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Concealing One's Meaning from Overhearers

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Two people talking, as at a crowded party, may try to conceal all or part of what they mean from overhearers. To do this, it is proposed, they need to build what they wish to conceal on a *private key*, a piece of information, such as an event mentioned in an earlier conversation, that is common ground for the two of them and yet not inferable by the overhearers. What they say must be designed so that it cannot be understood without knowledge of that key. As evidence for the proposal, pairs of friends were required, as part of an arrangement task, to refer to familiar landmarks while concealing these references from overhearers. As predicted, the two of them used private keys, which they often concealed even further by using certain collaborative techniques. Still, the two partners weren't always successful. © 1987 Academic Press, Inc.

In standard theories of language use, the speaker (call her Ann) has one main purpose in issuing each utterance, and that is to get her addressee (say Ben) to recognize certain of her intentions. She may want to tell Ben something, ask him a question, or offer him something, and she issues an utterance to do this. The primary question for these theories is how Ann designs her utterances to achieve these goals.

But this picture leaves out overhearers. At a crowded party, Ann may want to conceal parts of what she tells Ben from obvious bystanders or unnoticed eavesdroppers. If so, she has several courses of action open to her. She can whisper, or postpone talking about the parts she wants to keep private. Or she can switch into a mode of speaking we will call *concealment*. Example: *You-know-who finally did what she told us she'd do to our fashionable friend.* With concealment, Ann tells Ben what she wants to tell him but, at the same time, overtly conceals from overhearers particular parts of what she means—here, who the two people are and what the first did to the second.

Concealment is an instance of a general property of language use called *audience design:* Speakers design what they say for the particular people they believe are or might be listening (Bell, 1984; Clark & Carlson, 1982; Clark & Murphy, 1983; Garfinkel, 1967; Sacks, Schegloff, & Jefferson, 1974). They plan their utterances to be understood not by just anybody, but by the addressees and other participants in the conversation at the moment. Yet they can also take one of several attitudes towards overhearers. They can disclose all or part of what they mean to the overhearers; they can conceal all or part of it from them; they can even disguise all or part of it from them. They can show overhearers various forms of respect or disrespect—for example, by using polite language versus profanity, or by choosing pleasant versus disgusting things to talk about. Rarely are people entirely indifferent to bystanders. The attitude we focus on here is concealment.

Concealment, like the other attitudes toward overhearers, raises two issues for

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theories of language use—one about logic and the other about process. First, by what logic can speakers get their addressees to recognize certain of their intentions and yet conceal the same intentions from overhearers? The standard theories of speech acts (e.g., Austin, 1962; Bach & Harnish, 1979; Grice, 1968; Searle, 1969, 1975), discourse (e.g., Heim, 1983; Kamp, 1981; Stalnaker, 1978), and reference (Donnellan, 1978; Kripke, 1977; Russell, 1905; Strawson, 1950) have nothing to say about the issue, even though concealment is a potential factor in the design of any utterance. Second, how in practice do speakers accomplish these two goals—getting addressees to understand while concealing from overhearers? What techniques do speakers try, and how successful are they? Theories of production have no answers to these questions, even though, in some circumstances, concealment plays a critical role in the formulation and execution of utterances.

In this paper we take up both issues. We first sketch a logical scheme by which people can speak to addressees while concealing information from overhearers. We then report an experiment in which pairs of people were asked to talk about familiar places while concealing from an overhearer which places they were referring to. We use the findings to characterize some techniques that speakers exploit for concealment and how successful they are in using them.

An Analysis of Concealment

In concealment, the problem a speaker like Ann faces is how to get Ben, her addressee, to understand her while keeping Oscar, an overhearer, from doing so. To see how she might do this, let us turn the problem around and ask how Ben and Oscar should go about understanding her (see Clark & Carlson, 1981, 1982).

Ben, as Ann's addressee, is confident she is trying to provide him with sufficient evidence of what she means. All he needs to do is consider her utterance against their current common ground—their mutual knowledge, beliefs, and suppositions—and infer what she means. The process of inferring from sufficient evidence we will call *recognizing*.

Oscar should realize all this too—that Ann is providing Ben with sufficient evidence of what she means. But, as an overhearer, Oscar should also realize she need not provide him, Oscar, with sufficient evidence. He isn't part of the conversation, so she isn't obligated to let him know what she is saying. All Oscar can do is consider her utterance against what he believes *might* be Ann and Ben's current common ground, and about that he can never be certain. The process of inferring from *in*sufficient evidence like this we will call *conjecturing*. So what Ann must try to do is (1) give Ben evidence he needs to recognize what she means and yet, at the same time, (2) deprive Oscar of evidence he would need to conjecture what she means.

Ann's concealment may be total or selective. If she wanted to conceal *all* of what she means, she might favor one class of techniques, such as switching into a language Ben knew but Oscar didn't. If she wanted to conceal only *selective* parts of her meaning—certain referents (people or things she is referring to), predications, direct or indirect illocutionary acts, or implicatures—she might favor other techniques. To make the issue tractable, we will focus on the selective concealment of referents.

The Concealment Scheme

How, then, should Ann proceed? Her primary goal, whether she conceals or not, is to get Ben to recognize her meaning. She must design her utterance so that he can do this given their current common ground. If she says, *Derek has just arrived,* Ben should be able to figure out Derek's identity by appealing to their shared knowledge of a man named Derek of whom she could predicate just arriving. Now suppose Ann wants to conceal Derek's identity from Oscar. She cannot use *Derek has just arrived* if she thinks Oscar knows Derek by

name or could conjecture his identity from the name. But if she and Ben had talked about Derek the night before, and if she thought Oscar didn't know and couldn't guess that, she could use *The man we talked about last night has just arrived.* That should make her confident that Ben will be able to identify Derek and Oscar will not. But why?

