

Conversational Common Ground and Memory Processes in Language Production

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Speakers in conversation routinely engage in audience design. That is, they construct their utterances to be understood by particular addressees. Standard accounts of audience design have frequently appealed to the notion of *common ground*. On this view, speakers produce well-designed utterances by expressly considering the knowledge they take as shared with addressees. This article suggests that conversational common ground, rather than being a category of specialized mental representations, is more usefully conceptualized as an emergent property of ordinary memory processes. This article examines 2 separate but equally important processes: *commonality assessment* and *message formation*. Commonality assessment involves the retrieval of memory traces concerning what information is shared with an addressee, whereas message formation involves deciding how to use that information in conversation. Evidence from the CallHome English corpus of telephone conversations shows how each of these processes is rooted in basic aspects of human memory. The overall goal of this article is to demonstrate the need for a more cognitive psychological account of conversational common ground.

Consider this excerpt from a conversation between two friends who have not spoken with each other for some time:

- (1) A: Oh first of all I have Shana's shower coming up that I have to do.
B: Ah, that's right.
A: That's going to be like a huge like three day effort with all the cooking and cleaning and like actually party [sic] that I have to do.
B: Is there anyone you can get to help you?
A: Um Jessica's going to help and Beth might because you see, Diane is here now.
B: Oh okay. [#4913, 440.30]

What is striking about this example is just how unstriking it really is. Most readers will not find it startling that two friends are able to discuss various acquaintances and events with perfect ease. The smoothness of this interaction might be more surprising, however, if one were to consider more closely the cognitive psychological processes behind the success of referring phrases like “Shana’s shower” and “Beth.” How is it that Speaker A can use bare first names like Beth and Diane with apparent certainty that each name will refer unambiguously? How is it that Speaker B easily accepts these names without having to ask, “Beth who?” More fundamentally, how do Speakers A and B know that they have the same Shana, Jessica, Beth, and Diane in mind?

This series of questions impinge on a construct known as *common ground*, which describes the set of information that speakers and addressees take as being shared for the purposes of conversation. Therefore, an informal answer to these questions might be “Speakers make reference to common ground to design their utterances for particular addressees.” However, the exact extent to which speakers adjust their utterances by virtue of what they believe is mutually known has been controversial in psycholinguistic theorizing (P. M. Brown & Dell, 1987; Horton & Gerrig, 2002; Horton & Keysar, 1996; Keysar & Horton, 1998; Lockridge & Brennan, 2002; Polichak & Gerrig, 1998; Schober & Brennan, 2003). The goal of this article is to attenuate these controversies by proposing a set of mechanisms through which effects attributable to common ground can arise. Specifically, we suggest that the effects typically ascribed to conversational common ground are emergent properties of ordinary memory processes acting on ordinary memory representations. Our object is to give an account of the use of common ground that is sufficiently cognitive psychological to explain both what interlocutors get right and what they get wrong.

We frame our discussion by introducing a distinction between two processes that constitute different aspects of how speakers design utterances for addressees—*commonality assessment* and *message formation*. For each process, we describe how ordinary memory processes can produce effects that have generally been attributed to common ground in conversation.¹ It is important to note, however, that the concept of common ground has also been used to describe the information shared between individuals as they coordinate actions in other, nonlinguistic domains (e.g., playing chess; Clark, 1996b). In this article, we are primarily concerned with the cognitive processes that mediate the use of common ground during language production. As such, we do not intend our claims to obviate the usefulness of common ground as a theoretical construct in these other contexts.

¹Given our theoretical perspective, our use of the term *common ground* is meant to describe an emergent property of ordinary memory processes rather than its traditional definition as the set of information taken as shared with a conversational partner. Instead of relying on quotation marks to make our intended meaning clear in each instance, we simply use the term as is.

PROCESSES OF AUDIENCE DESIGN

As our opening example illustrates, speakers clearly produce utterances that are suited to particular addressees. After all, it is quite easy to imagine that there is a variety of addressees for whom Shana would have no uniquely identifiable referent. When Speaker B shows immediate understanding of who is meant by Shana, we are inclined to say that Speaker A has correctly formulated her utterance against the belief that Shana is part of their common ground. The process of constructing utterances for particular addressees has been called *audience design* (Clark & Carlson, 1982; Clark & Murphy, 1982) or *recipient design* (Sacks, Schegloff, & Jefferson, 1974), and, in general, the phenomenon of audience design is well documented. In a wide variety of situations, speakers adjust their speech to accommodate specific audiences (e.g., adults vs. children: Glucksberg, Krauss, & Weisberg, 1966; native vs. nonnative speakers: Bortfeld & Brennan, 1997; experts vs. novices: Isaacs & Clark, 1987). However, even in mundane conversational contexts, audience design has a central role to play in utterance production. For example, when Speaker A says, “Jessica’s going to help,” the form of her reference presupposes that her addressee will be able to understand “Jessica” as referring to a specific, mutually known individual (Stalnaker, 1978). With an addressee who potentially does not know Jessica, Speaker A would presumably have tailored her reference to reflect this belief, perhaps by saying, “My friend Jessica Smith is going to help.” The central idea behind audience design is that speakers incorporate their beliefs about others’ knowledge into their production processes. Fundamentally, audience design is a type of cooperative conversational behavior (Grice, 1975).

Important as audience design is, as a psychological process it remains woefully underspecified. Although speakers plainly are able to take their addressees into account, the mechanisms through which such adjustments are accomplished remain unclear (for a discussion of this point, see Schober & Brennan, 2003). To make progress in this area, we believe that it is necessary to unpack the different processes that have been grouped under the umbrella of audience design and examine a broad set of circumstances to which they apply.

We begin by making a distinction we believe is critical to an exposition of the uses to which speakers put common ground during conversation. Consider once more our opening example. When Speaker A utters, “Jessica’s going to help,” there are two different questions we can ask:

1. Is Speaker A correct to believe that Speaker B knows this other person?
2. Is “Jessica” the most appropriate form of reference when Speaker B is the addressee?

These two questions illustrate the distinction we make between commonality assessment and message formation. Commonality assessment involves considering

the likelihood that particular knowledge is shared with an addressee. Therefore, as a consequence of commonality assessment, Speaker A's utterance appears to incorporate the belief there is an individual Jessica who is mutually known to both Speakers A and B. Message formation, however, involves deciding how to construct utterances with respect to beliefs about commonality. Therefore, as a consequence of message formation, Speaker A's utterance also appears to incorporate the belief that this individual can be uniquely identified (in this context) by being referred to simply as Jessica. Although these processes are related, they involve decidedly distinct aspects of audience design. Believing that you and your addressee share some set of knowledge is quite different from deciding how to construct utterances that take this belief into account.

The distinction between commonality assessment and message formation also makes it possible to describe at least two different ways in which audience design could fail. This is important because different kinds of design failures potentially have quite different conversational consequences. First, a speaker might misassess commonality. That is, she might incorrectly arrive at the belief that her addressee does not share the required knowledge of the intended referent, or she might incorrectly believe that he does. Therefore, a failure in commonality assessment might prompt an addressee to reply, "Who is Jessica?" or "Of course I know Jessica." Second, a speaker might produce a referring phrase that fails to sufficiently specify an individual who is, in fact, mutually known. Such an error in formulation might lead an addressee to ask, "Which Jessica do you mean?" More important, speakers may be more or less accurate with respect to each of these aspects of audience design.

By proposing a set of specific processes that mediate audience design, we are also in a position to consider how partner-specific considerations might be incorporated into language production more generally. Models of language production (Bock & Levelt, 1994; Levelt, 1989) characteristically assume that speakers initially create a conceptual representation of their intended message that serves as input for subsequent formulation processes. However, the processes involved in the creation of such message representations have been left relatively unspecified (although, see M. Smith, 2000). We suggest that commonality assessment and message formation are intrinsically involved in the generation of messages that reflect speakers' addressee-relevant knowledge. As we shall show, our description of these processes is intended to accommodate the fact that many utterances are produced with a time course that makes effortful considerations of partner-specific information unlikely. The challenge, therefore, is to provide a model of conversational common ground that explains how relevant knowledge representations might become available within the time that speakers routinely allow themselves for utterance planning. By offering a memory-based account for how interlocutors might be prepared to produce utterances that reflect beliefs about common ground, we hope to provide a starting point for further specification of message planning more generally.

