

Chapter 9: Language and Communication

Language and Communication

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Language and Communication

WHAT'S THE ANSWER?

"Ahm gowa gega ped dawp." *We started the Psychology: Its Nature and Nurture Chapter with that quote. Is it language? What does it mean?*

Do animals have a language? Can they communicate with each other?

"What're you going to do, Steve? Teresa was the perfect date, but now she's sick. It's only two days 'til the dance. Everybody I know has already got a date," says Jeff to his best friend and fellow senior.

"Well, it's not hopeless yet. Let's go out and 'read the halls,'" replies Steve. Having said it, Steve then moves out to the front entry hall of the Student Center. Classes are out, and many of Steve's and Jeff's friends are heading into the Center. Steve seems to know everybody and goes out of his way

to greet every female who passes. Nobody does more than return the greeting, or pause just a moment for conversation.

As the crowd thins out, Steve turns to Jeff and says, "That was a big help. My guess is that Jessie doesn't have a date. I think I'll give her a call tonight."

"How could you tell? You barely spoke to her!" is Jeff's stunned reply. *How does Steve know?*



One of the major questions about language is how we store information used in speaking and understanding. Two hypotheses have been proposed: reappearance and utilization. A central problem is to explain how we can understand sentences we have never heard before.

Language is an abstract system of symbols and meanings. Whereas performance is an account of what we actually do, competence refers to our language potential. All languages have four features in common: meaningful terms; arbitrary assignment of symbols to concepts; openness, or productivity; and a sound-meaning link.

In processing language, speakers must share agreement on sound, rules of organization, and meaning. Four capacities are necessary for language to develop as a means of communication: brain capabilities, a speech mechanism, abstract reasoning ability, and also, it seems, an inherited urge to use these capacities.

Communication is the passing of information from one organism to another using signals. Communication involves at least four elements: transmitter, signal, channel, and receiver. The "language" of bees is communication, but its elements are of limited meaning. Communication between humans and chimpanzees has been established using sign language, but some issues are still unresolved. Confirming observations are being sought.

Nonverbal communication cues are part of the total communication process. These cues include paralanguage, proxemics, and skin sensitivity, among others.

Language

We use language to communicate with each other in all sorts of ways. We try to sell each other soap and cars, real estate and swim suits. We say one thing, but we do so in a tone of voice that may clearly tell our listeners something very

different. We sing to each other; we yell; we whisper; we plead. We draw on every skill studied in this book. To sum it all up, when it comes to communicating with others, we rely most heavily on our most sophisticated human skill -- language.

Think of the benefits provided by language. In printed form it allows us -- even as you are doing now, by reading -- to educate ourselves. If your professor gives you a written assignment, it allows you more freedom than any other animal to express what is unique about you. In fact, language and its related processes may be the most important feature distinguishing humans from all other animals.

The study of language leads naturally to a number of related questions which we address in this chapter: How do we organize our language for rapid recall of the words we need when we need them? What is language, and how does it contrast with speech? What are the distinguishing features of language? When we are processing language, what is the relative importance of sounds, syntax, and semantics? Are humans unique in their reliance on language? What is required of us physiologically and intellectually to use spoken language? Each of these questions identifies an important element in understanding the totality of humans' use of language.

How is Language Organized?



One of the most important questions about language concerns exactly how we store and retrieve information so that we can speak and write. There is no easy answer, but two suggestions have been made:

(1) *Reappearance*. You read in the chapter on remembering that through our life we *do* store certain experiences. If someone asked you right now to recall the first time you gave a talk before a group, you could recall (if you wanted to!) the complete event. In this sense remembering amounts only to stirring up something that already exists. That "memory" simply reappears. This is one theory as to how language may be stored, but it has some severe limits.

(2) *Utilization*. There's another possibility. Perhaps we don't actually just "report" on our memory as if viewing from the outside some event stored as whole within us. We may store only a few elements of an event -- just the traces of it (as separate "bones," which need to be reunited). If so, we might view memory as a process of reconstruction. There is an easy

way to demonstrate this for you. Was the doorknob on the outside of the door you used most often going into the house where you lived three homes back on the right or the left?

Now that's not something you're likely to have bothered to remember. But in recalling the answer -- we assume you were able to answer correctly! -- you probably just reconstructed a mental image of the entry way. You may have positioned trees or plants, entry steps, railings, and so forth. From this array you logically determined which way the door had to open. From that you deduced where the knob had to be. If that described what you did -- as it does for many of us -- then you've just experienced memory as an act of reconstruction.

What has this to do with language? Everything! In the Chapters discussing learning and remembering we discuss performance limits. We worry there about how much we can learn and what conditions lead to the best learning and recall. Here we are more concerned with the actual strategies we use internally as we listen and speak. The problem is easy to illustrate. We learned earlier that our total vocabulary is rather limited -- perhaps an adult can recognize 100,000 words. Despite this, we almost never create new words. Most of the sentences we hear (or say ourselves) don't contain new words. Yet we are constantly making up new sentences. Our stock of words is quite limited, but the supply of sentences we *might* generate is almost infinite. You have never before read a sentence exactly like the one you're in the midst of now, yet you understand this sentence with little difficulty. That's the challenge for psycholinguists -- scientists who study language. Psycholinguists might be described as doing the reverse of what paleontologists do.

Paleontologists start with skeletons and use knowledge about muscles and bones and body structure to create models of what



prehistoric animals may have appeared. Psycholinguists do the reverse with language, as suggested in the Figure. They must develop a system that will allow us to understand how -- even when as young as age five or six -- we comprehend sentences we've never heard before.

What is language?

Let's start by defining language as an abstract system of symbols and meanings. This system includes the rules (grammar) that relate symbols and meanings so that we can communicate with each other. The only term in that definition that might give you some trouble is "symbol," but that's easy. A *symbol* is anything that stands for anything else. The dinner bell is a symbol of the food that's available. A coworker's scowl is a symbol of his or her displeasure. The wink of a friend may symbolize a joke or agreement. Symbols appear constantly in our everyday life as suggested by the examples in the Figure.

Performance is simply an account of what we actually do or say. If we asked you your name, you would respond with some kind of verbal output called speech, or you would respond with a gesture from Ameslan (American Sign Language). Competence is a bit trickier. It refers to the ability we each seem to have to generate and interpret sentences according to rules. To illustrate: not proper that Words nonsense are the order in appear do. Said another way, "Words that do not appear in the proper order are nonsense!" You *know* what is correct order in English and what isn't.

This can be further illustrated in another way. One youngster, aged three, hid from her father behind some curtains in the family's living room. She said to her father, "Daddy, I'm behind the KURin."