Concealment from overhearers, we argue, depends on a special use of common ground. Let us describe all those parts of Ann and Ben's common ground that Oscar isn't privy to and cannot guess as *closed* to Oscar. A speaker like Ann, then, should proceed as follows:

> *The concealment scheme.* If the speaker wishes to conceal from an overhearer some part of what she means, she must try to design her utterance so that the addressee cannot recognize that part of her meaning without a piece of common ground she believes is closed to the overhearer.

Let us call this crucial piece of Ann and Ben's common ground a *private key* to the concealment part of her meaning. For successful concealment, then, Ann must find a piece of common ground she thinks is closed to Oscar (e.g., Ann and Ben's having talked about Derek the night before) and make it a private key to what she means.

Private Keys

Where should Ann search for information she can use as a private key? Very broadly, the common ground between two people consists of two types of information —*communal* and *personal* common ground (Clark & Marshall, 1981). Both should be potential sources for private keys.

Ann and Ben's communal common ground is what they take to be known, believed, or assumed by everyone, or almost everyone, in the various communities to which the two of them mutually believe they both belong—e.g., English speakers, U.S. residents, Californians, San Franciscans, bridge players, university graduates, physicians, and classical music buffs. For example, once Ann and Ben establish they are both San Franciscans and classical music buffs, they could take as common ground that they know what goes on at the Herbst Theater, Davies Hall, and the Opera House and where they are.

Communal common ground is an important potential source for private keys. If Ann can identify communities in which she and Ben, but not Oscar, are members, she can use information restricted to these communities. This tack leads to a family of methods as illustrated here:

1. *Use a foreign language.* Suppose Ann and Ben mutually know they are both speakers of Vietnamese. If Ann thinks it is unlikely that Oscar is too, she can switch to Vietnamese for anything she wishes to conceal from him.
2. *Use spelling.* Talking in front of a preliterate child, Ann and Ben, as literate people, could conceal by spelling, as in *What about a T-R-I-K-E for X-M-A-S?*
3. *Use ingroup jargon.* If Ann and Ben are both physicians and mutually know it, they can conceal diagnoses from overhearing patients by using technical jargon.
4. *Use cryptography.* As spies, Ann and Ben may belong to an intelligence community with special codes designed for concealing what is said from anyone outside that community.

Ann and Ben's personal common ground, on the other hand, is what they take to be mutually known, believed, or assumed based on personal experiences the two of them have shared. One part consists of what was said in previous conversations in which both were participants—and that includes the current conversation so far. Another part consists of what the two of them have jointly seen, heard, or otherwise experienced openly in each other's presence, for example, at a symphony concert.

This personal common ground is a second potential source for private keys. Ann can search for conversational or perceptual experiences she has shared with Ben and not with Oscar and use these as private keys, as in our example, *The man*

we talked about last night has just arrived. Most methods based on communal common ground—foreign language, spelling, jargon, cryptography—come prefabricated, ready for any occasion that requires them. But those based on personal common ground tend to be impromptu. A speaker like Ann must choose or devise them spontaneously, on the fly, taking account of overhearers in the very process of formulating her utterance. That makes them important to study as a component of formulating utterances.

Indirect Reference

Ann can hide private keys even further by the use of *indirect reference* (Clark, 1978; Nunberg, 1979). Compare Ann's *My car is parked down the street* with *I am parked down the street.* Or compare *The voters who live on Lincoln Avenue voted Republican last election* with *Lincoln Avenue voted Republican last election.* With *my car* and *the voters who live on Lincoln Avenue,* Ann refers directly to her car and the voters, but with *I* and *Lincoln Avenue,* she does so indirectly. With *I* she refers to herself and, via a *reference function* that maps cars onto people, thereby refers to her car. Ben, to make the link from her to her car, has to compute this reference function based on their common ground. The same holds for *Lincoln Avenue.*

Indirect references are ideal for concealment. They cannot be interpreted without knowledge of their reference functions, and Ann, if she is clever, can base these functions on private keys. Suppose Ann and Ben had talked about Derek's house in Guernsey. Ann could conceal Derek's identity by referring to him directly, as in *The man who has a house in Guernsey has just arrived.* She could be even more cryptic by doing so indirectly, as in *Guernsey has just arrived.* It should be hard enough for Ben to work out the mapping from Guernsey to Derek. It should be impossible for Oscar.

Collaboration in Concealment

In everyday conversation, speaking is a collaborative process (Goodwin, 1981; Sacks et al., 1974; Schegloff, 1982), and that is especially true of reference (Clark & Schaefer, 1987; Clark & Wilkes-Gibbs, 1986; Cohen, 1984; Isaacs & Clark, 1987). According to the collaborative model of referring (Clark & Wilkes-Gibbs, 1986), the current speaker and her addressee try to reach the mutual belief, for each reference, that the addressee has identified the intended referent correctly. In the simplest cases, the speaker presents a noun phrase (*e.g., the man who went to Guernsey*), and the addressee accepts it by allowing the conversation to proceed. In more difficult cases, the speaker may present a noun phrase that she and her addressee then repair, expand, or replace in an iterative process taking several turns to complete. The process ends when the two of them mutually accept that the description finally arrived at is adequate for identifying the intended referent.

The collaborative process has many features that could be exploited for concealment. One is that it works over time, over more than one conversational turn, allowing private keys to be introduced bit by bit. Suppose Ben stops Ann in downtown San Francisco to ask for directions, and she needs to refer to the arch at Grant and Bush. Here is a hypothetical conversation:

Ann: Are you from San Francisco? [preface]
Ben: Yeah. [confirmation]
Ann: Well, then, go to *the arch at Grant and Bush?* [presentation of a trial noun phrase]
Ben: Right, the entrance to Chinatown. [confirmation + expansion]
Ann: Yes. And then . . . [confirmation + continuation]

Aspects of Ann's reference to the arch are distributed over five turns. She uses her preface to establish how much common ground she has with Ben and selects the definite description *the arch at Grant and*

Bush accordingly (Krauss & Glucksberg, 1977; Schegloff, 1972). To that noun phrase she adds a question intonation, a *try marker* (Sacks & Schegloff, 1979), to show she isn't quite sure Ben will identify the arch and to ask him for confirmation. He says *right* to assert he has identified it and adds *the entrance to Chinatown* to display his identification further. She says *yes* to confirm his expansion, accepting that he has understood her reference, and continues on.