CONVERSATIONAL EVIDENCE AND METHOD

To provide explicit evidence for how speakers' utterances may or may not show evidence of audience design with respect to each of our proposed processes, we employ data taken from the CallHome American English corpus of telephone speech collected by the Linguistic Data Consortium (LDC; Kingsbury, Strassel, McLemore, & McIntyre, 1997).² This corpus consists of 120 spontaneous telephone conversations in English recorded and transcribed by the LDC. Volunteer participants were given the opportunity to make a 30-min phone call to a friend or family member anywhere in the world. After all the phone calls were collected, the LDC selected a contiguous 10-min portion of each conversation for transcription. These selections started at random points in the conversations, but never included the very beginning moments when the speakers were giving permission to be recorded. The transcripts made available by the LDC are time stamped and indicate a variety of important information such as speaker changes, idiosyncratic words, partial words, interruptions, overlapping speech, external noises, and nonlexemes like "uh" and "hmm." In addition to the written transcripts, the LDC also provides compressed speech files containing the actual recorded conversations.

From the complete CallHome English corpus of 120 conversations, we randomly selected 40 transcripts. Because each transcript covers 10 min of conversation, this allowed us to examine a total of 400 min of telephone speech, representing interactions between more than 80 different individuals. We used the written transcripts for most analyses, except in a handful of cases in which we resolved ambiguities by listening to the recorded speech.³

COMMONALITY ASSESSMENT

To begin discussion of the first of our proposed audience design processes, consider this brief interchange:

- (2) A: I got a letter from Tamar.
 B: Yes, I told her to write to you. [#6067, 1282.57]

²For complete details, go to <http://www ldc.upenn.edu>.

³We also listened to the beginning sections of some speech files to confirm that particular referents had not been mentioned earlier in the conversation. In the conversational examples presented in this article, the person who initiated the call is marked as person "A," whereas the call recipient is marked as "B." Also, instances of overlapping speech are indicated by pairs of asterisks. We have labeled each example with the four-digit number assigned to the conversation by the Linguistic Data Consortium, along with the timestamp, in centiseconds, for the first turn of the selected excerpt.

In this excerpt, Speaker A makes a reference to an individual, Tamar, who is clearly known to Speaker B. This reference works seemingly effortlessly, presumably because Tamar is part of Speaker A's and Speaker B's common ground. However, simply having information in common may not be enough—on the surface it would seem that interlocutors must also believe that this information is mutually known. For example, Speakers A and B might both independently have knowledge of Tamar, but for Speaker A to felicitously refer to Tamar in conversation, she would also have to believe that Speaker B knows Tamar as well (i.e., she must presuppose that Tamar is part of their common ground; Stalnaker, 1978). In a strict sense, however, Tamar still would not be part of their mutual knowledge. Speaker A would also have to believe that Speaker B believes that Speaker A believes that Speaker B is able to understand “Tamar” as referring to this particular individual. However, even this would not be enough: Speaker B would also have to believe that Speaker A believes that Speaker B believes that Speaker A believes that Speaker B knows Tamar and so forth. As Schiffer (1972) demonstrated, the chain of reasoning involved in achieving true mutual knowledge is potentially infinite.

Such an infinite regress clearly does not represent a psychologically valid approach to the problem of common ground. So how do individuals come to have beliefs concerning mutual knowledge? Lewis (1969) proposed that people rely on the existence of particular *bases* for believing that particular information is held in common. Such bases include prior agreement (i.e., conventions) and contextual salience and are described by Lewis as providing individuals with reasons to believe that certain knowledge is mutually known. Therefore, if it is conventional within a particular community for a nod of the head up and down to mean “yes,” then community members have good reason to believe that all other members of the same community share this knowledge, and such established meanings do not necessarily need to be explicitly (and exhaustively) verified for each and every interaction.

Building on the insights of Lewis (1969) and Schiffer (1972), Clark and Marshall (1981) considered the problem of mutual knowledge with respect to language use. In doing so, they provided an account of conversational common ground that has greatly influenced subsequent theorizing. Clark and Marshall proposed that interlocutors rely on a set of heuristics that involve taking into account particular kinds of “co-presence” between speakers and addressees. Specifically, interlocutors resolve the infinite regress of mutual knowledge by seeking evidence for what Clark and Marshall called *triple co-presence* in which the trio of speaker, addressee, and referent are all “openly present together” (p. 32). Triple co-presence applies in three domains. First, *physical co-presence* refers to information that is in the shared physical or perceptual environment of the interlocutors. Next, *linguistic co-presence* refers to information that can be derived from past and present conversations between interlocutors. *Community membership* refers to information that is part of the interlocutors' shared sociocultural background. According to Clark and Marshall, these co-presence heuristics permit speakers and addressees to as-

sume that information that meets one or more of the requirements for co-presence can, in fact, be treated as mutually known. More recently, Clark (1996a, 1996b) described co-presence as providing a shared basis for beliefs about either *personal* common ground (which includes both physical and linguistic information) or *communal* common ground. Commonality assessment, then, refers to the cognitive processes responsible for allowing speakers (and listeners) to presume personal or communal common ground.

In their original discussion, Clark and Marshall (1981) argued that the complexities of definite reference demand that people possess a special type of memory representation that encodes events that meet the standard of triple co-presence. They called this type of representation a *reference diary* (Clark & Marshall, 1978), defined as “a log of those events we have personally experienced or taken part in with others” (Clark, 1996b, p. 114). Consider a reference by our friend Gertrude to “the man in the red shirt.” Clark and Marshall (1978) argued that, to resolve this reference,

We must search our diary for an entry that provides evidence of the co-presence of the speaker (say, Gertrude), us, and an individual of that description. The diary entry must show that we were physically or linguistically co-present, or that we were co-present in some other sense. That is, we must search in every case for an *event*. (p. 63)

This view postulates the existence of special person-centered discourse representations that capture aspects of mutually experienced situations. To achieve commonality assessment, then, speakers search their reference diaries for events that provide assurance of triple co-presence.

Reference diaries represent an appealing approach to the problem of common ground. However, we suggest that the solution they provide is incomplete. Consider, for example, the question of what constitutes an “event.” First, people can refer to life experiences at many different levels of specificity (e.g., Alex’s birthday party, the period in which Alex was opening her gifts, the moment when she opened her gift from her maternal grandparents). At what level of specificity would people encode events into reference diaries? The answer to this question has implications for the range of circumstances in which people would have to infer triple co-presence, rather than having it directly encoded in a reference diary. Second, events often are not well bounded. Suppose Bunny wanted to assess whether she and Ed had triple co-presence for the moment at which Alex opened their gift. How would Bunny define the temporal limits on that event? Third, any higher level event is likely to have some episodes that meet the criteria for triple co-presence and others that do not. Therefore, it might be the case that Bunny and Ed have triple co-presence for the birthday party (in the sense that Bunny could say, “Wasn’t the party great?”) and for the moment at which Alex was opening their gift, but not for a subsequent moment at which Alex was opening the gift from her other grandpar-

ents. Would Bunny have to segment the events at several different levels before encoding the information into her reference diary? These considerations suggest to us that it would be difficult, in practice, to give a rigorous account of how events would formally be accumulated into reference diaries.

Reference diaries become even less tractable when the focus shifts from dyads to multiparty interactions: It is not computationally feasible for people to mark each memory trace with information about what is co-present with whom. Imagine a conversation involving five participants in which information is freely shared. For triple co-presence to be directly encoded in a diary entry, this would require each participant to rigorously tag each bit of information:

Alan	} were co-present when Beth announced that she was quitting her job.
Beth	
Claire	
David	
Evan	

To meet the standards of triple co-presence—as a precursor for encoding this information into reference diaries—Evan, for example, would have to assure himself that each of the other participants in the conversation seemed to have attended to what Beth said and understood it in an appropriate fashion. Our intuitions suggest that conversationalists do not devote their cognitive resources to such exhaustive marking of co-presence at the moment of encoding.

Instead, we propose that commonality assessment relies on memory retrieval and that the accuracy of commonality assessment will depend on the ordinary episodic memory traces people that encode as experiences unfold. Such episodic traces can frequently provide appropriate associations for later retrieval. For example,

1. Beth announced that she was quitting her job.
2. Alan looked shocked when (1).
3. David laughed when (2).

If no particular association is formed between, say, Beth's announcement and another individual present in the situation, such as Claire, then a speaker might later be unable to recall that this information is co-present for that person as well. Note that we do not want to rule out the possibility that there are some instances in which people encode co-presence information directly. For example, when someone reveals a secret after extracting a promise that the secret will not be passed on any further, it is quite likely that the addressee's representation could directly reflect the putative commonality of that information with the confidant and, more important, the lack of commonality with others. In general, although, we believe

that commonality is latent in memory representations of life experiences.⁴ In the next two sections on automatic and strategic assessment of personal common ground, we describe how memory processes function in the course of language production to make commonality manifest.