Her father replied, "Yes, I see you. You're behind the KURin," mimicking her mispronunciation exactly.

She replied, "No! The KURin!" For her, "KURin" when she pronounced it meant "curtain," but not when she heard it. Here, the child's speech performance has not yet equaled her linguistic competence. This also nicely illustrates the difference between speech and language.

The Essence of Language

Around the world there are certain features that identify language. These are features that are shared by all languages, setting them aside from all other systems of communication. Yes, you read that correctly -- there are systems of communication which are not languages, but we'll discuss some of those elsewhere in this chapter. What features do languages share in common?

Meaningfulness. Pronounce the word "milk" aloud. Ask some of your friends, both male and female, old and young, to say the same word. You can still understand it, can't you, regardless of who's saying it? That's one aspect of the meaning

of "milk." It doesn't matter who's saying it, how it's pronounced (within limits), or where the word is used, it still refers to a white liquid substance. Despite changes in pronunciation (mumbled, stressed, unstressed), loudness (too loud, just right, too soft), frequency (high or low), location, or anything else, for speakers of English the word is still associated with the same concept or object -- *milk*.

Arbitrariness. The relation between a symbol and the thing or concept to which it refers is arbitrary. There's nothing about dogs requiring us to call them "dogs." If we all agreed, we could just as easily call animals shaped like those we now call dogs, "cats." Put it another way: We can't tell the name of something just by looking at it. Each concept is arbitrarily assigned a particular symbol.

Openness. Play for a moment with the three words CHILD, KISS, and GRANDFATHER. There are six different orders in which those words can appear, as seen in Table 9.1.

Table 9.1

Productive use of language

<u>WORD ORDER</u>	<u>ONE TRANSLATION OF MEANING</u>
<i>Child, kiss grandfather</i>	The child is being asked to kiss grandfather.
<i>Grandfather, kiss child</i>	Grandfather is being asked to kiss the child.
<i>Child, grandfather kiss</i>	A statement about an event.
<i>Grandfather, child kiss</i>	A statement about an event.
<i>Kiss grandfather, child!</i>	The child being commanded to kiss grandfather.
<i>Kiss child, grandfather!</i>	Grandfather being commanded to kiss the child.

As you can see there, using the same three terms we can come up with six different orders for the three words, associated with six different meanings. Our language, thus, is productive, or open. Using a limited number of words, combining them in different orders yields new meanings. There are, of course, mathematical limits to our language, but functionally we can say our language is infinite in the nuances and varieties of meaning it can convey. If we can't string together enough adjectives to

achieve exactly the meaning we desire for a specific noun, we simply invent a new one.

Sound-meaning link. This is really crucial to our ability to communicate. We are able to communicate with each other because we've already reached an agreement. The meaning of each concept is permanently linked to a particular word -- it is printed and pronounced (sounded) in the same way each time it is used. Without that agreement we'd have no language. Without that agreement we'd have no communication.

Known languages share these four features in common, as suggested in the Figure.

Think About It

The question: At the start of the Psychology: Its Nature and Nurture Chapter and again at the beginning of this chapter we started with some nonsense words. We asked you if they could be called language. If so, then what does the phrase "Ahm gowa gega ped dawp" mean?

The answer: Refer to the cartoon strip.



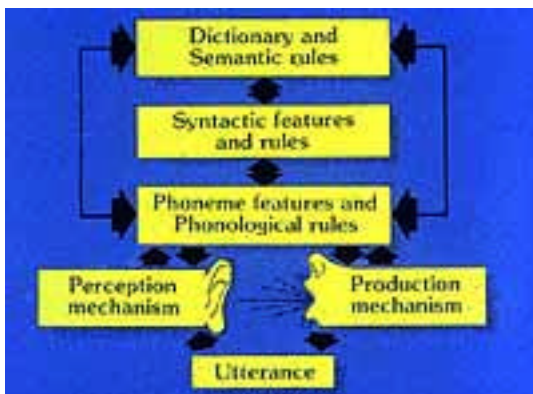
If you will read very carefully, you can figure out what almost every one of the words means. Pay attention to what's going on as different words are used. Notice who's speaking when various words and phrases are used. Notice also what the apparent subject of each statement is. Keeping these things in mind, you should be able to translate "Ahm gowa gega ped dawp" correctly. Want a hint?

"Ahm" means "I'm." See if you can solve the puzzle now. Once you've finished, the meaning of the nonsense words will be clear. The link between each "word" and the action or object to which it refers is arbitrary, but the terms are used productively. Moreover, the link between sound and meaning is there. We have, in short, introduced you to a "language" in the cartoon strip in the Figure.

Processing Language

"Do you know what time it is?"
"Yes." . . .
"Well?..."
"Yes. Yes, I *do* know what time it is."
"Will you tell me what time it is, then?"
"Oh. I'm sorry. I didn't realize you wanted to *know* the time. You just asked me if *I* knew the time. It's. . ."

And there we'll leave our fanciful conversation. Why are we very unlikely to have a conversation like that? Understanding the answer involves an explanation of the important elements of language processing. Basically, there are two sets of reasons why such a conversation is unlikely to occur. First, you and I converse on the basis of an unwritten - - but universally practiced -- set of rules governing use of language.



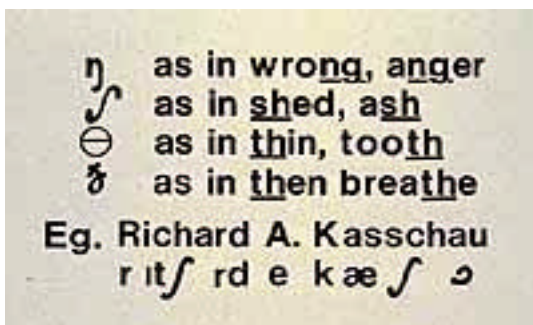
When you pass someone in the hallway and say, "How are you?" , you do not expect them to respond with a list of joint aches, pimple locations, and problems with a garlic-filled lunch that just won't quit. "How are you?" is not an invitation for a detailed report; it's a social greeting indicating we acknowledge

someone else's existence and are generally (socially) concerned with their well being. "Do you know what time it is?" is not answered yes/no, it's a request to demonstrate specific knowledge. It's understood that way by speakers of English; it's practiced that way.

The second set of reasons why this conversation would not occur is somewhat more complex. They involve the primary skills which are combined to allow us to utilize our spoken language. There are three elements involved: One is sound. These sounds come in several different "packages" -- English, Spanish, French, Vietnamese, Chinese, Tamil. . . The second skill leading to spoken language is our understanding of syntax, the rules by which we organize our words into lengthier messages. The final factor is the meaning we attach to the words we use. Among these three, syntax and meaning explain why we interpret "Do you know the time?" correctly. The words "know the time" ordered as they are (syntax) means (semantics) the speaker is asking you to inform him/her as to the actual time.