Each of these features could be used in concealment. If Ann wants to try out an esoteric key, she could use a preface to check on its viability and abort the process if the check fails. Or she might present her description with a try marker to check whether the key has been grasped. Ben, for his part, might offer an expansion of his own to check whether he has understood her key.

So far we have described techniques that people *might* use for concealment. But what techniques do they actually use impromptu, and how successful are they in using them? To explore these questions, we carried out an experiment on referring to familiar places. The task we put to people made concealment difficult, requiring the concentrated use of whatever techniques they had at hand. So the task was able to reveal a wide range of their techniques precisely because it was so demanding.

METHODS

Pairs of Stanford University students, separated by a screen, were given identical sets of pictures of eight well-known Stanford landmarks or scenes. For the student designated the *director,* the pictures were in a set order, and for the student designated the *matcher,* they were in no particular order. (For convenience in *our* references, we will consider the generic director to be female and the generic matcher male, even though both sexes assumed both roles in different pairs.) The goal was for the matcher to arrange his pictures in the same order as the director's. Although the director and matcher couldn't see each other, they could talk as much as they liked. The director's pictures were then reshuffled and the procedure repeated five more times for a total of six trials.

The catch was that there in the same room, behind another screen, was an overhearer obviously able to hear everything they said. (The generic overhearer will be considered male.) There were two conditions. In the *concealment* condition, the two partners knew that the overhearer was another Stanford student with the same eight pictures, and their job was to prevent him from arranging his pictures in the right order. In the *indifference* condition, as a control, no mention was made of the overhearer or of concealment: the two partners were indifferent to whether the overhearer understood or not.

Impromptu methods of concealment, according to our analysis, should generally be impossible for two unacquainted people from the same communities as the overhearer. So we chose as director and matcher pairs of friends. They had known each other a median of 1.6 years (ranging from 1 to 19 years) and rated that they knew each other an average of 6.4 on a scale of 1 (not at all) to 7 (very well). There were 16 pairs of directors and matchers in all, eight in the concealment condition and eight in the indifference condition. The overhearer was always unacquainted with the director and matcher before the experiment. All students were native English speakers enrolled in an introductory psychology course and received either course credit or payment for participating.

In the concealment condition, the three students were led together into a small room and seated at three desks separated by screens. One of the two friends at random was designated the director, and the other, the matcher, and then all three listened to all the instructions. They were

told they all had identical sets of eight pictures, and the director and matcher were to try to arrange theirs in the same order without letting the overhearer do so. They were each supplied with a matrix of two rows of four spaces into which to place the pictures; the postions were numbered one through eight to help them keep track. The director's pictures were then shuffled and placed in the eight places of the matrix in front of her; the matcher's and overhearer's pictures were scattered around the perimeters of their desks. The director and matcher were instructed to go through the pictures in numerical order, though they could backtrack to fix mistakes, and they were not allowed to use a foreign language. They were told they would be timed, and they should try to be accurate. The overhearer was asked not to talk during the session. The director's pictures were reshuffled before each new trial, and the procedure was repeated. No one was told of any errors until the experiment was over.

Via questionnaires, all three students were each asked after each trial to estimate which of the pictures the matcher had got right and which the overhearer had got right. After the last trial, the director and matcher were asked how each description used on that trial was related to its corresponding picture, and the overhearer was asked to say, for each picture, what if anything the director and matcher had said revealed its identity. The concealment sessions took about 60 min.

In the indifference condition, the two friends were led through the same procedure as in the concealment condition, but without mention of overhearers or concealment. The overhearer was the experimenter himself. We considered having a third student at the third desk, but judged that the two partners would be suspicious of what we were up to and wouldn't simulate ordinary cases of indifference. The experimenter had a legitimate reason for being there and wouldn't raise such suspicions. The two students were each asked via questionnaires after each trial to judge which pictures the matcher got right. The indifference sessions took about 20 min.

The eight pictures were black and white photographs from a book about Stanford that depicted: Hoover Tower, the front of Memorial Church, an arcade at Stanford Medical Center filled with bicycles, an academic procession at commencement with robed faculty and flag bearers, a fountain commonly known as "The Claw" in front of the Stanford Bookstore, an aerial view of Stanford Stadium with much of the campus visible behind it, three palm trees in the central quadrangle, and a view down a long columned passageway in front of Memorial Church showing tiles with graduation years on them. The landmarks and scenes seemed familiar to everyone. The photographs were mounted on stiff cards measuring 15 by 20 cm.

Microphones were attached to the director's and matcher's lapels, and each session was tape recorded and later transcribed. The transcripts marked all speaker changes, interruptions, starts and ends of overlapping speech, unusual pauses and intonation, and nonspeech vocalizations such as laughter and coughing.

RESULTS

The results will be divided into three parts—difficulty in concealing, methods of concealing, and failures in concealing.

Difficulties in Concealing

The referential process in our task is well described by the collaborative model of reference. In the indifference condition, the director (D) typically would indicate a position and then describe or refer to the picture that belonged there, as here:

D. Picture number 2 is the claw.
M. Okay.

(All cited and italicized examples come from our transcripts verbatim but with

names changed for anonymity.) In easy cases like this, the matcher (M) would then say *okay*, and the director would go on to the next picture. In more difficult cases, the matcher would expand on the director's initial description, or ask for an expansion or correction, and the director would go on only when both were satisfied the matcher had understood, as here:

D. The long view of the quad uh walkway
M. those
M. numbers right?
D. is number 5
M. Mkay
D. Yeah with the numbers on the bottom.