Personal Common Ground

Automatic commonality assessment. In their telephone conversations, the CallHome participants frequently appear to introduce topics without engaging in overt assessments of common ground. Consider this excerpt:

- (3) B: I mean I can't even study if I'm with Patrick because I'll sit I'll read stuff
 A: yeah
 B: like I can read a book but I can't like study and because I don't I can't block everything out
 A: yeah
 B: so
 A: So you guys are still seeing each other? [#4325; 205.19]

Although the conversationalists have been discussing the exigencies of studying for several turns, Patrick has not been mentioned prior to this point. Furthermore, Speaker B appears to refer to Patrick without a struggle. That is, we get no sense that the speaker paused to consider whether knowledge of Patrick was shared or whether “Patrick” was an appropriate way to refer to the concept of this individual. Speaker A’s last utterance, “So you guys are still seeing each other?” confirms that Patrick—and much more—is in common ground. In this section, we provide a model of how judgments of common ground can be made in an automatic fashion.

Speaker B’s utterance in Example 3 suggests that she unreflectively believed that knowledge of Patrick was shared between herself and her addressee. As we noted earlier, Clark and Marshall (1981) argued that what we are calling commonality assessment can be reduced to a standard of triple co-presence. We propose, however, that automatic commonality assessment relies on a weaker standard: If the speaker has a strong enough pattern of associations in memory between his or her addressee and the intended referent, the likelihood is reasonably high that they have this information in common. With respect to the previous example, our claim is that Patrick emerged automatically as a valid conversational referent because, with Speaker A serving as a memory cue, Patrick became relevant as part of the content of Speaker B’s collection of accessible memory traces.

⁴We have argued that reference diaries are not feasible as representations that underlie audience design. However, if future evidence supports the existence of reference diaries, we would still propose that they are typically acted on by nothing more than ordinary memory processes to yield appropriate topics for conversation.

Of course, the mere presence of a body of memories that associate an addressee with a referent does not ensure commonality, as we shall see when we discuss circumstances that may lead speakers to make errors. Even so, we believe that the likelihood of associations being informative is sufficiently high that automatic commonality assessment need not be conceptualized as anything more complex than the product of ordinary memory search (Gerrig & McKoon, 1998). Specifically, each participant in a conversation (or rather, the concept of that individual in memory) can potentially function as a cue for the retrieval of associated information. This automatic, cue-based search imbues a range of related individuals and other topics with extra accessibility—*readiness*—in memory. It is that readiness that makes these representations available to other processes in speech production and comprehension.

This automatic search of memory involves a memory process that has been called *resonance*. Resonance is a fast, passive, and effort-free mechanism in which cues in working memory interact in parallel with information residing in long-term memory (akin to global-matching models of recognition memory; e.g., Gillund & Schiffrin, 1984; Hintzman, 1986, 1988; Ratcliff, 1978; see also Nelson, McKinney, Gee, & Janczura, 1998). Because resonance provides a parallel search of memory, a wide range of associated information can potentially become more accessible; resonance has been implicated as a memory process that functions quite broadly, for example, in the course of text comprehension (e.g., Albrecht & Myers, 1998; Gerrig & McKoon, 1998; Gerrig & O'Brien, 2005). For conversational situations, we suggest that other individuals function as highly salient cues to make information with which they are associated ready. Moreover, although resonance processes may change the accessibility of a potentially large pool of information, the memories that are most highly and consistently associated with a cue will become most ready—and it is those memories that are likely to constrain the processes of language production. Even so, those representations must become sufficiently ready with respect to an appropriate threshold and must do so within a time frame that will allow them to have an impact on production processes. Under this constraint, partner-specific associations that are either too weak or too slow to reach threshold will not sufficiently influence subsequent utterance planning.

Because our evidence comes from conversations, it is difficult to make strong assertions that particular judgments of commonality were made automatically. Still, most of the transcripts have passages that fit the metaphor of readiness. Consider this excerpt:

- (4) B: I talked to Kristen though when I was home.
 A: yeah?
 B: yeah. She seems to be doing well. She's working which is good and she's got um she's healthy again.
 A: That's good. [#4245; 617.07]

The time course with which Speaker B mentions Kristen and the news about her health suggests that these topics presented themselves to language production processes as co-present without strategic reflection. In addition, Speaker A accepts both topics without difficulty.⁵

Note that this account of automatic commonality assessment as resonance based makes the label itself (i.e., commonality assessment) partially infelicitous for at least two reasons. First, associations in memory do not themselves provide conclusive evidence of commonality. As will become apparent when we discuss errors with respect to judgments of common ground, speakers' utterances will sometimes be flawed because resonance leads to mistaken assessments of commonality. Second, the term *assessment* appears to suggest a strategic process, although it is intended to apply equally to cases where evidence for commonality is recovered automatically from memory. We accept these limitations because we emphasize that the outcome of commonality assessment will be equivalent in both automatic and strategic situations.

Most instances of automatic commonality assessment are those in which topics present themselves to speakers without strategic intervention. Therefore, in the example that opened this section, "Patrick" presented itself as a topic to Speaker B because Speaker A, acting as a memory cue, enabled sufficient readiness for general or specific memories of Patrick to cross the threshold for language production. As Clark and Marshall (1981) pointed out, however, having beliefs about commonality does not assure speakers that particular topics will actually be in common ground. In that sense, the validity of this proposal will rest on the extent to which it predicts the types of errors that speakers make. First, however, we outline the circumstances in which speakers exercise strategic control over the processes of commonality assessment.

Strategic commonality assessment. For example, often speakers appear to strategically consider whether certain information is co-present between themselves and an addressee:

- (5) B: But guess who got deep selected?
 A: For commander?
 B: yeah.
 A: Let me think. Oh, it's got to be Barney. [#4415; 321.42]

⁵Although it would certainly be possible (if laborious) to calculate the timing between successive utterances, this would not allow us to be completely certain about the automaticity of commonality assessment in particular instances. Although it might be possible to interpret inordinately long pauses as indicative of strategic processing, there is not much one could say about a pause of, say, 0 ms because there is no way of knowing what conversationalists are doing, or preparing themselves to do, while the other person is speaking. Therefore, an immediate and fluid utterance might truly be the result of automatic processes or it might be the result of strategic planning that was initiated several seconds earlier. Even so, the majority of routine utterances probably do involve automatic activation of relevant information.

In many respects, this example provides the strongest assumption of common ground in the conversations we considered. Speaker B is sufficiently certain in her judgment about what is mutually known to her and Speaker A that she allows Speaker A to play a guessing game. It seems very likely, under these circumstances, that Speaker B preplayed the game. That is, she likely made a strategic appraisal of the information she had associated with Speaker A in memory—to ensure that the question, “But guess who got deep selected [for commander]?” would yield a unique response. Given the extent to which information about Barney pervades this particular conversation, it seems reasonable to assume that other information about Barney had been made ready through the automatic process of resonance. Still, the guessing game suggests strategic intervention.

As was true in our discussion of automatic commonality assessment, the nature of the evidence does not permit unambiguous conclusions about the processes that underlie commonality assessment (i.e., we cannot definitively support our sorting of automatic and strategic in every instance). What becomes clear, however, is that speakers make reference to memory processes with reasonable frequency to obtain explicit confirmation of the commonality of particular information. Consider Example 6 in which Speaker A is trying to arrange a visit with Speaker B. Toward the end of the excerpt, Speaker A tries to alleviate some confusion by confirming that they have co-presence for Speaker B’s departure date from the locale Speaker A wishes to visit:

- (6) A: So um but anyway I want to come visit you.
 B: When?
 A: Next summer.
 B: oh I’d love to except you have-
 A: You’re going to be gone. What?
 B: See I don’t know how long I’m going to be here.
 A: oh
 B: What, I- d- do you mean like early summer or late sum-
 A: {breath} Well I mean your, your w- job goes through when July, June of next year?
 B: yeah. I was hoping to be out of here before July. [#4245; 848.09]

Table 1 contains various examples from the CallHome corpus in which speakers explicitly query what their addressees remember. Several queries appear to function as *presequences* for subsequent conversational moves (Clark, 1996b; Schegloff, 1980), through which speakers ascertain whether their addressee can recall a relevant memory for what they want to talk about. In general, moments when addressees answer, “Yes, I remember,” or otherwise confirm that they have the right referent in mind, exemplify what Clark and colleagues (Clark, 1996b; Clark & Brennan, 1991; Clark & Schaefer, 1987) described as *grounding*. Grounding occurs when speakers and addressees provide evidence that they have understood one another with respect to a particular topic. It is also a way in which