Sound

We are all used to the fact that our language is composed of series of individual words. But that was something we learned. We didn't know it until we practiced processing the language. In fact, when you are speaking at a normal rate of speed, the pattern of sounds coming from your mouth is almost constant -- boundaries between words are not at all obvious. In a simple word association experiment, children (Grades 1, 3, and 5) were given a variety of simple, single words. They were asked individually to respond each time with the first word that occurred to them when they heard the stimulus word.



One first-grader, upon hearing *once*, responded *upona*. She illustrated the problem of trying to learn a language on the fly. Every fairy tale the child had heard probably started out, "Once upon a time. And, more than likely, she had never heard the word *once*

any other phrase. So we learn how to analyze sound. We gain experience in separating the stream of sounds, as illustrated in the Figure, into individual words. It's important that we be able to do so, yet each spoken word helps us understand the others spoken with it. Feature 9.1 discusses some of the ways in which changes in sound may alter the meaning of a message.

Feature 9.1

SOUND'S IMPORTANT

In the Remembering Chapter we spoke about the very shortest-term memory that we have—our sensory store. Most of our examples involved storing visually presented information, but the same sensory storage feature must also be working when we talk to one another. It takes almost a second to say "marshmallow." We have to store and remember the first part of the word until we hear the last part. That way we can be sure the speaker didn't say marshes or marshlands or marshal.

But, in addition, such things as emphasis and grouping of words can also affect what we interpret a speaker to mean. For example, read out loud the following sentence: "Woman without her man is nothing." Without knowing how the words are grouped, two interpretations are possible. Re-read the sentence in each of the following ways, but pause between the brackets:

(Woman without her man) (is nothing.)

(Woman) (Without her) (man is nothing.)

The location of the pauses determines the meaning of the sentence. In fact, by altering the location of the pauses, you have completely reversed the meaning of the sentence!

Another feature that influences meaning is inflection or emphasis within a sentence. Consider the sentence "I want you to do it." If "I" is stressed, it means the speaker as opposed to someone else, wants you to do the task. If "you" is stressed, it means the speaker wants you, rather than someone else, to do the job.

These major changes in meaning are one of the reasons why machine translation of spoken language has been so hard to achieve. The wording was identical in our last two examples. Yet, the sense of the meaning of each sentence changed markedly as the pauses and emphases were shifted around.

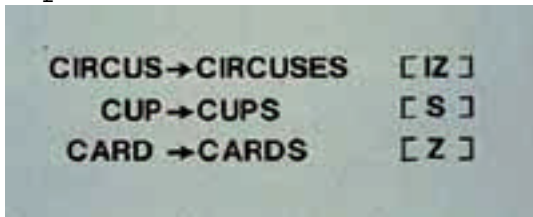
There is a language of sounds called American Sign Language, or AMESLAN (AM-eh-slann). Our English language has 26 letters, but how many sounds must you be able to create in order to speak English? Thousands? Hundreds? No, surprisingly, English is based on only about 43-45 different basic sound units called phonemes. To recreate the sounds needed to speak English, you need a knowledge of three things: The phonemes (illustrated in the Figure), the places where pauses occur, and

the syllables that need to be STRESSED. The brief sentence written in Ameslan in the Figure contains all three pieces of information, so someone with no knowledge of English but a working knowledge of Ameslan could pronounce the sentence correctly so that any speaker of English could understand him/her.

Syntax

We write elsewhere in our discussion of language about the impact that word order can have on the meaning of a message. There are several aspects of order, of both sounds *and* words, that influence the meaning of a spoken message. When we hear a word, the sequence of sounds determines how we will pluralize the word as illustrated in the Figure.

The /e/ sound in *tree* causes us to pluralize it by adding a /z/ sound -- yielding /trez/. The same is true of *cha-cha*, *boo*, and *mariachi*. But if we hear *cut*, we pluralize it with /s/ to yield /kuts/. Based on the sound we hear, we also pluralize *book*, *rap*, and *soap* with an /s/. More than 80% of first-graders can pluralize these word forms correctly.



CIRCUS	→	CIRCUSES	[IZ]
CUP	→	CUPS	[S]
CARD	→	CARDS	[Z]

Only about a third can process a third widely used form of pluralizing based on sound using the /iz/ sound -- as in *circus* yields as its plural *circuses*; *fox*, *winch*, and *glass*

are all pluralized the same way. We aren't able to process the third type of pluralization with 80% accuracy until roughly fifth-sixth grade.

In addition, the order of words themselves in a sentence is also important in determining meaning. Some words seem to be treated with respect, others are pushed around almost at (our) will. Yet we pay attention to the order of words, because it provides us with valuable information. For instance, there are two major kinds of words: content and function.

Content words are an open class -- we're always making up new ones. "A-OK" was added to our vocabulary from the moon shots. "Turn on to" was added by adolescents; more recently, "the bomb." By contrast, function words are closed -- we learn all of them by the age of 12 or so. These include pronouns, prepositions, and determiners (such as a, an, the, and so forth), in addition to many other such classes of words. We might think of function words as the mortar holding the bricks (the content words) together as illustrated in the Figure.

Function words may be deleted in telegrams, but sentences without them are awkward and less well understood.

Syntax also has to do with the relationship of words to one another as they appear in sentences. "The man cooked the spinach" is very easy to translate; it follows the rules quite well. But how about "They are frying chickens"? Does that refer to some cooks who are really cooking chickens or does it refer to the type of chicken?

A *psycholinguist* is interested in studying the rules by which we translate sentences and understand the speaker's intended meaning. The distinction between the surface structure of the sentence -- what is actually spoken or written -- and the underlying or deep structure -- the basic, internalized rules from which the sentence is generated -- is one of the things psycholinguists study. Obviously, in the case of the chickens, the context in which the sentence was spoken would do much to specify the intended meaning.

Semantics

Semantics is the study of meaning. What is meaning? You read in the Remembering Chapter about some measures of a word's meaningfulness. Table 9.2 lists other ways we may understand the meaning of word -- but there are still more.