These patterns are typical of tasks of this sort (Clark & Wilkes-Gibbs, 1986; Isaacs & Clark, 1987).

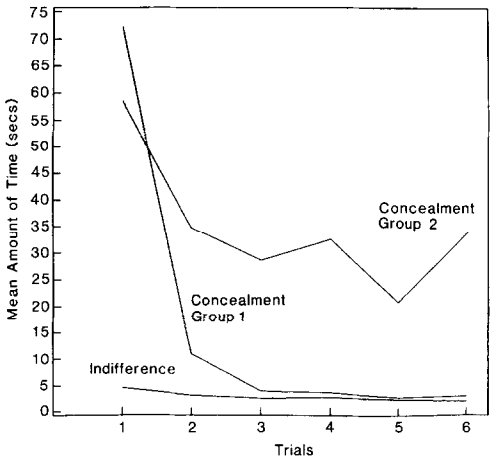


FIG. 1. Average time per picture consumed by pairs in Groups 1 and 2 of the concealment condition and by pairs in the indifference condition.

Time and Effort

The referential process should take more time and effort when the director is trying to do two things at once—refer for the matcher *and* conceal from the overhearer. With indifference, the director can offer the most obvious description that distinguishes the target picture from its neighbors, like *Memorial Church* or *commencement*, and it should usually be accepted immediately. With concealment, the director must avoid the obvious description and cast about for a private key, as in *where you worked one time? when I didn't?* Since these keys are often esoteric, she may need to try more than one or clarify them further before they are accepted. So two partners should take much longer for concealment than for indifference.

Figure 1 plots the average time each pair spent per picture in the concealment and indifference conditions. For the concealment condition, we have plotted two subgroups separately. The four pairs in Group 1 used the same private keys from Trial 1 on, whereas the four pairs in Group 2 changed one or more of their keys on each new trial. Since these subgroups were identified post hoc, we cannot apply statistical tests for differences between them. Yet, interpreted with caution, the differences suggest that their contrasting strategies had an important influence.

As expected, concealment took a great deal longer than indifference. As Fig. 1 shows, two partners took an averge of 25.6 sec per picture in the concealment condition, but only 3.0 sec per picture in the indifference condition, a ratio of more than 8 to 1 ($F(1,14) = 33.44, p < .001$). On Trial 1, these two times were 65.4 and 4.7 sec ($F(1,14) = 50.38, p < .001$), and on Trial 6 they were 18.8 and 2.2 sec ($F(1,14) = 6.05, p < .027$). So the time difference remained through Trial 6. The same pattern was reflected in the number of words used by the two partners together on each picture. As shown in Table 1, the concealment pairs averaged 49.0 words per picture, and the indifferent pairs, only 6.6 words per picture ($F(1,14) = 21.35, p < .001$). This difference also remained through Trial 6. This pattern isn't surprising, since the more time a pair took, the more words they uttered.

Concealment should also require more turns per picture than indifference. In all but the simplest conversations, however, what counts as a turn depends strongly on

TABLE 1
AVERAGE TIME, NUMBER OF WORDS, SPEAKER ALTERNATIONS, AND ACCURACY BY PARTICIPANTS IN THE CONCEALMENT AND INDIFFERENCE CONDITIONS

	Concealment			
Measure	Group 1	Group 2	All	Indifference
Average time per picture (s)				
Trial 1	72.2	58.6	65.4	4.7
Trial 6	3.3	34.3	18.8	2.2
All trials	16.2	35.0	25.6	3.0
Average number of words per picture				
All trials	32.7	65.2	49.0	6.6
Average number of alternations per picture				
Trial 1	24.8	16.5	20.7	1.9
Trial 6	1.0	9.0	5.0	1.1
All trials	5.8	9.7	7.8	1.3
Matcher accuracy (percentage correct)				
Trial 1	93.8	68.8	81.3	100.0
Trial 6	100.0	93.8	96.9	100.0
All trials	97.4	86.5	91.9	99.2
Overhearer accuracy (percentage correct)				
Trial 1	53.1	37.5	45.4	—
Trial 6	65.6	31.3	48.5	—
All trials	64.1	29.7	46.9	—

the theory of turn taking one adopts. The conversations in the concealment condition were very complex indeed, and included a host of speech overlaps, interruptions, partial utterances, back channel responses, and repairs. What we could count was the alternations of speakers on each trial. As summarized in Table 1, concealment averaged 7.8 alternations per picture, and indifference, only 1.3 per picture ($F(1,14) = 25.58$, $p < .001$).

By the collaborative model, two partners should use briefer descriptions and need less refashioning as they refer more than once to the same picture (Clark & Wilkes-Gibbs, 1986). On each new trial they can use the description mutually accepted on the previous trial and yet make it briefer, and this is what is generally observed (see Carroll, 1985; Clark & Wilkes-Gibbs, 1986; Isaacs & Clark, 1987; Krauss & Glucksberg, 1977; Krauss & Weinheimer, 1964). One director in the indifference condition made these references to one picture over the six trials: *the medical school with a bunch of bicycles, bicycles at the med school, the bicycles at the med center, the bikes, the bikes,* and *the bikes.*

The result, as Fig. 1 shows, is that time per picture tended to decrease over the six trials. The indifference group took 4.7 sec per picture on Trial 1 and decreased to 2.2 sec per picture by Trial 6. The linear decrease, as tested in a linear trend analysis, was reliable ($F(1,35) = 27.16$, $p < .001$). In the concealment condition, Group 1 can take advantage of their repeated use of the same keys and become much faster over trials; Group 2, who tended to change keys from trial to trial, can too, but less often. The times decreased over the six trials from 72.2 to 3.2 sec per picture for Group 1, and from 58.6 to only 34.3 sec per picture for Group 2. The decrease for Groups 1 and 2 together was highly reliable (linear trend, $F(1,35) = 38.54$, $p < .001$).