TABLE 1
Examples of Explicit Queries About Commonality

-
1. A: I'm I'm w- well, I'm all right. I'm okay, but, eh, you know, do you remember how I was feeling when I was in in um man like just wanted to like quit the program, and I'm sick of it, and- {breath}
- B: yeah.
- A: I'm feeling that way again. {laugh} [#4485; 25.97]
2. B: well speaking of animals {breath} remember the fleas we had at Immaculate Conception last year that I was telling you about?
- A: Yes yeah.
- B: They're back again. [#4665; 1070.34]
3. B: Well no they're not up but I'm playing it's uh just it's very hard to get my chops back in form but I'm going to try, I'll tell you what's happening {breath} uh first of all you knew that we had Conti here last year.
- A: yeah but I haven't talked to hi- yes I did talk to Conti, yeah, mhm [#4702; 96.55]
4. B: on uh November third Roman Schvala
- A: mhm
- B: Remember that name?
- A: Sure.
- B: Very good tenor man.
- A: yeah. [#4702; 679.26]
5. B: And remember I told you I got attacked by that bird in the-
- A: Yes. *In the park*
- B: *Well that wasn't-* yeah, it wasn't the same kind of bird he was just trying to steal my food. {breath}
- A: He wanted *your sandwich.* {laugh}
- B: *But there are bir-* Right. [#5242; 657.61]
6. A: {breath} *I mean I know the I know* the one that- do you remember Lowai?
- B: *some of them are-* yeah [#5278; 954.70]
7. B: a lot of kibbutz people go there. Th- c- the it's right by the tennis courts they built it. If you remember, *near the swimming pool and the tennis courts* at the other end of town there.
- A: *oh yeah m-,* oh it's by that [#6107; 1329.72]
-

speakers strategically seek evidence for commonality (see also S. W. Smith & Jucker, 1998). For instance, Example 5 in Table 1 provides an instance in which Speaker B, seeking evidence for commonality, suggests that Speaker A should remember an episode of a bird attack, which Speaker A confirms by offering, "In the park. He wanted your sandwich." This incident can be treated as co-present (i.e., grounded) for Speakers A and B once Speaker B accepts this information ("Right"). In such cases, the process of commonality assessment is made overt.

The CallHome corpus also provides several instances in which speakers are unable to recall whether they had, in fact, shared information with their addressees, presented in Table 2. These moments quite strongly demonstrate the ways in which commonality assessment relies on ordinary memory processes. Presumably, the speakers have reason to believe that the particular information is the type of infor-

TABLE 2
Examples of Speaker Uncertainty About Previous Communications

-
1. A: But did I tell you this? He said they might be moving.
B: oh no [#4913; 695.45]
2. A: It is- Oh do you know what we did Wednesday?
B: *mm mm.*
A: *Went to* Wisconsin with Ann Hanson. Or did I tell you that already?
B: No
A: Yes
B: No
A: uh y- her sister lives up in Beaver Dam.
B: ohhh.
A: and Dotty, Marianne and I wanted to go to this quilt uh *store up there.*
B: *oh right.* Yes. I remember. [#5242; 846.94]
3. A: God I went out on this date and had like the biggest flop ever have I talked to you since then? {laugh}
B: {laugh}*No you haven't*
A: *it was so pathetic* and we had nothing in common nothing it was like *oh well*
B: *yeah you wrote* to me about him. [#5931; 359.17]
4. A: I got you. Yeah I've got another buddy who, uh, is a marine pilot. I'm trying to think if you had ever met this guy. I don't think so. [#4415; 419.19]
-

mation that they would have shared with their addressees. Still, they cannot (apparently) find an episodic memory trace that confirms the telling. A construct from the memory literature that seems particularly relevant here is the distinction between *remember* and *know* judgments (Rajaram, 1993; Tulving, 1985). In experiments exploring the remember-know distinction, participants are asked to differentiate between instances in which they can consciously recollect learning a particular item (i.e., they can retrieve a specific episodic trace) versus instances in which they know that they learned the item but cannot remember exactly when. We suggest that a similar distinction informs speakers' strategic judgments of commonality. In some cases, they are able to retrieve an episodic trace that supports commonality, which corresponds to remembering the fact that certain information is indeed co-present. In other cases, they know they have commonality in the absence of an episodic trace. We suggest that these cases of knowing without remembering would be more likely to give rise to the types of explicit queries found in Table 2.

Previously, we suggested that automatic and strategic assessment have functional equivalence. In both cases, speakers are poised to formulate their utterances as a consequence of having obtained some indication (veridical or not) of whether triple co-presence holds. We emphasize, however, that the final products of commonality assessment need not always occur prior to message formation. Although we are discussing commonality assessment and message formation separately, we believe that the processes interact. Clearly, the products (or partial products) of commonality assessment contribute to the formulation of referring phrases. In re-

turn, the processes underlying message formation may influence the assessment or reassessment of commonality. Indeed, the demands of fluent conversation may cause speakers to execute particular utterance plans before evidence concerning commonality is sufficiently ready. Such utterances may be marked as provisional, perhaps through the use of hedging devices or intonation. As message formation processes make further partner-specific associations available, however, speakers would subsequently have a firmer basis from which to assess commonality. Consider the second example in Table 2. In that example, as Speaker A formulates her description about “what we did Wednesday,” she appears to grow more certain that she did, in fact, already narrate the day’s events to Speaker B.

Our analysis is largely focused on the processes that give rise to speakers’ utterances with respect to new conversational topics. Even so, the examples in this section suggest how, ultimately, speakers’ utterances also provide evidence of reciprocity between speakers and addressees. Consider once again Example 5 from Table 1. In this instance, Speaker A contributes “In the park,” which facilitates Speaker B’s ability to make a contrast between the current event he is narrating and the prior story. The interaction between Speakers A and B presumably enhances memory retrieval so that Speaker B appears, subsequently, to behave as if fairly detailed recollections of the prior story were co-present (e.g., “it wasn’t the same kind of bird”). Given our view of commonality assessment and message formation as consequences of ordinary retrieval processes, we would expect it generally to be the case that interactions between speakers and addressees will have a critical impact on how audience design manifests itself in conversations (Clark & Krych, 2004).

Finally, because the examples presented in this article come from telephone conversations, linguistic co-presence was of far greater importance than physical co-presence, which was only occasionally relevant when conversationalists talked about background noises and similar auditory events. As a memory-based model of common ground, our account is not necessarily intended to cover instances involving current physical co-presence. However, to the extent that message planning evokes episodic traces about prior physical co-presence, then the processes of commonality assessment should still apply. Here is an example from the CallHome corpus that appears to involve memory retrieval for physical co-presence:

- (7) A: And you got a little house- is it similar to ()? [name of the referent is unintelligible]
 B: yeah- yeah it’s yeah
 A: oh
 B: It’s about- oh no smaller than theirs. It’s about the size of their sitting room, kitchen and one bedroom.
 A: oh yeah [#5232; 526.24]

In the first line, Speaker A’s query clearly presupposes that Speaker B shares knowledge of this other house. Speaker B’s eventual response, however, appears to draw on specific knowledge concerning the house’s physical characteristics. We

suggest that moments like this are the result of commonality assessment working off of associations in memory between particular individuals and perceptual aspects of previously experienced events.

Errors with respect to personal common ground. We have suggested that audience design processes assume commonality based on the existence of a pattern of associations in memory between an addressee and another individual or event. However, it is fairly easy to imagine scenarios in which an association exists in the absence of commonality, or in which an association is too weak to be recognized as such for the purposes of commonality assessment. Under these circumstances, we predict that speakers would be likely to plan an utterance that would reflect a misassessment of commonality. There are a number of cases in the CallHome corpus when something exactly of this sort seems to happen. At these moments, speakers are often compelled (either of their own accord or through feedback from the addressee) to explicitly check whether some item of information is mutually known. In Table 2, Example 2 presents a moment in which a speaker asks, “Or did I tell you that already?” Here is another example:

- (8) A: yeah okay {breath} I told you about the shampoo did I tell you?
 B: What shampoo no [#4623, 274.22]

Here, Speaker A begins by making an assertion about the commonality of “the shampoo,” but almost in the same breath seems to realize her mistake and asks her addressee to confirm whether this information is, indeed, part of their common ground.⁶

In general, our resonance perspective assumes that the likelihood of errors will depend on the nature of the associations in memory between concepts for individuals and other types of information. For example, certain individuals may be strongly associated with one another in memory (e.g., a close group of friends), and information encoded with respect to one person may be misassessed as being shared among other members of the same group. Because errors of this sort reflect uncertainty about the set of individuals with whom speakers have previously discussed certain information, they represent a type of *source monitoring* difficulty (Johnson, Hashtroudi, & Lindsay, 1993; see also Marsh & Hicks, 2002). If the memory traces activated in the context of a particular addressee do not contain sufficient specific episodic information about relevant prior conversations with that individual, moments like that found in Example 8 containing “Did I tell you?” can

⁶As described in Clark (1996b), moments like “Did I tell you ... ?” also function more generally as devices used by speakers to give addressees the opportunity to decline to hear particular conversational contributions (such as jokes; Sacks, 1974). Our focus is on instances where apparent uncertainty about past interactions motivates speakers to check for commonality.

result. Similarly, consider this instance in which two friends are in the midst of catching up on various aspects of each other's lives, such as children:

- (9) A: yeah they're doing good. We have another one too, Colby. Did I tell you that? [#6861, 1062.37]

Here, Speaker A is unable to clearly recall whether she has told Speaker B about her newest child, presumably because Speaker B normally belongs to the group of people with whom she would generally be expected to share such good news.