Table 9.2

How a Word May Gain its Meaning

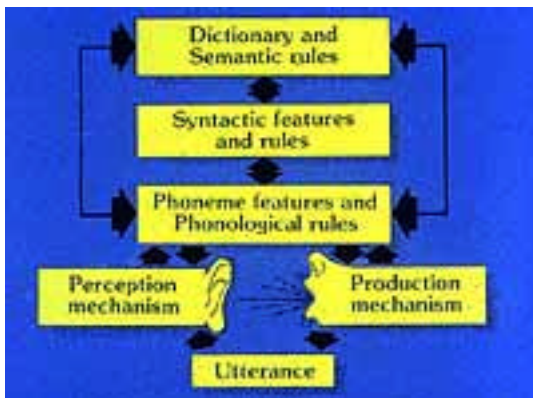
<u>Source</u>	<u>How it Works</u>	<u>What's an Example?</u>
<i>Convention</i>	Certain words are directly associated with an object or event.	Any nouns serves as an example: arm, road, recital...
<i>Assigned</i> animal	Words not directly associated with an object or event may be combined to generate an assigned meaning.	Describe a zebra to someone who has never seen one: "A stocky white horse-like with black stripes."
<i>Context</i>	The environment in which a word is pronounced often determines what its meaning will be.	"Port" is a wine, a loading/unloading place for ships, and a direction for ships to turn.
<i>Inflection</i>	Without changing any word said, the emphasis given to	Pronounce the following sentences emphasizing "ever" one

certain words can influence "What a pretty dress! How did you ever make it?"

A satisfactory definition of "meaning" has to account for a variety of word-related factors. For instance:

- (1) Why is "My typewriter has bad intentions" clearly *nonsense*?
- (2) Why is there a *contradiction* in saying, "My sister is an only child"?
- (3) Why is it *ambiguous* to say "I was looking for the pens"?
- (4) If we say, "The oar is too short," why do you *immediately infer* that you can also correctly say "The oar isn't long enough"?
- (5) Finally, if your professor says, "Many in the class were unable to answer the question," why must it *entail* that "Only a few in the class grasped the question"?

These are not easy questions, but then, if they were, we wouldn't be listing them! A good theory of meaning has to provide an answer to such questions. Words can be thought of as linguistic signs, each of which has an arbitrary connection with the thing to which it refer -- its referent. That's easy, but then think about the conversation about time, at the beginning of the Processing Language section. It illustrates a situation in which a speaker responds literally to a question. Clearly this was inappropriate, as we all know. In asking "Do you know what time it is?" we are really saying "If you know the time, please tell me what it is." There is a conveyed or natural meaning implied in the question even though it is not included in the literal words being used. All these different meanings are what make the meaning of meaning so hard to pin down.

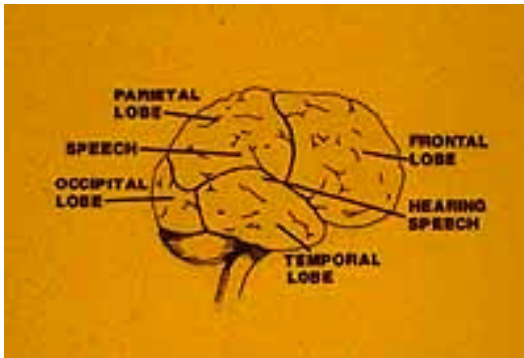


To process language, it is apparent that first sound must be decoded and the syntax correctly understood. The remaining task is to assign meaning to the units of the message. These three processes occur simultaneously, or in parallel, so this doesn't take very long at all. By the time you finish reading this

sentence you will have already grasped its meaning. Weren't we right? In trying to identify what goes on when we "comprehend" a spoken message, we find there's little to consider. You either do or do not understand a spoken message. In talking with a friend, by the time he or she is done speaking, you're ready with an answer. If you talk too long, your friend may be so eager to speak and so sure of your message that he or she will interrupt you. One of the challenges for psycholinguists is to explain the rapid and efficient process by which we are able to do these things.

Physiological Requirements for a (Spoken) Language

As we discuss elsewhere, there was quite an argument during the 1970s about exactly what is required for a spoken language. Some psycholinguists almost seem threatened now that a communication system has been established between humans and chimpanzees and apes. The worriers seem to feel we are somehow less human for the effort. Consequently, a lot of attention has been given to figuring out exactly what abilities separate us as a species from other animals -- if any do. The ability to think is important, but the use and processing of language seems key. What's involved in language? Four elements are required for language: brain capabilities and vocal cords discussed here, as well as an ability to reason abstractly and (probably) an inherited inclination discussed in reviewing intellectual requirements for language.



Several parts of our brain are involved in receiving, interpreting, and sending spoken words. First, the motor cortex controls our vocal cords, tongue, and mouth movements. A second area -- our auditory cortex -- provides feedback from our ears for the words we are speaking.

It monitors the speech we are producing. If you pronounce a word wrong or say the wrong word, you catch yourself within a word or two and correct the error quite rapidly. The lag time between committing an error and initiating a correction is a measure of how rapidly we monitor -- and can correct -- our own verbal output.

A third portion of the brain is our association cortex, which is responsible for storing, processing, and retrieving the words and thoughts we need. Finally, there are a variety -- a wide variety -- of connections between the temporal (auditory) lobes of our brain and the areas involved in actually processing the spoken word. As can be seen in the illustration, then, many different areas of our brain are involved in speech.

Another vital element -- but only for *spoken* language -- is our vocal cords. The vocal cords are two membranes stretched tightly across a portion of our throat, through which air must pass. They can be made to vibrate with a passage of air going up the windpipe (throat). For some words, whether or not your vocal cords are vibrating determines which of two sounds you may hear. For instance, place your fingers on your "Adam's apple" (voice box, or *larynx*, if you want to be technical). Make the sounds associated with F (a nonvocalized sound) and V (a vocalized sound). Can you feel your throat vibrating when you say V, but not when you say F? S and Z provide the same effects. Your vocal cords vibrate for Z (a vocalized sound), but not for S (a nonvocalized sound). Notice that your mouth is shaped exactly the same when saying both F and V. Its shape is different, but identical for S and Z. The only difference is the (absence of) vibration of your vocal cords -- a second requirement for speech.

Intellectual Requirements for a (Spoken) Language

We note elsewhere that everything in language can be represented by a symbol. For most of us that discovery is made

in early life. It occurs almost by accident -- we certainly aren't aware of it when the idea dawns upon us.

How important is this ability to manipulate abstract symbols? Consider an example from Helen Keller's life story. Deaf and blind since a very early childhood illness, Miss Keller (seen in the Figure) suddenly learns or realizes as she is drawing water at a well that all things have names. The moment is described by her childhood companion and teacher:

"The word, coming so close upon the sensation of cold water rushing over her hand, seemed to startle her. She dropped the mug and stood as one transfixed. A new light came into her face. She spelled 'water' several times. Then she dropped to the ground and asked for its name and pointed to the pump and the trellis, and suddenly turning round she asked for my name. I spelled 'Teacher.' Just then the nurse brought Helen's little sister into the pump-house and Helen spelled 'baby' and pointed to the nurse. All the way back to the house she was highly excited, and learned the name of every object she touched, so that in a few hours she had added 30 new words to her vocabulary."