With concealment, the two partners should find it more difficult to formulate how to talk about a picture. Time, number of words, and number of speaker alternations all attest to this, but there is qualitative evidence as well. The indifference pairs always used equative sentences with definite descriptions, like *The second picture is the medical center* or, on later trials, noun phrases or nominals alone, like *medical center.* These are the forms one would use under optimal conditions. The concealing pairs, however, used many other forms as well. On the first mention of a picture on Trial 1, they used mostly descriptions, as in *Um, number four involves my summer job?; It looks like what we tell our, w- what we tell people to do when we work;* or *Okay, um, let's see, the sixth one is, let's see, I usually go tearing down here?* They also used many forms that would be judged ungrammatical by standard theories, such as *Uh first one is Maria works in front of it?* The point is, they exploited a

variety of complex expressions never used by the indifferent partners.

Errors

Concealment also led to more errors than indifference, as shown in Table 1. The matchers, who were meant to get everything right, were correct 99% of the time in the indifference condition, but only 92% of the time in the concealment condition, a reliable drop in accuracy ($F(1,14) = 4.94$, $p < .05$). The overhearers in the concealment condition, who were not meant to get anything right, were correct fully 47% of the time. This is reliably greater than chance at 12.5% ($F(1,7) = 18.28$, $p < .004$), but reliably less than the 92% for matchers ($F(1,14) = 44.70$, $p < .001$). The matchers in the concealment condition improved over trials, from 81% on Trial 1 to 97% on Trial 6 (linear trend, $F(1,35) = 10.87$, $p < .01$), but the overhearers did not. So in trying to conceal, directors didn't do as well as they could have with their matchers, nor were they always successful in keeping their overhearers in the dark.

Techniques for Concealment

What techniques did the two partners use for concealment? If our proposals are right, their primary resource should be the use of private keys. The director should have described some relation to the picture (e.g., *I usually go tearing down here* or *where you worked one time? when I didn't?*) that she believes is part of her common ground with the matcher but is closed to the overhearer. Their secondary resource is the collaborative process itself. The two partners should help hide their keys via some of the same techniques they would ordinarily use in collaborating on references.

Private Keys

Two concealing partners should try to build their references on private keys. To see how they did this, we identified the keys each pair attempted to use for each picture on each trial. We defined a key as a bundle of information around a coherent theme that could have been expressed as a definite description for that picture.

The two partners were not as efficient in concealing referents as they could have been. If they had found the perfect keys right away, they would have used one key per picture for all six trials. In fact, they tried an average of 4.4 different keys per picture over the six trials. For Group 1, who used the same keys from Trial 1 on, the average was 2.7, whereas for Group 2, who changed many of their keys on each new trial, it was 6.2. Not surprisingly, most of the keys were introduced by the director, but 15% were introduced by the matcher.

The attempted keys should be based mainly on personal and not communal common ground, and they were. Almost all (97%) were built around people, events, situations, appearances, or conversations the two partners knew from joint personal experience. Exclusively communal common ground was used in only 3% of the attempted keys, and even some of these are debatable. One pair of friends from Atlanta alluded to a well-known tower there to refer to Hoover Tower. Another pair discovered by chance on entering the room that the overhearer hadn't been at Stanford the year before; later, they alluded to a time capsule buried the year before that he presumably couldn't have known about.

The relations chosen from personal experience were of many kinds. They included events (e.g., *the place where he served me coffee*), habitual activities (*where Jim works*), similarity (*it looks like the infield*), locations (*this picture is the closest place to where I live right now*), and many other types of experiences. They involved the central object depicted (e.g., Hoover Tower or Memorial Church), incidental objects (e.g., the flags at commencement, or the bicycles at the Medical

Center), and even perspective (e.g., that the picture of Stanford Stadium was an aerial view).

Almost every key bore a relation to all or part of the landmark in the picture. These relations took two main forms. About half (49%) described a connection with the *particular* place or object depicted, as in: *Is it where I had trouble with Paul?* (Memorial Church); *Do you know where I go for my Bach Orchestra?* (Memorial Church); and *Scott works there?* (Hoover Tower). Most of the rest (44%) described something in relation to the *type* of place or objects depicted, as in: *The century* (a bicycle race, which alluded to bikes at the medical school); and *For the one, think of what Mariel makes fun of* (the Catholic church, an allusion to Memorial Church). This second type of relation never occurred in the indifference condition. Another 5% of the keys were built on incidents in the experiment itself (e.g., *the one we had so much trouble with last time*). The remaining 2% were uncodable.

The keys were constructed on a system of levels. Take the picture of the claw fountain. At Level 1, it could be described as itself, e.g. as *the claw*. At Level 2, it could be described in relation to another object, event, or process, e.g., as *where someone wanted to put my teddy bear*. At Level 3, it could be described in relation to the object mentioned at Level 2, e.g., *Chico's present to me* (the teddy bear). And so on. In the indifference condition, all descriptions should be at Level 1, and they were, as partners invariably described each landmark directly. In the concealment condition, all descriptions should be at Level 2 or above, and they were, with one exception. In that case, the director said, *Med school, oh, shit,* [*laugh*], *um,* recognizing it as a mistake.