The manner in which associations between individuals are encoded in memory can also lead to more straightforward source monitoring problems. For example, the conversationalists in the previous example later go on to discuss a pair of mutual acquaintances, but Speaker B has extensive difficulties in trying to recall where she heard certain information about this couple:

- (10) B: [...] I know that they'd had some some problems you know between them. And I thought they'd worked them out. But-
 A: In their marriage?
 B: yeah.
 A: Well see I didn't know that.
 B: s- someone had told me I think you had told me that or someone had told me that.
 A: No I didn't even know. Yeah this is news to me.
 B: Well e- whoe- I don't know when someone told me that but
 A: I hope everything is okay
 B: Someone had told me that s- one time and it seemed like they'd worked things out- [#6861, 1104.73]

Such moments demonstrate how associations between representations for close friends or colleagues can easily lead to incorrect beliefs about the information shared by those individuals.

The memory literature contains several analogs to this phenomenon. Consider, for example, the false memory paradigm reported by Roediger and McDermott (1995, 2000). Roediger and McDermott (1995) asked participants to study lists of related words like *bed*, *rest*, *awake*, *tired*, *dream*, and so on. A strongly associated target word (e.g., *sleep*) was, critically, always absent from the studied list of words. When later asked either to recall the entire list or to recognize test words as old or new, participants reported having seen the critical word about as often as words that were actually on the list. Roediger and McDermott (1995) suggested that nonpresented items like *sleep* are activated at encoding through some form of associative priming and that later, at retrieval, participants must engage reality monitoring processes (Johnson & Raye, 1981) to decide whether a retrieved item was actually seen. This activation–monitoring model bears a strong similarity to the present resonance-based account of commonality assessment. To the extent that normal memory processes result in the

activation of associated information, that information has the potential to enter into concurrent speech production processes.

On the other hand, resonance can be successful only to the extent that cues are present and available with sufficient strength to reach threshold. Therefore, when associations between individuals and other information are weak (or missing altogether), the processes of commonality assessment will not be able to reveal, within any reasonable time course, that certain information can be treated as co-present. Again, the memory literature contains multiple examples of this sort of retrieval failure. Context-dependent memory, for example, illustrates how associations between particular information and the context of learning can influence whether that information is subsequently retrieved from memory (S. M. Smith, 1994). If people are unable to access the right sorts of contextual associations, then retrieval may be impeded.

In a recent experiment, we tested this claim by varying the ease with which speakers could associate particular information with particular addressees (Horton & Gerrig, in press). As part of a referential communication task, we placed one group of speakers in a situation in which each of two different addressees could be uniquely associated with different referential domains. For the other speakers, however, both addressees were associated with the same domains. Analyses of the speakers' referring expressions revealed that they were more likely to adjust their utterances toward the communicative needs of their partners when each addressee could be associated with a unique referential context. This result demonstrates the tight coupling between memory availability and language use.

Returning to the CallHome corpus, we examined the prevalence of difficulties in assessing commonality. In Table 3, we present all 12 instances from our sample of conversations in which there was explicit evidence of an error with respect to personal common ground. These errors were of two kinds: In some instances, speakers treated as new something that they had already told their addressee at some point in the past. In other instances, speakers treated as given something that they had not previously informed the addressee about (for a similar analysis, see Auer, 1984). We found 2 cases of assuming too much and 10 cases of assuming too little. Therefore, when errors of this type occurred (or, more accurately, were marked as such by the addressee), it was more likely to be the case that speakers erred by being conservative and assumed that particular knowledge was not shared. In these circumstances, the addressees in our transcripts indicated the error by saying things like, "I know" or "Yeah you told me."

Communal Common Ground

In our discussion of personal common ground, we presented examples of the fluency with which speakers appeared to make use of information concerning commonality. Although the bulk of the conversations covered topics that were per-

TABLE 3
Errors in Commonality Assessment Based on Personal Common Ground

Assuming too much

1. B: I think I had mentioned before that, um, that uh, that uh, that there's a company now that I'm working with um, uh, which is very much just, just myself and Gus.
A: oh
B: And that um
A: No, you hadn't mentioned that. [#4074; 147.70]
2. A: yeah okay {breath} I told you about the shampoo did I tell you?
B: What shampoo no [#4623; 274.22]

Assuming too little

3. A: Actually I've, I've been up to Holland before. Spent about two weeks up there.
B: {breath} yeah.
A: So um, but that was years and years ago.
B: With your parents when your father was stationed over here, right?
A: Yeah. [#4093; 1186.35]
 4. A: I forgot to delete e- ouchies from
B: Yeah you told me.
A: Did I tell you that?
B: And they said ouchies?
A: Yeah. And I, yeah, I explained a little bit. [#4432; 461.93]
 5. A: What *about Jochanan?*B: *At the beginning-* Jochanan's five year's old.
A: I know. [#4564; 309.78]
 6. B: He he um he he's like got a a very good schedule.
A: Yeah you wrote me. You're very lucky. Dvora's baby is not a good baby I'm telling you
{laugh}
B: I know she told me he's horrible. [#4629; 670.19]
 7. A: In January we we're actually planning on going every Monday eh oh I didn't tell you our hours. *The nor-*A: *Well yeah* you did eleven to five [#4702; 430.96]
 8. A: um but uh I there are a couple of things that I wanted to be sure to mention to you
B: yeah
A: One is that um Isabelle was one of four women who made the centering prayer retreat.
B: okay I read that sure in your letter okay. [#4705; 1206.73]
 9. A: My nephew's name is Jeff McDougal
B: yeah
A: He made his vows in the Jesuits a year ago.
B: You said that.
A: I I couldn't remember if I did or not. [#4705; 1334.66]
 10. A: [...] and he was caught selling so- you know to a person lumber {laugh}
B: {laugh}
A: So yeah that's I I I jeez I had forgotten about that um well you mentioned that- I I was under the impression that you'd already know about this
B: yeah I know that's okay. [#5166; 383.61]
 11. B: this one guy with- who was like a a fresh br- breeze blown through the factory uh uh uh twenty-four twenty-five year old guy
A: oh yeah you mentioned him [#5278; 728.75]
 12. A: or my um my friend lives in Harrisburg and she wants to go to like Hershey Park um
B: isn't that *the one that was-*A: *they have-* huh?
B: that just moved? that's the one that just moved
A: yes sh- yeah my friend just moved there and the thing is um- [#5931; 877.42]
-

sonal, the CallHome corpus provides similar examples with respect to communal common ground. Consider Examples 11 and 12 in which speakers achieve abrupt topic changes by making assumptions of community membership:

- (11) A: Anyway. So how's the weather?
 B: You know it's really nice.
 A: mhm
 B: It's not as, h- how's the weather over there? How come people are dying in Chicago, huh?
 [#4245; 939.71]
- (12) B: It's really wonderful. It's such a happy news, you know?
 A: Well, it's different.
 B: We had such a hard time here this morning. We had such a difficult time here this morning.
 A: It's different. I can imagine. I can imagine. I read the paper and heard the news.
 B: Jerusalem oh th- you know it. It's so devastating I can't begin to tell you. {breath} A hundred people are wounded and seven dead. [#4673; 211.03]

In each case, the speaker who introduces the topic (i.e., heat wave-related deaths in Chicago and a suicide bombing in Jerusalem) makes a strong assumption that news of the events will be accessible to the other party. As we did for personal common ground, we suggest how memory processes function to make such language performance possible.

As with personal common ground, communal common ground can be assessed in an automatic fashion. Recall that our claim with respect to the resonance model is that people serve as cues for memory searches. A parallel suggestion for community membership is that people are associated with communities and that the concepts of those communities can serve as memory cues as well. Such communities range from broad categories like *speakers of English* to more circumscribed categories of individuals like *cognitive psychologists* to very particular and localized groups like *residents of the 5400 block of Elm Street* (Clark, 1996a, 1996b). Any given individual simultaneously belongs to a large number of diverse and only partially overlapping communities. The belief that one's interlocutor belongs to one or more of these communities could potentially facilitate retrieval of a whole host of related information from memory.