This is the only known instance where someone was present to observe the exact moment at which one of us made the intellectual link between the abstract symbol system (language) and the events of the abstract and concrete worlds to which it refers. Clearly, such an ability to manipulate the abstract symbol is critical to our use of language.

Much debate still swirls around another issue: It's nature versus nurture, heredity versus environment all over again. Evidence suggesting that we *inherit* our tendency to use language is impressive. First, the onset time of the development of language in children is almost constant all over the world. Second, in comparable languages, a fixed sequence of language development exists. Thus, nouns are the first word class mastered and pronouns the last. Third, if something hinders normal language development, it does not alter the step-wise developmental processes of acquiring language itself.

Yet, for those arguing that language acquisition is mainly a *learned* skill there are also some impressive arguments. First, we know that without practice, little language skill and ability to communicate will develop. Second, all around the world children generally remain in the company and care of their parents for many years. In North American societies it may be as long as 18-20 years. This degree of contact assures that a sufficient opportunity for learning a language exists.

Inherited? Acquired? We don't have a final answer yet. However, these four elements -- brain, vocal cords, reasoning ability, and inclination -- seem to be completely represented only in humans.

Communication

If you were approaching the group pictured in the Figure, to whom would you most likely say "Hello"?

Which of the dogs in the second figure is mad at you?

As a third example, unlike animals that mark their territory in a variety of ways, we humans are very likely to leave verbal cues to ward off any possible intruders as suggested in the third figure.

These are but two examples of a basic process in which we are all engaged almost all the time -- communication. You may be surprised to learn that language is not the only vehicle of communication. Humans communicate with other humans in many different ways. Animals other than humans communicate with one another, yet they're not using language. In other instances, animals are communicating with humans and vice versa.

One of the most interesting examples of human communication involves nonverbal communication in which we communicate with one another without using overt, spoken/written language. That's what's occurring in the first Figure. You can even rank order the degree of openness or approachability displayed by each of the people sitting in the bleachers.

Communication as a Process

Communication is the passing of information between organisms by way of signals that evoke behavior. We'll see that this may involve a wide range of processes, since the forms of communication vary widely. The wag of a dog's tail, the laid-back ears of a horse, and the sonar beeps of a dolphin all have the common goal of communicating -- whether from animal to animal or animal to human. Among humans, however, the forms have found their widest diversity. And among those forms nonverbal communication -- especially the use of various body cues -- represents the most subtle, but interesting form.

Native Americans refined one of the oldest means of communication -- fire and smoke. Our means of long-distance communication have since expanded greatly. Samuel Morse's code-based telegraph relies on dots and dashes. The telephone, developed by Alexander Graham Bell, relies on clicks, beeps, and voice. Long-distance communication has blossomed even more over the past half-century, and now includes television coverage by satellite, cellular phones in many places, and paging

everywhere. All of these examples share some basic processes. Let's examine them.

The model shown in the Figure includes the four important elements in the process of communication. First, there must be a transmitter. This source encodes, or produces, the message. The information source operating the transmitter must follow the rules of meaning, of organization, and of production -- whether written, spoken, gestured, or otherwise -- which must be shared with the target of the message.

Second, a signal, or message, is produced. This is the spoken word in talking, the dots and dashes in Morse Code, or radio waves in broadcasting. There are many examples of signals, and what will serve as a signal is determined (and limited) by the channel.

Third, there must be a channel, the medium by which the signal is carried away from the transmitter. The channel itself has a direct influence on the means of encoding (sending) and decoding (receiving) the signal. The channel may be many different things -- wire for electricity, air or liquid or solid for sound waves, or paper for print.

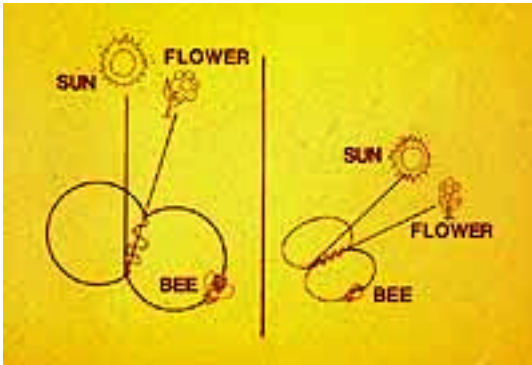
Sometimes the channel itself affects the quality of signal that is received. If you're shouting to someone across a field or a busy highway, you may have problems communicating. Distance allows other sources of sound to make it hard for your friend to hear and understand you. This channel noise shows up as static on radio or as "snow" on television, though it's only a faint signal in direct, face-to-face communication.

Finally, there must be a receiver. This is the intake system for the signal, sometimes called the decoder. Both the transmitter and receiver must operate under the same rules in order for communication to occur. The difficulties you had at the beginning of the chapter on Psychology: Its Nature and Nurture understanding "Ahm gowa gega ped dawp" occurred because you didn't know the meaning of the terms. However, the terms follow the same rules of organization and pronunciation as standard English.

Notice that the four basic elements in this model exist in all of the communication systems we've mentioned. Successful communication in each of these systems depends on prior agreement. The transmitter and receiver must agree on the meaning, organization, and form of the signals being produced and received. The United Nations sometimes flounders because of lack of agreement of this type. Contracts really attempt to spell out an agreement before a deal is completed. Wording and the meaning of the chosen words is thus critical for the forming of a successful contract. To achieve a successful communication, then, requires several steps.

When Animals Communicate

Do animals have a language? Can they communicate? To find the answers let's study perhaps the most sophisticated analysis of animal communication ever attempted. A Nobel prize was awarded to Karl von Frisch for his work in decoding the communication signals among bees. The problem is an obvious one.



When a bee returns to the hive having discovered pollen, it needs to relay information about the pollen's location to other worker bees. Your knowledge of geometry should tell you how many pieces of information must be conveyed. What's needed? Distance and direction.

Examine Table 9.3 and the illustration to see how this is done.

Table 9.3

Honeybee dances as related to distance separating hive from pollen source

FORM OF DANCE	DISTANCE FROM HIVE(Meters)
Round dance	3-100
Figure eight and sickle-shaped dances	100-200
Tail-wagging dance	200-300

Do the bees have a language? No. Remember how we define language in discussing the essence of language? Two critical issues for language are (1) meaningfulness -- the "language of the bees" clearly qualifies -- and (2) productiveness -- the bees fail here. Their communications use steps and processes that are locked one to one with features of the environment. The dance -- the angles, and the speed -- relay only distance and direction. Those same terms cannot be used to communicate anything else -- not even how high above ground the pollen is located. The bees' symbols cannot be used productively.