The keys used for concealment ranged from 2 to 7 levels deep, constituting 43, 47, 8, 1, 0, and 1% of the attempted keys, respectively. (This excludes seven keys we couldn't classify.) In Group 2, many keys were built on keys from previous trials in a form of chaining. A new key (e.g., *Chico's present to me*) was created at a higher level on the basis of a previous key (e.g., *where someone wanted to put my teddy bear*), which is what accounts for most of the keys above two levels. In the one key seven deep, the director referred to the name of a woman who had a friend whose home town was near a city that had the same name as a dormitory where a friend of theirs lived with the same last name as someone they thought was in the commencement picture. Overhearers should have a difficult time penetrating baroque descriptions like this. Indeed, they identified the referents only 30% of the time for the pairs who chained after Trial 1 (Group 2) compared to 64% of the time for the pairs who didn't (Group 1) ($F(1,6) = 11.29$, $p < .02$). The matchers also had more difficulty with chained descriptions. They made 14% errors in Group 2 compared to only 3% in Group 1.

Many of these keys were used, as expected, in indirect references. In the indifference condition, directors almost always referred directly to something depicted, as with *Memorial Church, the claw, Hoover Tower,* and *the stadium*. They continued to do so through Trial 6. In the concealment condition, directors regularly referred to what was depicted indirectly. On Trial 1, they tended to describe things in the pictures, as noted earlier. But by Trial 6, almost every reference was indirect. Examples from Trial 6: *Tsk um Arne and me* ["the place that looks like the desert island where Arne and I want to live"]; *Okay, gummi bears* ["the place where you and I ate gummi bears (a type of candy)"]; and *four, silk dress* ["the place where a friend put her silk dress"]. In the last example, the director referred directly to a silk dress and, via an unexpressed reference function from silk dresses to places, thereby referred to the fountain. She was confident that the matcher could work out the function, and that the overhearer couldn't.

So, in concealing, the two partners created private keys from events, processes, people, and objects in their personal common ground. They seemed willing to try any relation so long as their partners would get it and their overhearers couldn't. Sometimes, they tried to hide them further by chaining new keys to previous ones, and by leaving the relations unexpressed in indirect references.

Collaborative Techniques

Two partners also collaborated in concealing in their use of prefaces, special modes of presentation, special interruptions, and speed.

1. Prefaces. In the concealment condition, the two partners should have tried hard to find areas of common ground that were closed to the overhearer and yet accessible to the two of them. So if the director wanted to use an esoteric key, she should try to establish that it, or its general area, is mutually recognizable before going any futher. Prefaces are an ideal way of doing this. In fact, they were legion in our transcripts, as in these three examples:

(1) Okay, remember in Hiltonhead? [M. Uhhuh?]
(2) The first picture, we're gonna take, um, you know where we, you know uh, you know where the dorm was last year right? [M. Yeah?]
(3) Okay, Ben, do you remember the place that- [M: Yes?] um, John came and sang. John and Dick and Bill sang happy birthday to me? couple days ago? [M: no]

Most prefaces asked the matcher to recall some event, though a few simply oriented the matcher to some area of common ground. Many prefaces were successful in bringing an area of common ground into joint focus, but many, like the last example, were not. Prefaces were used an average of 1.9 times per pair on Trial 1, but only 0.2 times per pair on each trial after that. They were never used in the indifference condition.

2. Try markers. Another common technique was to pronounce a noun phrase with a try marker, a rising intonation, as in *the fourth one is um my best friend on the ski team?* The try marker here is interpreted, not as "Is the fourth one my best friend on the ski team?" as if it were an ordinary question, but as "Do you understand what I am referring to with *my best friend on the ski team?*" With it, the director solicits confirmation on a description she was unsure the matcher would grasp. In the indifference condition, try markers were used an average of 2.0 times per pair on Trial 1 and never on Trials 2 through 6. In the concealment condition, they were used 7.9 times per pair on Trial 1 and 2.2 times on each trial after that. The mean frequency over trials was reliably greater in concealment than in indifference ($F(1,14) = 11.54$, $p < .004$). The concealing director's goal was apparently to try out a key and expand on it only if asked.

Try markers were useful in a strategy of *gradual revelation*. The idea was for the director to present one key bit by bit, or several keys one at a time, until the matcher had identified the referent. For Memorial Church, one director named a series of religious acquaintances, asking after each whether the matcher had identified the picture yet. For the passageway with graduation tiles, another director listed objects in the time capsule under the tile laid the previous year, again asking about recognition after each object. With this technique the two partners don't reveal any more information than necessary, since they stop immediately when the matcher has understood. It is like unveiling a sculpture inch by inch until the observer can identify what it is. Someone less familiar with the sculpture than the observer should still not be able to identify it.

3. Truncation. Another technique for closing off a gradual revelation is truncation. In conversations without overhearers, a speaker can try out one definite description, and if that doesn't work, try out another, and then another, until the addressee

cuts her off, as in this example (from Sacks, quoted by Jefferson, 1973, p. 59):

A. I heard you were at the beach yesterday. What's her name, oh you know, the tall redhead that lives across the street from Larry? The one who drove him to work the day his car
A. [was-
B. [Oh *Gina!*
A. Yeah Gina. She said she saw you at the beach yesterday.

A in effect invites B to cut her off the moment he has identified the woman she is referring to, and eventually he does, with *Oh Gina*. B's utterance here we will call a *truncator*.

Most partners used some truncation, as in this example from the concealment condition:

D. My class at the beginning of this quarter
D. [was there
M. [yeah yeah yeah yeah yeah yeah

The truncators included *yeah yeah, right right,* and *okay okay*. In the concealment condition, they were used on 61% of the pictures in Trial 1 and 6% in later trials; in the indifference condition, the two percentages were only 9 and 2%. The overall percentage was reliably higher for concealment than for indifference ($F(1,14) = 6.09$, $p < .027$). To our ears, the truncators seemed to be used in concealment to keep the directors from revealing to much, but in indifference to speed up the task.

4. Speed. The four pairs in Group 1 of the concealment condition all sped up their talk after Trial 1. On being questioned afterwards, three of the four pairs said they did so to make understanding harder for the overhearer. Their rationale was that the overhearers, with enough time, might be able to figure out some of the keys. The way to prevent that was to give them too little time.