The range of circumstances in which information concerning communal common ground can emerge automatically may be reasonably constrained, however, because many relevant communities do not exist in a way that would allow them, *a priori*, to contribute to memory encoding. Instead, many types of communities appear to be constructed as *ad hoc categories* (Barsalou, 1983). Unlike more stable, permanent knowledge structures, an *ad hoc* category like "things to take with you in case of fire" is created on the fly to serve a particular purpose. In a similar sense, groups of people can be thought of as belonging to an *ad hoc* "community" that does not necessarily exist outside the immediate communicative context. Consider this excerpt in which Speaker A is relating the story of a recent date:

- (13) A: So I {breath} and I'm thinking okay what can we talk about for all this time so we drive twenty minutes to go to like an Applebees you know Applebees?
 B: uh-huh [#5931, 390.69]

Here, it is easy to imagine that the community of “people who know Applebees” would be hard to define. Therefore, it seems unlikely that this community could be used as the basis for a resonance-driven memory search.

We can, however, find communities that seem sufficiently well-defined to serve as automatic memory cues. For example, if two individuals are students in the same class, it would be reasonable for them to assume that anything that happened in that class could be treated as co-present. The class would, in effect, serve as a distinct cue for communal common ground. The CallHome corpus provides several examples of this sort. Here is an exchange between two people who are apparently members of the military:

- (14) B: We've had a big change of uh leadership over here.
 A: oh yeah?
 B: yeah, the base CO changed. The clinic OIC changed. The clinic CU nurse changed. And just trying to get uh, you know, the feel for how everybody else is you know, going to respond to them, and how they're going to respond to everybody else, has been trying, to say the least, for the past oh, probably, month or so.
 A: yeah [#4415; 32.26]

Speaker A apparently has no trouble understanding what Speaker B means by the “base CO,” “clinic OIC,” and the “clinic CU nurse.” In such cases, a community like the military can act as a cue for the automatic assessment of commonality, resonating with other structures in long-term memory to increase the accessibility of particular types of information.

Even so, many instances of commonality assessment with respect to communal common ground will require strategic uses of memory. For example, a student might run into a friend on campus and do a conscious memory search to determine which classes they have shared together. That explicit search should make available a range of topics and individuals about which commonality can be assumed. Similarly, a speaker might wish to refer to a particular public figure or celebrity. The speaker again might engage in a memory search to assess the probability that the addressee is part of a community in which the target individual is well known. Previous research has provided clear examples of this kind of community-based assessment. For example, Isaacs and Clark (1987) asked native New Yorkers and novices to match sets of postcards depicting New York City landmarks. Part of the participants' task involved discovering what their partners knew (or did not know) about New York, and then using that information to tailor their descriptions as needed. When the community is not obvious (being a native English speaker is generally immediately apparent; in most cases, being a native Californian is not),

speakers and addressees have to engage in explicit assessment to determine what can and cannot be considered shared knowledge.

In our sample from the CallHome corpus, we found three examples of explicit assessment, including the Applebee's mention in Example 13. Here are the other two cases:

- (15) A: I think I'm going to take it do you guys have tele courses? Do you know what those are?
 B: What are they?
 A: Tele courses. It's like you get a video [#4325; 506.23]
- (16) A: [describing a particular type of plant] And you know they have those stiff pods-
 B: mm-hm
 A: —in the fall you know? So anyway Kendall must've bent down and poked her eye.
 B: {gasp} [#5242; 620.16]

In these examples, knowledge of “tele courses” and “stiff pods” resides within ill-defined communities. As a result, speakers confirm that these concepts are present in common ground.

Errors with respect to communal common ground. Just as we suggested in the context of personal common ground, errors in communal commonality assessment are possible whenever people misjudge, in an automatic or strategic fashion, the information that they share with other members of particular communities. We know from research by Fussell and Krauss (1991, 1992) that people's assessments of the sociocultural knowledge possessed by others are not completely veridical. For example, Fussell and Krauss (1992) asked participants to estimate the likelihood that other Columbia University students would recognize a set of famous and not-so-famous faces. Although these judgments on the whole were highly correlated with the faces' actual identifiability, there was nonetheless a systematic bias in the direction of what the participants themselves actually knew. People who were able to recognize Alexander Haig tended to overestimate the degree to which others would recognize Haig as well. Therefore, there may exist particular biases in people's assessments of what is or is not communally known. More specifically, speakers might regularly assume that their addressees are more similar to themselves than, in fact, is really the case (Nickerson, 1999). Such a bias could lead to systematic errors in commonality assessment with respect to communal common ground, for example:

- (17) A: and one of her students showed her how to get into the X five hundred directories.
 B: which are?
 A: hm?
 B: what are the X five hundred directories?
 A: oh um where you put- your um how c- how can you not know? [#5273, 304.71]

Here, Speaker A apparently overestimates her addressee's knowledge of the X500 directories, and then, in fact, scolds him for lacking this knowledge.

A second source of errors with respect to community membership could arise when people are, in fact, members in the same well-defined communities but there are external reasons why a community member lacks some particular set of knowledge. We mentioned, for example, the idea that everything that transpired in a class could be taken as common knowledge among class participants. However, if you are talking to a friend who, unbeknownst to you, missed class, you might very well make an error by inappropriately assuming certain information to be co-present. Such cases are interesting because it is due to the very fact that a group is well defined that it becomes difficult for a speaker to recall exactly which members of the group have already been informed about certain events or topics. As we suggested earlier, there are particular circumstances, such as secrets, when it may be more important for people to encode information with respect to particular individuals within a larger community. Otherwise, that information may merely be encoded in association with the community more generally.

We found seven instances in which speakers made an error in assessing commonality with respect to communal common ground, presented in Table 4. As before, the speaker could assume that the addressee already knew something that he or she, in fact, did not know, or the speaker could assume that the addressee did not know something that he or she, in fact, did know. In general, analogous to the Fussell and Krauss (1992) results, speakers showed evidence of overestimating the degree to which other people would know certain information given that they themselves knew this information.

MESSAGE FORMATION

The second process that we suggest is crucial for understanding how speakers design utterances for addressees is message formation, which refers to the process of constructing utterances to reflect the information believed to be shared with particular addressees. Clearly, message formation can also describe a much more general set of processes in language production (Levelt, 1989), but our focus here is on the aspects of message planning that are centered on audience design. Otherwise, we assume that language production is carried out as described by standard models of utterance planning and execution (e.g., Bock & Levelt, 1994; Levelt, 1989; Levelt, Roelofs, & Meyer, 1999).

To understand why it is important to distinguish message formation from the process of commonality assessment, consider the following case of relatively straightforward personal reference: You and a colleague are both acquainted with a third individual, and you both know that you both know this other person. In other words, facts about commonality (assessed either strategically or automatically) are not ambiguous in this situation. However, what *is* open to question is how best to refer to this person. Given that there is an almost infinite variety of ways in which people can refer (R. Brown, 1958), speakers must still decide which formulation is

TABLE 4
 Errors in Commonality Assessment Based
 on Communal Common Ground

Assuming too much

1. A: It's about being a blue collar man.
 B: I guess so.
 A: They're the ones who can eat all day.
 B: Really? Well I mean he does work his ass off so- [#4092; 279.65]
2. B: and now that I'm leaving, going back to Duesseldorf she's all going crazy. um and thinks eh she's eh c-concluded that I'm abandoning her.
 A: oho
 B: But it is-
 A: Being stalked here {laugh}?
 B: Pardon?
 A: In America, we would say are you being stalked? [#4234; 981.33]
3. B: Why don't you don't you have total phone like you know
 A: total phone? {laugh}
 B: It wo- eh do you know what that's what how would you {laugh}
 [B explains what total phone is, then at 1039.53:]
 A: oh here it is Priority Party Call
 B: Party calls?
 A: Party calls.
 B: total phone {laugh} [#4245; 1004.21]
4. A: we might be getting lofts {breath}
 B: huh?
 A: we might be getting lofts
 B: I might be getting lost?
 A: loft in in our room. L O F T S lofts, to give us more room under do you understand?
 Instead of-
 B: um, I don't know what a loft is. [#4838; 855.24]
5. A: and one of her students showed her how to get into the X five hundred directories.
 B: which are?
 A: hm?
 B: what are the X five hundred directories?
 A: oh um where you put- your um how c- how can you not know? [#5273; 304.71]

Assuming too little

6. A: um readjusting as far as Americanisms
 B: mhm
 A: uh Blimpie's scared me. Blimpie's is the sandwich place {laugh}
 B: {laugh} I know. I know. [#4245; 568.02]
 7. B: I guess he buys the books for uh something called Borders which is a bookstore that car-
 A: Yes we have it here too. [#4569; 211.13]
-

most appropriate for a given situation. For example, with your colleague you might refer to this mutually known individual variously as "Frank," "Frank Duncan," "Mr. Duncan," or "the guy who has the corner office." Which form you choose would depend on a myriad of factors, such as the referent's salience in the local context and how recently you have referred to that individual in the past. With re-

spect to audience design, any account of message planning will have to describe a process for constructing the most appropriate form of expression.

