived probability of the addressee's knowing the name of the referent declined. However, the proportion of variance explained by this factor was relatively small, and no effects attributable to the matcher's gender were found. Most curious was the fact that messages for only 20% of the least recognizable targets, and even fewer of the others, included any descriptive information in addition to the name. It appears that our describers' preferred initial strategy was to present the name and see what happened.

Knowledge judgment task. The results of the knowledge judgment task, performed by all subjects after they had completed the referential communication task, provided good support for the assumption that one can model speakers' beliefs about their addressees' knowledge using judgments from an independent group of subjects. Correlations between mean estimated proportions correct for both male and female targets (both $r = .79$, $p < .001$). As Table 2 indicates, the intercepts and raw correlations obtained by regressing estimates onto actual values were quite comparable to those of Experiment 3. When subjects could correctly name the stimulus, they were significantly more accurate at assessing identifiability both to men and to women (both $z > 4.0$, $p < .001$); however, sensitivity to gender differences in performance was unaffected by whether they knew the name of the object ($z < 1$). Individual subjects' judgments showed the same pattern as the group estimates. All but six of the individual correlations for male targets, female targets, and the male–female difference were greater than the minimum required for significance ($39, df = 40$) at the .05 level. These results provide further evidence to suggest that subjects who know what a stimulus object is have socially shared assumptions about that item's identifiability to others.

As in the previous experiments, subjective feelings of recognizability affected subjects' estimates of stimulus recognizability. Rated confidence in one's response was correlated significantly with estimates for male and female targets, but not for the male–female difference (mean individual $r = .48$, .46, and .03, respectively). Likewise, correlations between feeling of knowing ratings and estimates were fairly high for male and female targets ($r = .43$ and .55, respectively) but negligible for the male–female difference ($r = -.11$).

General Discussion

The studies we have presented address two issues: the nature of communicators' prior beliefs about the social distribution of knowledge and the effects of these prior beliefs on message production in interactive communicative contexts. Overall, the results suggest that people are fairly good at making judgments of others' knowledge and that speakers in interactive contexts draw upon these prior beliefs, to a limited extent, in constructing their messages. We address each of these points in turn below.

Beliefs About the Social Distribution of Knowledge

Our studies show that people can estimate others' knowledge with quite good accuracy. The ability appears to be general—applying to public figures (Experiment 1), everyday objects (Experiments 3 and 4), and, from a recent experiment (Fussell & Krauss, 1991), New York City landmarks.

Two lines of evidence suggest that people agree in their perceptions of the social distribution of knowledge. First, almost all individual subject's correlations between estimated and ac-
tual values were statistically significant, and most individuals showed the same biasing effects of knowing the name that was found in the group data. Second, mean estimates by subjects in Experiment 4 were highly correlated with estimates for the same stimuli made by subjects in Experiment 3. Thus it appears that, on the basis of these group estimates, we can model with some accuracy the assumptions speakers make about what their addressees know.

As hypothesized, subjects' estimates of others' knowledge were biased in the direction of their own knowledge. In Experiments 1, 3, and 4, estimates of others' ability to identify a given stimulus were higher for subjects who knew the name of the stimulus than for subjects who did not. In fact, the knowledgeable subjects substantially overestimated the identifiability of even the most unrecognizable stimuli. The same pattern of results was found by Fussell and Krauss (1991) using landmarks as stimuli and appears similar to the estimates of correct responses to general knowledge questions in the Nickerson et al. (1987) study.

The idea that individuals take others' knowledge, beliefs, and feelings into account in formulating their own behavior has wide currency in social psychological theory. To cite just one example, social comparison theory (Festinger, 1954) 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. To make such comparisons, the individual must estimate how these abilities and beliefs are distributed in those populations. Our findings suggest that these perceptions of others' beliefs and abilities are likely to be biased by what the perceiver him- or herself believes and can do.

Although the present studies do not directly address the issue of how people estimate others' knowledge, they do suggest several processes that may be involved:

**Reasoning from one's own memory or cognitive processes.** In Experiment 1, subjects' estimates of a public figure's identifiability to others were highly correlated with estimates of his identifiability to themselves. Similarly, in Experiments 3 and 4, estimates of the identifiability of everyday objects were correlated with feeling of knowing when subjects did not know the name and with confidence in the response when they did. Similar results are reported by Fussell and Krauss (1991) and Nickerson et al. (1987). Nevertheless, there is evidence to suggest that these subjective feelings are not subjects' only sources of information about others' knowledge. In the Fussell and Krauss study, subjects given the names of the stimuli (and thus not uncertain about them) were as good at assessing proportions of correct identifications as those who generated the names themselves. It is possible that an anchoring and adjustment process (Tversky & Kahneman, 1974) is used, in which subjects start with their own feeling of knowing and then revise up or down based on estimated recognizability.

**Inferring from a small number of individuals.** In a pilot study, subjects were asked how they made knowledge judgments about how much students in different majors would know about a variety of topics. The most common responses were that they used a few people they knew as models, used a stereotype of the category, or used both. Although there is reason to be skeptical about self-reports of cognitive processes (cf. Nisbett & Wilson, 1977), a preference for reasoning from small numbers of individual cases rather than from statistical data is consistent with results of several studies of social judgment (e.g., Borgida & Nisbett, 1977; Hamill, Wilson, & Nisbett, 1980; Nisbett, Borgida, Crandall, & Reed, 1976).