The two partners, then, used a variety of collaborative techniques in conjunction with private keys. They used prefaces to try out esoteric pieces of common ground, presented tentative descriptions to be expanded on if needed, invited truncators to cut off too much revelation, and sped up. Their main aim, it appeared, was to reveal their keys in stages to avoid revealing any more information than necessary.

Failures of Concealment

The two partners, despite their effort, often failed to conceal the identities of the pictures from their overhearers. Why did they fail? What clues did they let slip through their fingers? And did they realize how badly they were doing? We first consider the judgments of the participants as to how well everyone did and then look at some reasons for the partners' failures.

Judgments of Success

Each participant in our experiment was asked after each trial to estimate which pictures the matcher got right, and which the overhearer got right. Table 2 shows the percentages of pictures, but only in the concealment condition, that each participant estimated had been correctly identified by the matcher and by the overhearer. Everyone thought the matchers had done splendidly—that they had been right 99% of the time—when they were actually right 92% of the time. More surprisingly, everyone thought the overhearers had been right in the neighborhood of 43% of the time, not 12.5% of the time, which was

TABLE 2
PERCENTAGES OF PICTURES THAT THE DIRECTOR, MATCHER, AND OVERHEARER ESTIMATED HAD BEEN CORRECTLY IDENTIFIED BY THE MATCHER AND OVERHEARER IN THE CONCEALMENT CONDITION

Identifier	Source of estimate	Percentage
Matcher	Director	99.5
	Matcher	98.5
	Overhearer	99.0
	Observed	91.9
Overhearer	Director	50.0
	Matcher	35.4
	Overhearer	44.8
	Observed	46.9

chance. In fact, overhearers were right 47% of the time. So everyone was pretty accurate at judging how *many* pictures the matcher and overhearer would get right.

The three participants, however, varied greatly in how accurately they predicted which *particular* pictures the overhearer got right. Suppose a director predicted that her overhearer got pictures 1, 2, and 8 right and 3–7 wrong, when the overhearer actually got 1 and 3 right and 2 and 4–8 wrong. The director was accurate in five of the eight predictions, or 62% of the time. But given that she predicted he got three right and five wrong, and given that he actually got two right and six wrong, she would have been correct an average of 56% of the time even if she had assigned her three rights and five wrongs at random. Her actual predictions were 6% better than this chance figure. By averaging over individual cases like this, we calculated the three percentages (corresponding to 62, 56, and 6%), for each type of judge, for the matcher's accuracy and for the overhearer's accuracy. Those percentages are listed in Table 3.

The overhearers were more accurate than the directors or matchers at predicting which pictures they, the overhearers, got right. Overhearers made correct predictions 72% of the time, and the directors and matchers, only 59 and 57% of the time. Only the first percentage is above chance ($F(1,7) = 19.40, p < .003$), and it is reliably larger than the second and third, whether they are corrected for chance or not (when corrected for chance, $F(1,7) = 6.60$ and 6.88, $p < .05$). The three percentages for the matcher's identifications are too near ceiling to tell us anything.

So two partners suspected the overhearer of having identified three to four pictures each trial, but couldn't tell which ones they were. The overhearer was better at judging which ones he got right, but he still wasn't perfect.

Sources of Failure

The postexperiment questionnaires revealed two major sources of failure—revealing too much adjunct information and using risky keys.

Adjunct information. For every reference used for concealment, one can divide the information the two partners made public into two parts—the private key proper and adjunct information. Consider one director's presentation, *this is where someone wanted to put my teddy bear.* Now the private key is the event, mutually known by the director and matcher, in which a friend of the director's wanted to put her teddy bear into the claw fountain. That event itself was closed to the overhearer. But in talking about it, the director displayed or presupposed adjunct information she surely believed was *not* closed to the overhearer: that the director had a teddy bear; what teddies are; what putting is; what sorts of things a teddy is likely to be put into; etc. For a successful concealment, the referent must *not* be conjecturable from the adjunct information alone.

Directors often misjudged how much

TABLE 3

PERCENTAGES OF PICTURES THAT THE DIRECTOR, MATCHER, AND OVERHEARER CORRECTLY PREDICTED HAD AND HAD NOT BEEN IDENTIFIED BY THE MATCHER AND OVERHEARER IN THE CONCEALMENT CONDITION

Identifier	Judge	Correct predictions	Chance predictions	Difference
Matcher	Director	91.9	91.7	+0.2
	Matcher	91.4	91.0	+0.4
	Overhearer	91.4	91.4	0
Overhearer	Director	58.6	55.7	+2.9
	Matcher	56.5	53.3	+3.2
	Overhearer	71.9	57.7	+14.2

could be conjectured from the adjunct information alone. The overhearer to *where someone wanted to put my teddy bear* looked through the pictures for something one could sensibly put a teddy into and chose the claw fountain. He was right. Other overhearers were correct in choosing Hoover Tower for *I might hang a picture of Glenn off of this for his birthday* and for *where I was paid and getting dizzy,* the commencement picture for *we want to someday do this,* and Stanford Stadium, where the Olympic soccer matches had been held, for *Number 3 you heard a lot of noise from, this summer.* Many failures seemed to be of this sort, perhaps a majority. So although the directors used private keys, they often provided so much adjunct information that the keys weren't absolutely necessary.

Risky keys. The keys people used ranged in the risk they ran of being discovered. Most keys were safe, built on private experiences the two friends could be fairly certain the overhearer, a stranger, had no knowledge of. Examples: *we were talking about the aesthetic value of this on the way over; Sam and Joey; where Jim works,* and *this is that class that Andy and Eric were in.* Although one key backfired when the overhearer happened to know the person named, the risk was generally minimal.