A number of theorists have proposed that the forms of particular referring expressions depend on speakers' assumptions about how accessible a given referent is to addressees. Ariel (1988, 1991) defined accessibility in terms of memory availability, proposing an "accessibility hierarchy" to describe the relation between different forms of expression and the memory requirements of different referential situations. Closely related treatments of this issue have been discussed in terms of the presumed identifiability of particular referents (Chafe, 1994, 1996) and the given or new distinction (Gundel, Hedberg, & Zacharski, 1993; Prince, 1981). The general idea behind these views is that the more available a referent is in the context, the more likely it is that a speaker will use a relatively minimal form of expression to refer to that entity. Therefore, pronouns denote entities that are presumed to be highly accessible in the discourse, whereas full proper names or indefinite noun phrases (NPs) denote entities that are assumed to be relatively inaccessible to addressees at the moment of production. On this view, choices in message formation are intrinsically tied to speakers' estimations of the information available to addressees.

We suggest that there are two ways in which this conceptualization of reference formulation is of limited utility. First, we believe that it is not necessary for speakers to maintain an explicit "model of the listener" to formulate utterances for addressees appropriately. Instead, we argue that associations based on ordinary memory representations serve as input to message planning processes, obviating the need to postulate the existence of dedicated partner-specific discourse models (see also Pickering & Garrod, 2004). Second, as shown by the diversity of referential circumstances found in the CallHome corpus, formulation cannot always be a matter of selecting the right "level" of expression from a limited range of choices (e.g., pronoun vs. definite NP). Although there are circumstances in which some type of expression selection might occur (e.g., frequently mentioned entities like the names of well-known individuals or references to constrained sets of perceptually available objects, as in the typical referential communication task), such a process does not offer a solution to the more general problem of how people formulate references to entities lacking any kind of pre-existing "name" (S. W. Smith & Jucker, 1998). In the next sections, we flesh out these points as we consider message formation in the context of both automatic and strategic processes.

Automatic Message Formation

To begin discussion of automatic message formation, consider our now familiar example:

- (18) A: Oh first of all I have Shana's shower coming up that I have to do.
 B: Ah, that's right.

In our view, commonality assessment is a process that refers to concepts. In that sense, as a product of commonality assessment, Speaker A has reason to believe that the concept of Shana is co-present for her and Speaker B. The question of message formation, then, is with what surface manifestation she should refer to Shana. In this section, we explore how one might see the automatic impact of specific audiences on speakers' utterances, an issue that has inspired some controversy. Researchers have asked, in various ways, whether common ground has an impact on, for example, speakers' initial utterance plans (e.g., P. M. Brown & Dell, 1987; Horton & Keysar, 1996; Lockridge & Brennan, 2002). By extending our perspective of common ground as an emergent property of ordinary memory processes, we hope to clarify the terms of the debate. In particular, we suggest that common ground acts as a constraint similar to any other type of information that affects the particular lexical items that emerge on the surface of utterances.

Controversies in this area have arisen because researchers have focused on domains in which it is possible to define what is right and what is wrong. Most often, those assessments of performance are made by reference to Grice's (1975) Cooperative Principle. With respect to reference, the Gricean maxim that most often applies is the "maxim of quantity" (p. 45):

1. Make your contribution as informative as is required
2. Do not make your contribution more informative than is required.

According to the cooperative principle and the maxim of quantity, speakers should consider their audience when deciding how much information is necessary to uniquely identify a particular referent (Gundel et al., 1993). Consider "Shana." If Speaker A were speaking to a stranger, this expression would be saying too little; in the context of Speaker B, calling her "my close friend, Shana" seems like too much. The imperative to be cooperative establishes for each speaker the important goal of designing utterances that are optimal for each addressee. Clark and his colleagues (Clark, 1996a, 1996b; Clark, Schreuder, & Buttrick, 1983) identified this conversational goal as the Principle of Optimal Design.

Researchers have attempted, in various ways, to see to what extent speakers approach the goal of optimal design (P. M. Brown & Dell, 1987; Horton & Gerrig, 2002; Horton & Keysar, 1996). These experiments suggest that "optimality" might depart from the predictions of the Gricean maxims. Consider an experiment by Brennan and Clark (1996), in which *directors* were asked to describe a set of cards depicting common objects (e.g., shoes, cars) so that *matchers* could reconstruct the directors' array of cards. During one set of trials, the cards included multiple objects from the same category such as a penny loafer, a sneaker, and a woman's pump. In this situation, directors and matchers swiftly adjusted toward using subordinate terms to refer to the items in each category—merely saying "shoe" would be infelicitous. In a subsequent set of trials, however, the object cards were changed such that there was now only one exemplar from each category. The inter-

locutors, however, often used the same subordinate labels (e.g., “the penny loafer”) on the next trial, although these expressions were now overly specific.

In their third experiment, Brennan and Clark (1996) examined whether this tendency to be too specific depended on the identity of the conversational partner. To accomplish this, one half of the directors described the second set of cards to a new matcher, whereas the other directors interacted with the same matcher throughout the experiment. Brennan and Clark found that directors who had come to use terms like penny loafer with one matcher often initially continued to use these terms with a new matcher, although the target objects were now unique. Although this did not happen to the same extent as when the matchers stayed constant, it clearly demonstrates how the strength of referential precedents—which facilitate performance—can lead speakers to momentarily violate the maxim of quantity.

The work by Brennan and Clark (1996) also demonstrates how common ground might wield an automatic influence on message formation. Directors described the arrays with unique referents several times to the matchers. With each new round, the likelihood that the director would stay with the precedent (e.g., the penny loafer) decreased in favor of the basic level term (e.g., “the shoe”). We can conceptualize this pattern as the joint effect of three primary constraints: the world (i.e., the composition of the array), the director’s cognitive psychological states (i.e., the proximity of a particular representation to some threshold for speech production), and the association between a particular expression and a particular matcher. The third constraint is what we would generally recognize as the locus for effects of common ground (for a similar proposal, see Metzling & Brennan, 2003). Recall the resonance model we described for automatic commonality assessment. We expect the common ground component for automatic message formation to function in a similar fashion. Specifically, we expect that addressees would serve as cues to increase the accessibility of particular formulations of concepts. Of course, depending on the strength of the other constraints (e.g., the world and the accessibility of the speaker’s own internal representations), addressee-relevant constraints may not have sufficient impact for an effect of common ground to be apparent on the surface of speakers’ utterances.

This account of automatic message formation makes common ground similar to other constraints that have an impact on linguistic choices. We know from blend errors (e.g., “At the end of today’s *lection*,” a blend of *lecture* and *lesson*; Garrett, 1975) that speakers often have available, system internally, more than one word or phrase to lexicalize a particular concept. In the vast majority of cases, constraints during speech production narrow the choices down to a single word or phrase on the surface of the utterance. We suggest that associations between particular addressees and particular expressions function as another type of constraint. On this account, common ground does not, *a priori*, have any particularly greater or lesser privilege than any other constraint that might be present. In addition, this view makes clear that the relative time course of common ground effects in language processing will depend on the nature of the cues guiding memory retrieval. Partner-related information that is strongly and immediately available will most likely

have an impact at the earliest stages of formulation, whereas information that is relatively weak or slow to rise past threshold will only be able to influence relatively late aspects of production, if at all.

These suggestions are consistent with constraint-based approaches to language comprehension in which sentence interpretation is viewed as involving the simultaneous integration of multiple sources of information, both linguistic and nonlinguistic (e.g., MacDonald, Pearlmutter, & Seidenberg, 1994; McRae, Spivey-Knowlton, & Tanenhaus, 1998). Constraint-based models have considered, for example, how factors like lexical frequency and contextual plausibility can serve to constrain the likelihood of particular sentence parses. Implicit in many of these accounts is the assumption that such factors will have an impact on processing that is dependent on the strength of their availability as cues in memory. In an analogous fashion, information associated with one's interlocutor, made available through routine memory processes, could conceivably serve as another potential constraint (see also Hanna, Tanenhaus, & Trueswell, 2003; Metzger & Brennan, 2003; Nadig & Sedivy, 2002).

Therefore, our perspective suggests that common ground is merely one of many potential constraints on message formation. As such, common ground will most likely have an automatic impact when production mechanisms are making a choice among pre-existing representations. In the absence of pre-existing representations, however, we suggest that speakers are more likely to engage in strategic processing, to which we now turn.