As is discussed in analyzing when animals communicate with humans, similar issues arise now that we've established communication systems with chimpanzees, but for bees the issue is clear. They don't have a language. It's less clear with dolphins. Dolphins seem to emit different sonar beeps when they're in a friendly group than when they are faced with danger. In fact, playing audio recordings of each type of sonar beep into otherwise quiet groups of dolphins seems to alter their behavior. They seem to respond differently to the two signals. Feature 9.2 details some of this fascinating research. It remains a question, as yet unanswered, whether these beeps are or can be used productively. Tune in in another decade for a more clear-cut answer.

Feature 9.2

"BEEP-BEEP"

The "Roadrunner" of cartoon fame goes "beep-beep" to communicate. Psychologists have discovered that the bottlenose dolphin also emits sounds to communicate, but this time in real life. The sounds have been recorded both in the ocean and also where the dolphin was quite restrained, and presented with specific stimuli. And what has been learned?

The dolphins seem to emit different types of sounds—even though they do not have any vocal cords. The sounds are of three types: (1) pure whistles, (2) slow trains of clicks, and (3) complex sound waves (quacks, squawks). Combinations of these sounds seem to be emitted under specific conditions.

For instance, when in distress, the dolphin emits two whistles over and over again—one getting gradually louder, the other getting gradually softer. It silences any nearby dolphins and causes them to search for the source. Once found, that dolphin is pushed to the surface and a complex exchange of signals occurs.

The slow trains of clicks range in frequency up to 80,000 cps. They are emitted to aid navigation—serving as sonar (sound) location to avoid obstacles and find food. When alone, dolphins emit mainly whistles and clicks. Together, they also emit whistles and slow series of clicks—first one dolphin and then the other—though rarely at the same time. When playing violently or courting, all dolphins emit all three sounds. Squawks and quacks then are especially frequent.

There's little doubt these signals are serving as a basis of communication. More work is needed, however, before we'll understand the precise make-up of the messages themselves.

When Animals Communicate with Humans

About once a decade for the past 60 years one psychologist or another has tried to establish communication based on language with chimps or apes.



Most of the early attempts involved just raising the baby animal as a human child, treating it in every way as a member of the human family. No luck. The best attempt after years of effort yielded a chimp that could pronounce three words. However -- as with human infants just learning to talk -- you had to know the chimp to understand the words.

Then Beatrice and Allen Gardner, a husband-wife team of research psychologists, made a smart decision. They noted that chimps have a very limited vocal apparatus, but gesture and imitate constantly -- using their hands. Why not try to teach a chimp using American Sign Language (Ameslan)? Ameslan is a language that meets all the demands of our earlier definition. The Gardners chose to study chimps because they are biochemically more similar to humans than they are to any monkey or ape.

The project started in 1969 at the Reno campus of the University of Nevada. A one-year-old chimp arrived and was promptly named Washoe (the name of the county in which the university is located). Only Ameslan was used in the presence of Washoe, but it was used constantly -- for idle chatter, for operant conditioning of Washoe, and for normal give-and-take conversation among the project personnel.

The results were astounding. By the age of four, Washoe could use some 85 different symbols correctly. By the age of five, she had almost doubled that number. As with children, the counting was stopped somewhat after that. Washoe knew too many words for the experimenter to get an accurate count!

By holding up objects that Washoe knew, it was possible to get her to gesture the sign for the object. Another observer

(who could not see the object being held up) could identify the sign, and thus the object, correctly. Washoe clearly understood and could communicate the meaning of the words. The Gardners were later able to teach four other chimps to use Ameslan. Other researchers at Central Washington University observed in similar experiments using Ameslan that some of the older chimps taught signs to younger ones!

Are we actually on the verge of being able to communicate with another species of animals? Some serious questions have developed about Washoe's language. First, does she observe standard rules for ordering single units of language (gestures/symbols) into multi-unit messages (sentences)? The Gardners said yes, about 80 percent of Washoe's two-gesture communications are correctly ordered -- well above chance levels of performance. But Herbert Terrace of Columbia University, who in the late 70's raised a male chimp named Nim Chimpsky, reached a different conclusion, as suggested in the Figure. After teaching Nim syntax (word order) for signed gestures, Terrace eventually had to conclude that Nim never really understood word order. Terrace asserts that Nim's sentences were largely imitative. Nim signed when he wanted something, making demands but not conversation.

Second, and perhaps most crucially, when children develop language, the increase in average message length grows steadily once they start combining single words into longer sentences. Terrace reported that Nim's average sentence length ranged from 1.1 to 1.6 units as Nim grew from 26 to 45 months old. Sentence length did not continue to increase as it does for humans. Terrace concluded that the chimps are not mastering a language.

The Gardners replied that Washoe was raised for years in a family environment by only a few people, all expert signers in Ameslan. They assert that Nim was raised by a much larger number of researchers, each present for a much shorter period of time. Less skilled in Ameslan than the "family" that raised Washoe, Nim's teachers gestured more abbreviated messages.

What we have here is a major methodological problem. Washoe was raised under conditions encouraging naturalistic observation. Nim was raised under much more tightly controlled conditions of experimental observation. Different techniques have yielded different results. Given the expense of conducting this research, it may be years before we know who's right.

Think About It

The question: Do animals have a language? Can they communicate with each other?

The answer: Animals can communicate with each other, but they use stimuli that do not vary in their meaning. The bared teeth, laid-back ears, and bristling fur of a snarling dog send a message, but these elements cannot be recombined in a different order, or used to mean different things. Thus, most animals do not use a "language" in the usual sense, although chimps, apes, dolphins, and whales may be exceptions.

The Gardners concluded that they observed longer sentences from Washoe because her environment was richer than Nim's.

This is a clash of methodologies. The Gardners used modified naturalistic observation; Terrace used study techniques much closer to the classic experimental model. The issue of experimental design is a key to resolving the differences of opinion of these researchers.

When Humans Communicate

Let's play with some numbers to see how much language you're exposed to each year during normal communications. Let's assume that as a student you're carrying a normal class load that keeps you in class and conversing with friends five to six hours a day -- a normal 15-16 credit-hour load. That will expose you to perhaps 100,000 words a day -- 50,000 during five-six hours of lectures and a like amount in the rest of your waking hours. That's about 36-37,000,000 words a year if you *don't* listen to the radio or television. Can you read at the rate of 300 words per minute (roughly one page of double-spaced typing with 1-inch margins)? If so, that means you're taking in almost 20,000,000 words a year if you read three hours a day. In total you may listen to or read as much as 60-100,000,000 words a year!