Other keys were riskier, often much riskier. They were built on information a director, on reflection, should have expected to be common ground in communities the overhearer might well belong to. Examples: events from the movies *Repo Man* and *Young Frankenstein;* the golden arches for McDonald's Restaurants as a clue for the arches in front of Memorial Church; *something that's going to happen in June* for the commencement picture; and *cluelessness* and *black holes* for the long hallway. Directors tended to use such keys when only two or three pictures remained and they could assume the matchers but not the overhearers knew which. They were sometimes wrong in these judgments.

For a few keys, it was the adjunct information that was critical anyway. One director said, *Patricia always says I want a baby?,* referring to the Medical Center with the bicycles, since one bicycle had an infant seat on the back. What is critical to identifying this picture was not the private information about Patricia, but the adjunct information about babies. What the director should have said is, for example, *Remember what Patricia always says I want?* Another pair exchanged *Are there going to be a few people at our wedding* and *mm yeah just a few* to identify a picture with just a few people in it.

So two partners often gave the overhearer too much information by using risky or irrelevant keys. They seemed to underestimate how much overhearers knew about the risky keys and how far overhearers had already narrowed the options.

Conclusion

We have argued that audience design is an essential feature of language use: Speakers design what they say for the particular people they believe are or might be listening. Theories of language use have acknowledged this only gradually. At first they tended to treat all listeners alike; speakers designed utterances mainly to be true or false. The next generation of theories (e.g., Austin, 1962; Grice, 1968; Searle, 1969) dealt with how utterances are designed for addressees, but they focused exclusively on speaking to single addressees. These theories had to undergo basic revisions to account for speakers talking to more than one conversational participant at a time (Clark & Carlson, 1982). They need still further revisions to say how speakers deal with overhearers (see Clark, 1987). The research reported here is intended to help specify those revisions.

Audience design is especially obvious in definite reference. In the main theories, when Ann is addressing Ben and wants to refer to Derek, she must try to design a def-

inite description—e.g., *Derek* or *that tall guy*—so that Ben can identify Derek based on that description plus their current common ground (see Clark & Marshall, 1981; Clark, Schreuder, & Buttrick, 1983). But, as before, Ann's design has to change when she and Ben are joined by other participants. It changes even more radically when she and Ben can interact directly, as in a conversation. There, according to a good deal of evidence, she and Ben collaborate on the making of each reference (Clark & Schaefer, 1987; Clark & Wilkes-Gibbs, 1986; Cohen, 1984; Isaacs & Clark, 1987). Their goal is to establish the mutual belief that Ben has understood Ann's reference, and it may take them several exchanges to reach that goal.

Dealing with overhearers, we have argued, alters the process still further, depending on the speaker's attitude toward the overhearers. If Ann is indifferent to whether or not her overhearer Oscar understands, she can refer to Derek as she normally would with Ben—say, as *Derek*. But if she wants to make certain that Oscar too can identify Derek, she may need to expand on or change that reference—say, to *Derek Aitken from Denver*. If she wants to conceal his identity, as we have seen, she might use instead *the man we talked about last night*. She may even want to disguise Derek's identity so that Oscar thinks she is referring to someone else, and that would require other considerations. These four attitudes—indifference, disclosure, concealment, and deception—each follow a different logic. Each requires Ann to design her reference for two different purposes at the same time.

In this paper we have brought out two main points about concealment. The first concerns its logic. Ann's goal is to design her reference (a) to enable Ben to identify the referent and, simultaneously, (b) to prevent Oscar from doing so. To achieve this, according to our proposal, Ann must build her reference on a private key. That key is a piece of Ben's and her common ground (satisfying requirement *a*), but one she believes is closed to Oscar (satisfying requirement *b*). The students in our task tried to do just that. Almost all their keys were built around events, processes, states, and objects from joint personal experiences that excluded the overhearer and yet bore some relation to the landmarks whose identities were to be concealed. And each pair of partners worked hard at finding these areas. Two partners took much more time when they were trying to conceal than when they were indifferent.

The second point is about the process of concealment. Finding and using private keys that fit this logic can be difficult, especially on the fly. This poses two main problems. Ann and Ben need procedures for discovering and focusing on the right private information in the first place. They also need techniques for expressing the keys in such a way that adjunct information doesn't give them away. In our task the students solved these two problems in an ingenious way. They used a variety of collaborative techniques that they had available anyway for other purposes.

Their main strategy was to reveal their keys gradually turn by turn. The director would search for closed areas of personal common ground by the use of prefaces (e.g., *Okay, remember in Hiltonhead?*) and check on the understanding of a key with a try marker (e.g., *my best friend on the ski team?*). If these failed, she would try another private area or key. She would often try one key after another until the matcher caught on and cut her off with a truncator (e.g., *right right*). When the director did refer to a landmark or scene, she tended to do it indirectly, as in *Position eight is gummi bears* instead of *Position one is the place where you and I ate gummi bears*. These techniques enabled the two partners to focus on private, shared experiences without divulging too much information to their overhearers.

Our task made concealment particularly hard because it was so demanding. The two

partners were no more familiar with the pictured landmarks than the overhearers were, so they had to worry about divulging too much. Also, with only eight pictures, the overhearers could narrow down the alternatives with relatively little information. And the partners had no choice but to conceal each reference; they couldn't postpone talking about a landmark just because it was hard to conceal. So the time and errors we found may not reflect most everyday attempts at concealment.

Still, the failures in our task reveal difficulties people can have in finding and using private keys. Two partners sometimes chose a proper key but, in making their reference, divulged adjunct information that gave it away. The idea was right, but the execution was faulty. Other times they overestimated the opacity of their keys. It was too easy for the overhearers to conjecture which pictures the keys were about. Yet the two partners seemed to know how often they let revealing information slip through their fingers.

In general, then, speakers take account of overhearers as well as addressees and other participants as they formulate and execute utterances. Any theory of these processes, to be adequate, must do so too.

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