Strategic Message Formation

We have suggested that automatic message formation requires that referents have pre-existing representations. However, even in these cases it is possible that speakers will use strategic memory processes to make decisions about how best to refer to entities in discourse. As we have acknowledged, the CallHome conversations do not allow us to make unambiguous claims about which instances required strategic intervention. For that reason, the most informative circumstances are those in which the speakers engaged in overt monitoring. As in other domains of speech production, we expect that speakers monitor their output to ensure that what they have said will not lead to mistaken interpretations (e.g., Hartsuiker & Kolk, 2001; Levelt, 1983; Postma, 2000; Schegloff, Jefferson, & Sacks, 1977). In Table 5, we provide various examples of reformulation that appeared in our CallHome sample.

In four of the examples, the speaker expands a bare first name (e.g., "Mindy") to better specify the individuals in question ("my sister-in-law Mindy"). The remaining examples are interesting in that they demonstrate the interaction between commonality assessment and message formation. In each instance, the speaker initially uses a pronoun but then expands the reference to a full NP. Apparently, monitoring processes (either self-monitoring or monitoring of addressees' reactions) led the

TABLE 5
Evidence for Monitoring in Message Formation

-
1. B: But since he's been ill he doesn't seem to do that. I think I'm not sure whether **Linda** g-
that *their daughter is Linda*
A: Yes yes. [#4569; 584.04]
2. B: {laughs} okay um Mikhail and um are **they** still here *Farrach's sisters*? I- I met them. I
just did I tell you?
A: who?
B: they wanted to come see Remopolin- Mikhail and and ah Chanamalka. Farrach's sisters
they're here for the whole summer
A: oh right. [#4623; 433.17]
3. B: oh yeah I got one nice one **Mindy** *my sister-in-law Mindy* when Sarah was born gave me
a very nice blue
A: yeah [#4623; 583.75]
4. B: Well I think what **he's** done see *Mr. Deverow* makes these discs
A: uh-huh
B: to go with your work
A: oh. [#4665; 1005.46]
5. B: That's when **Peggy** called me that night
A: oh that's right
B: *Peggy Dougherty*
A: That's right, yeah. [#4705, 1540.92]
6. B: and um it- you know it's rea- it's it was really good and of course **she** teaches theology
that was another *thing*
A: *mm.*
B: I'm I- *Isabelle*
A: oh that's great. [#4705, 1457.65]
7. B: Everything is disorganized that's why the lights are constantly going out and the
transportation is just eh- but anyway **he** *Don Ward* lives through all this.
[#4705, 1576.47]
8. B: But what was the hassle with **him**?
A: oh nothing.
B: with *Larry*?
A: nothing oh nothing. [#5242, 795.24]
9. B: But um **Matt** or um *Leith's friends Matt and Rachel* from here took really nice pictures.
They have a nice camera
A: Yeah [#5532; 254.60]
-

Note. The initial referring expression is indicated in bold, and the reformulated expression is indicated in italics.

speakers to believe that the referent of the pronoun might not be sufficiently accessible. These examples illustrate how particular configurations of cues serving as input to commonality assessment can lead to utterances that may not be, strictly speaking, well-executed with respect to optimal audience design.

The CallHome conversationalists, however, discussed a full range of topics beyond mutually known individuals. Because, for many of these topics, the speakers could not have pre-existing representations to draw on when describing certain en-

tities, we believe that the conversations must have been rife with instances of strategic formulation. In some cases, we can observe the conversationalists overtly trying to formulate appropriate references:

- (19) A: Really that's what Lawrence and one of his friends that's what he did when he was in the service. Because he just uh you know the eh the you know how the tops of the tanks have those kind of ball bearing things
 B: mhm
 A: He just made sure that those ran right. [#5907, 202.21]

Examples like this closely parallel experimental findings from referential communication tasks involving abstract shapes like *Tangrams* (e.g., Clark & Wilkes-Gibbs, 1986; Horton & Gerrig, 2002). In this context, however, it is difficult for us to detect strategic formulation (i.e., instances in which speakers strategically contemplated the requirements of the addressee) because the addressees generally accepted the formulations without comment.

Errors in Message Formation

Despite the apparent success of the majority of speakers' formulations, we did find a handful of cases, presented in Table 6, in which particular referring expressions prompted addressees to ask for clarification. Unlike the instances of self-monitoring and correction described earlier, these involved moments in which the speakers referred to something or someone that was unambiguously in common ground, but did so in a way that gave the addressees difficulties in identifying the intended referent. Given the complexities of message formation, it is somewhat surprising that we did not find more errors of this sort; but again, it is likely that addressees chose not to flag certain infelicities (Isaacs, 1990). As a result, we have probably underidentified the number of formulation errors. In any event, four of the five cases involved errors in personal reference to other individuals (1 in reported speech), whereas the remaining moment involved an error in formulating a reference to a particular concept (Example 5). Given the over 200 instances of personal referring expressions used by speakers in our transcripts to introduce new referents, we consider it fairly impressive that there were only four moments containing some kind of formulation error involving proper names—and most are somewhat marginal. Aside from the one clear case in reported speech, the speakers in two other cases hedged their utterances (through the use of a tag question, "right?" and by saying, "what's her name"), indicating that they sensed that their referring expressions might be incorrect. The final moment involved an infelicitous use of a pronoun ("her husband") that prompted the addressee to ask for clarification ("Elsa's?").

One could conclude from the small number of errors of this type that speakers are just particularly careful when it comes to forming expressions referring to

TABLE 6
Errors in Message Formation

-
- | | |
|----|---|
| 1. | A: and it's Goode, right |
| | B: Bode |
| | A: Bode |
| | B: Bode as in a- abode |
| | A: abode [#4093; 1624.89] |
| 2. | A: and what does her husband do do you know? |
| | B: Elsa's? |
| | A: Yes. [#4569, 401.59] |
| 3. | A: oh my goodness. I talked to your husband for a little while this morning before the minute was up. |
| | B: mhm. He now uh yeah, he had a call he said Tammy, I said Tammy who. He said you know Tammy Long. |
| | A: {laugh} [#5388; 1589.25] |
| 4. | B: um, have you talked to ev- um what's her name Sheila? |
| | A: Sheila who? |
| | B: Sheila um ne- um what's her name *Nadine and* them's sister. |
| | A: *White* |
| | B: You see her still? [#5388; 1692.84] |
| 5. | B: What about those class things that you were going to? |
| | A: What class thing? |
| | B: I don't know. Don't they have a program? |
| | A: Oh the Wednesday night learning? |
| | B: mm yeah [#6067; 1209.03] |
-

other individuals (Murphy, 1992). It could also be the case that speakers simply have more experience in producing names, particularly for people that they know well or encounter frequently. Therefore, we might have expected more errors in forming expressions for transitory, one-off types of referents—as in the last example in Table 6 in which the speaker says, “those class things you were going to,” leading the addressee to ask, “What class thing?” Presumably, this speaker has never had occasion to refer to these classes before and has difficulty doing so in such a way that the addressee can easily identify what is meant.

However, again the pattern of observable errors could have been influenced by selection biases on the part of addressees. It might be of greater importance that proper names be established to a relatively high criterion, making it more likely that addressees will call speakers' attention to errors made in producing a particular name. Similarly, it is possible that the speakers produced many sorts of inadequate or vague referring expressions for other types of less well-defined entities that the addressees chose to let pass or perhaps did not notice at all.

Each of these possibilities, in some sense, confirms the importance of considering a variety of examples from spontaneous conversation, as we have done in this article. Employing the CallHome corpus has allowed us to consider a broad range of circumstances in which speakers and addressees negotiate reference. If nothing

else, these observations are valuable because they provide a set of constraints for the expected language behavior of participants in more controlled experimental settings. To the extent that we have learned something about what speakers do and do not “get right” in natural conversation (and why), we can better evaluate the external validity of claims about how well people are able to engage in audience design under more restricted circumstances.

CONCLUSION

We have outlined a model of audience design processes that explicitly separates speakers’ beliefs about what information is shared with an addressee from their decisions about how to refer to this information in conversation. We have used the separation between commonality assessment and message formation as a means of illustrating how discussions of audience design, and of conversational common ground more generally, might be more firmly rooted in standard cognitive psychological mechanisms. To this end, we have pieced together a number of ideas from various topics in the memory and cognitive psychological literature—for example, resonance (Gerrig & McKoon, 1998), *ad hoc* categories (Barsalou, 1983), and remember–know judgments (Rajaram, 1993). We have done so to demonstrate that many effects attributed to common ground can be explained in a relatively direct fashion by assuming that language use, like any other aspect of human cognition, is rooted in the ways our memory processes work. We fully acknowledge that many of the details of this proposal remain to be filled in. Still, we intend our arguments to motivate a more complete cognitive psychological understanding of conversational common ground. Until researchers more precisely detail the means through which considerations of one’s partner could or could not enter into routine conversational processes, debates over the utility of common ground as a theoretical constraint on language use will continue to lead to less than satisfactory conclusions.

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