**Inferences from others' likely behaviors.** People may also assess what others know indirectly, for example by considering the opportunities to acquire various sorts of information that their typical activities and behaviors provide. Some subjects reporting on their own judgment processes in the pilot study claimed that they considered each major's likely courses of study. Nisbett and Kunda (1985) have shown that subjects can estimate the frequency with which other students participate in various types of activities with some accuracy, but further work is needed to determine whether people can accurately infer what others would know on the basis of their participation in these activities. It is possible that judges use something resembling Kahneman and Tversky's (1982) simulation heuristic; that is, they use the ease with which they could generate a scenario by which the target could acquire the requisite knowledge to assess others' likelihood of knowing.

**Beliefs About Others' Knowledge and Referential Communication.**

We have argued that speakers' beliefs about their addressees' knowledge play an important role in message construction, even in interactional contexts in which feedback from the listener is readily available. The present studies support this hypothesis: The tendency to add identifying information to the names of both people (Experiment 2) and objects (Experiment 4) increased significantly as the perceived likelihood of the listener recognizing these stimuli declined.

Contrary to expectations, however, in Experiment 4 the matcher's gender had no effect on the amount of information provided. This in part may be due to the fact that although subjects perceived some objects to be differentially familiar to men and women, the size of the perceived discrepancy was often small. It would be interesting to perform the experiment again using items of greater differential recognizability to men and women or using a set of social categories for which greater differences in knowledge can be found.

Although we found significant effects of prior beliefs on message construction, models of language use (e.g., Clark & Marshall, 1981; Grice, 1975, Mead, 1934; Rommetveit, 1974) and previous research (e.g., Danks, 1970; Fussell & Krauss, 1989a, 1989b; Isaacs & Clark, 1987) led us to anticipate that the effects would be larger. Communicators in our studies frequently provided little or no identifying information with the name of a stimulus, regardless of its recognizability. Several factors may account for these discrepancies. One is a technical consequence of the fact that the analyses rest on messages in which subjects use the name of the stimulus. It is difficult to determine how many such observations will be obtained from a set of dyads before the transcription of all their dialogues, and this is particularly problematic with items from the low end of the recognizability continuum, which by definition few speakers are likely to know, but which are essential for the analysis. Thus, it
is possible that we simply lacked enough observations to provide good tests of the hypotheses.

A second factor is that the type of knowledge judged—ability to name a stimulus from its picture—is somewhat different from the type of knowledge required by the matcher in the referential communication task. The matcher's task, matching a stimulus with a name, is easier than identifying and naming the stimulus, and it may well be that all speakers assumed that their listeners could identify the target under these constrained circumstances.

It is also possible that subjects were influenced by other aspects of the communicative situation (Higgins, 1981). Even within the constraints of the task used here, speakers may strive for different goals (e.g., to amuse their partners, to create a favorable impression, etc.), and these goals can influence the form their referring expressions take.

Although these factors probably played some part in attenuating the effects of attributed knowledge on communication, the most important determinants probably stemmed from the interactive nature of the task itself. As we argued in the introduction, audience design in conversational contexts has at least two components: prior beliefs about one's communicative partners and feedback from the ongoing conversation. Although we hypothesized that speakers would draw on both sources of information in performing our task, it is likely that the interactive nature of the exchange increased their reliance on feedback and lessened their reliance on prior beliefs. One reason for this may be the "real-time" nature of conversation: Speakers in interaction may not have enough time to consider their addressee's perspective in the way that subjects performing a paper-based judgment task can. Instead, they may be forced to use simplified judgment heuristics (e.g., determining whether the stimulus exceeds some arbitrary threshold of recognizability and, if so, using its name without any supporting information), or they may fail to take the listeners' knowledge into consideration at all.

More importantly, the availability of feedback may lead speakers to rely less on prior beliefs than they would in noninteractive contexts, because they know they can revise their messages on the basis of the addressee's responses (cf. Clark & Wilkes-Gibbs, 1986). This may be particularly true in the current studies, in which the social consequences of producing a more appropriate description are likely to be minimal. In cases where these consequences may be greater (e.g., talking to a superior), we would expect speakers to rely more heavily on prior beliefs. However, although the effects of prior beliefs on message construction were not as strong as we had anticipated, the fact that we found any such effects in an interactive communicative context attests to their important role in the process of audience design.

Although we have discussed prior suppositions and interactively provided feedback as though they were independent components of the audience design process, they are likely to be dynamically related. On the one hand, prior expectations may guide message production and the elicitation and interpretation of feedback. On the other hand, feedback can lead to modifications of one's prior beliefs about the addressee's category memberships and about the kinds of knowledge that are characteristic of a given social category. The roles of feedback and prior beliefs, both separately and in interaction, can only be disentangled when experimental paradigms permit one to assess speakers' prior beliefs independent of their talk.

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