How much output do you produce? That, of course, will vary, depending on whether you're a good listener or a better talker. Most of us talk at a rate of from 120 to 150 words per minute. If we talk -- including *everything* we say -- five hours a day at that rate and live to 70, we will each produce roughly one *billion* (1,000,000,000) words during our life!

Numbers are fun, but the staggering thing is to consider the accuracy of the entire process. Very seldom do we say "banana" when we mean to say "Excuse me!" Very seldom, in fact, do we ever choose the wrong word for any occasion. The only word that will give you much difficulty is your name. Your name is unique to you, so the rest of us have less time to practice it than we do for the rest of our vocabulary. As a result, all of us have more difficulty when others use our name than almost any other word we use in our daily interactions.

Nonverbal Communication

Remember the example of the two young men in the WHAT'S THE ANSWER section of the chapter? One young man was able to "read" a series of signals, and react to them. Communication with his fellow humans was involved, yet not a word was spoken concerning his need for a weekend date. Learn from this that language is *not* the only vehicle of communication.

In fact, much of what passes for language-based communication is actually information you are injecting into a conversation by giving and reading nonverbal cues. In 1927, psychologist Edward Sapir said, "We respond to gestures with an extreme alertness and, one might almost say, in accordance with an elaborate and secret code that is written nowhere, known by none, and yet understood by all."



Nonverbal communication involves transmission of information by means other than language in its spoken, written, or otherwise coded form. Three types of nonverbal messages are most often used. Factual messages are involved in requesting or providing goods, information, or service

-- even in rituals, such as giving a medal for valor. Idexical messages contain information about the sender's biological and psychological makeup. How does he or she feel about the other people communicating? What are his or her social and cultural affiliations? Finally, regulatory messages help assure orderly management of a conversation. Who speaks? In what order do they speak? How long do they speak? Such communication is accomplished through a variety of nonverbal cues. Knowledge about those cues can be very helpful in allowing you to emphasize your own messages not just verbally, but also through use of your posture.

Paralanguage. Any time we talk we are offering a verbal signal to be received and interpreted. Paralanguage identifies the non-linguistic aspects of our spoken words. In what tone are we speaking? When do we pause? Do we stutter? All of these are paralinguistic cues that will "flavor" any listener's interpretation of what is heard. For example, even the simple word "Thanks" can be interpreted either as genuine gratitude or as sarcasm, depending on the tone in which it is spoken.

Proxemics. How do you walk with your friends? You don't walk ahead or behind them, you walk beside them, and within a certain distance -- not too close, but not too far away either.



Proxemics is the study of the distance between us when we walk, talk, stand, or sit around with one another, as illustrated in the Figure. We are individually wrapped by our "personal space" -- an invisible envelope that we maintain around ourselves into which others cannot intrude

without arousing discomfort. We prefer to let only certain people within that space, as you can see in elevators. People don't all crowd next to the door. Rather, they spread themselves out so that each person has roughly an equal share of the available space. And when someone exits, that space is redistributed.

Personal space doesn't exist for us when we first learn to walk -- we'll touch anyone or anything. By the age of three, however, we have developed our own personal space, and it increases in size between ages three and twenty-one years.

DISTANCE	VOICE
INTIMATE (0-45 cm)	WHISPER
PERSONAL (45-120 cm)	SOFT-LOW
SOCIAL (1-3.5 m)	FULL-MODERATE
PUBLIC (3.5 m-∞)	LOUD

The distance between two people can be used to predict the nature of the social relationship that exists between them. For example, the further up you go in a business organization, the larger your desk becomes, and, therefore,

the farther away from you a visitor sits as suggested in the Figure.

Skin sensitivity. Skin sensitivity refers to who touches what parts of what person's body in a conversation. This sounds crude, but some very reliable rules are still operating here. For instance, are you more likely to tap your professor's shoulder to get attention, or is he or she more likely to tap yours? In a family group, is a child more likely to push a parent, or the parent a child? In each instance, the answer may seem obvious.

However, if you combine these feelings with those we discuss regarding personal space, you can see that we are very careful about whose personal space we will violate. We almost never violate the personal space of someone superior to us by title, position, or family role. On the other hand, with people

over whom we hold a position of responsibility or to whom we feel superior, we are most likely to initiate first contact.

Think About It

The question: We shared with you the manner in which a dateless high school senior identified some young women to call for a date. He did so simply by talking with them and watching their behavior, without ever asking them directly whether they had a date to an upcoming dance. How did he do it?

The answer: He simply watched for covert signals. Using his knowledge of nonverbal communication, he watched for signs from his female friends that they could be approached or that they liked him. How? In terms of proxemics, he observed which young women stood closest to him when they talked with him. In terms of paralanguage, he listened for the warmest tones. In terms of skin sensitivity, he watched to see who would accidentally bump him, or touch him as she passed. None of these cues alone would be enough, but for the careful, dateless male observer, these cues together gave the information he needed. He could guess who would be most receptive to a call from him. Can you think of any other nonverbal communication not mentioned here?

USING PSYCHOLOGY:

"Talking" Through Body Language

In this chapter we discuss a number of nonverbal cues that people use when evaluating or getting a general impression of others. An interesting such form of communication that can be easily manipulated involves *kinesics* -- body placement and motions.



For example, in the section examining communication we ask you to identify the persons illustrated with whom you would be most likely to start a conversation. If you responded only to their body positioning, the person leaning forward with eyes downcast, legs pressed together, and

hands clenched almost seems to be saying "Don't bother me!" How could the signs be any more obvious? On the other hand, the persons slouching a little, leaning back with legs crossed loosely, and smiling are clearly approachable. If you are trying to look friendly, your posture alone can say "I'm easy to

talk to." So -- look everybody in the eye, cross your legs loosely, don't fold your arms, and have a ready smile!

Another point, perhaps obvious, but also very important, is the general impression you make by your choice of cosmetics and clothes. Say you're going to be picked up for a special date on Saturday night. What would you think of your date if he or she showed up smelling of the garden fertilizer shoveled that afternoon? The message being relayed to you is quite clear. On the other hand, if the aroma was perfume or after shave lotion, the message would be something very different. The same point applies to clothing. You're always advised to dress your finest for a job interview. Why? There are two reasons. First, first impressions last. Second, you're making a nonverbal statement to the person interviewing you that the interview was important enough for you to go out of your way to dress appropriately.

The examples go on and on, but the point is clear. We talk to each other to communicate. At the same time, the way we say our message and the environment in which we speak may make as lasting an impression as the actual words.

One psychologist has suggested that in the communication of attitudes and feelings, only seven percent of the total message may be communicated verbally. It was proposed that 38 percent of the message is conveyed by the tone of voice of the speaker, and 55 percent is relayed by the facial expressions of the one who is talking. That means a total of 93 percent of an emotional or attitudinal message may be nonverbal! So, talk with body language if you want to make yourself heard.

REVIEW QUESTIONS

LANGUAGE

1. What are the major benefits to humans of having the ability to use language?
2. Why is memory so important in the use of language? Describe the two major views of how memory works and illustrate one view.
3. Explain the difference between performance and competence in language.
4. List and describe the four characteristics shared by all spoken languages.
5. In order for people to communicate in a given language, what are the three aspects of the language with which

they must agree?

6. What four characteristics are required before an organism can develop a language?

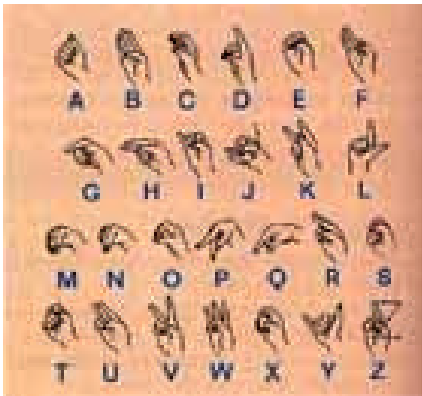
COMMUNICATION

1. Define communication and identify the four elements in most important systems of communication. Choose one system and identify by example the four elements in that system.
2. Do you consider the patterns of communication used by bees a language? Why or why not?
3. Do you consider the communication established between humans and primates a language? Explain.
4. Identify various types of nonverbal communication and provide an example of each type from your own life.

ACTIVITIES

1. To understand the difference between reappearance and utilization concepts of memory, consider how long it takes you to learn the following series of numbers: 010011101001101010001. Now, use the following coding system: 000 = 0, 001 = 1, 010 = 2, 011 = 3, 100 = 4, 101 = 5, 110 = 6, and 111 = 7. Learn the code so you can recall the numbers 0 through 7 easily when given any set of three 0's and 1's, and vice versa. Now have a friend read the series above to you slowly. As your friend reads, translate the triplets of 0's and 1's into single digits between 0 and 7. To recall the original series, simply use the single digits to generate the 0 and 1 combinations. Here you've used a few rules and little memory to store a greater amount of coded information than you could easily learn and recall otherwise.

2. Advertisers are constantly searching for sign-stimuli. These are the innate releasing stimuli that cause a highly predictable response in any organism. We humans do not react to very many such stimuli. Think of the advantages to advertisers if they could identify sign stimuli that would release buying behavior in us! Any time a product is revised at all it is usually advertised as "NEW." Could this be a sign stimulus? Try to identify as many possible language-based sign stimuli in advertising as you can.



3. Psychologists often work with handicapped people, such as the deaf. If time permits, seek out and interview someone who can communicate using American Sign Language. What are the problems in communicating with someone who is deaf? Are there any shades of emotion or meaning that cannot be communicated other

than verbally? Using the signs in the Figure, see if you can communicate in sign language. How much does it slow you down when you must communicate by gesture, rather than by mouth?

4. Aphasia involves language difficulties caused by brain damage from war, accidental injury, or illness. Receptive and expressive aphasias involve problems with hearing and expressing language. Aphasias may occur also in writing or in spoken language skills. Again, time permitting, discuss with a psychologist this condition and some of the difficulties it causes. Find out the various methods used to surmount it.

5. For an hour one day keep track of how many people smile at you when you look at them in your normal way as you are walking on your campus. Then, the next day, changing as little of your other behavior as possible, during the same hour try to smile at every person you meet and keep the same count. How many people smile at you the second day? Is there any difference? What does this tell you about the manner in which your gestures are causing people to react to you?

6. Nonverbal communication plays a large role in the total amount of communicating we do. We rely on a wave of the hand to say "hello" or "good job" or "I'm okay." Make a list of as many gestures as you see used in a day, where the gesture itself communicates an entire message without a word having been spoken. How many different gestures did you find?

7. One of the most important communications we receive as we are driving is the highway-related information relayed to us by signs. What messages are most important to us? In what ways do the highway signs change as the average speed of the cars passing them increases? Identify as many aspects as you can of the ways in which highway signs are designed to communicate the maximum amount of information in the least possible amount of time. What changes would you recommend to increase the impact

of the messages being relayed? When your list of answers is complete, select the best and the worst advertising billboard messages that you found.

INTERESTED IN MORE?

DEESE, J. (1970). *Psycholinguistics*. Allyn and Bacon. Will be interesting (but brief) reading. An essay by an experimental psychologist who switched his beliefs about the storage and use of language-based information from a "reappearance" to a "utilization" point of view. Explains his reasons for shifting.

LILLY, J. (1967). *The Mind of the Dolphin: A Nonhuman Intelligence*. Doubleday. This is an interesting case study of how the beliefs of a scientist influence both what he studies and how he studies it. Lilly analyzes the sonar (sound) signals of dolphins and tries to communicate using human sign language. He raises some very challenging issues about subhuman communication skills.

LINDEN, E. (1976). *Apes, Men, and Language*. Penguin Books. Starting with an analysis of how humans have taught sign language to chimpanzees, this author extends these findings to discuss how we believe humans communicate.

MATLIN, M. (1983). *Cognition*. Holt, Rinehart & Winston. A delightful text, covering the traditional topics in learning and memory plus chapters on perceptual processes, problem solving, and language. Activities interwoven with text encourage understanding.

MILLER, G. A. (1967). *The Psychology of Communication: Seven Essays*. Basic Books. A challenging series of essays that examine a wide range of problems involving psychology and communication. Covers topics from automation (humans communicating with machines and vice versa) to the study of psychic phenomena.

POLLIO, H. R. (1974). *The Psychology of Symbolic Activity*. Addison-Wesley. Lightly illustrated, this book discusses a wide range of symbolic activities from thinking to language. Heavy reading, but well written.

REYNOLDS, A. G. & FOGG, P. W. (1972). *Cognitive Psychology*. Winthrop. Covers many topics, but has especially

good sections on models of memory, language development in infants, and the problems (as they relate to language) of living in a bilingual home.

TERRACE, H. (1979). *Nim: A Chimpanzee Who Learned Sign Language*. Knopf. Terrace reports on his attempt to teach a chimpanzee sign language. Through use of data, he challenges the conclusions of Beatrice and Allen Gardner on the language ability of chimps.