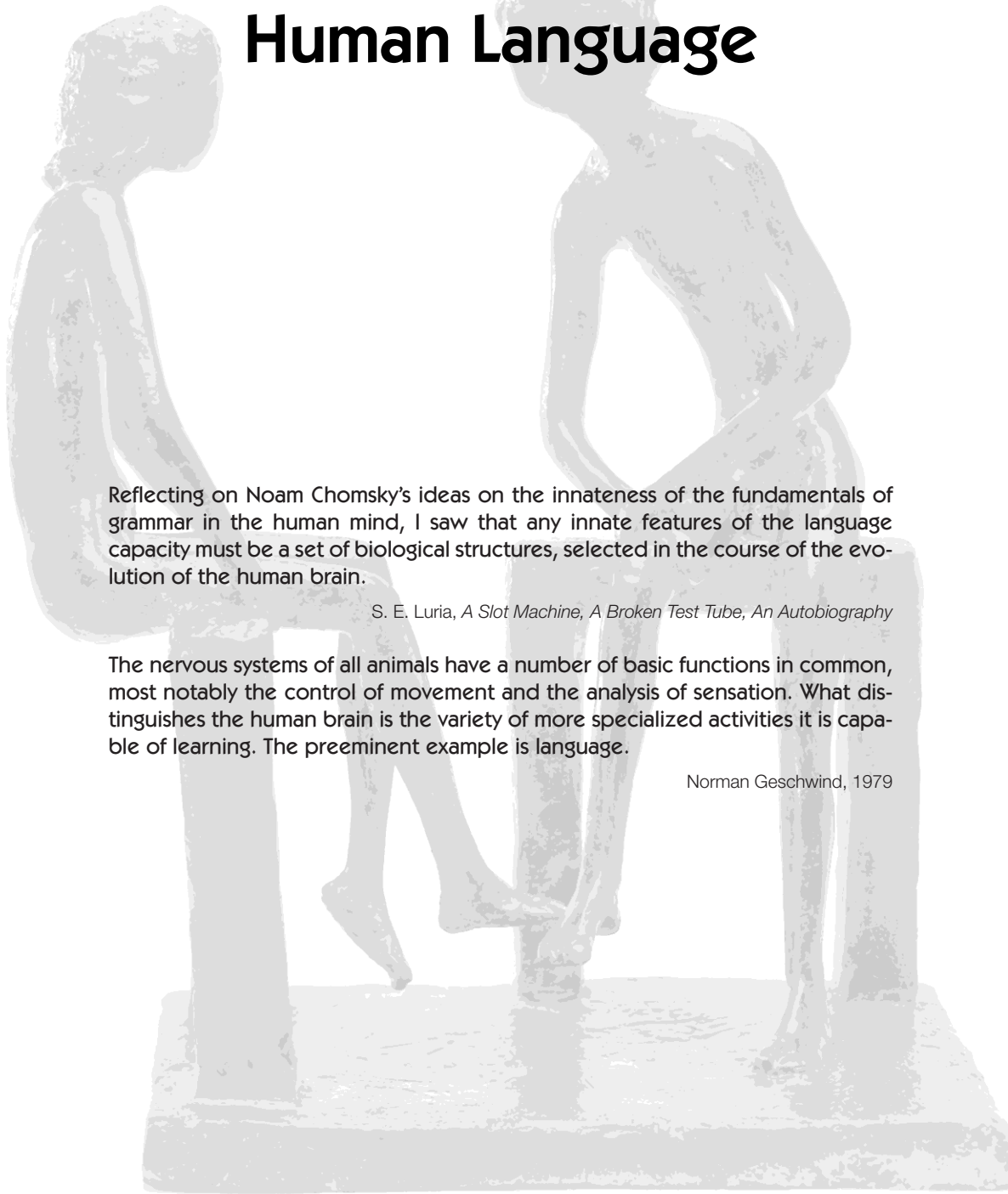
PART 1

The Nature of Human Language



Reflecting on Noam Chomsky's ideas on the innateness of the fundamentals of grammar in the human mind, I saw that any innate features of the language capacity must be a set of biological structures, selected in the course of the evolution of the human brain.

S. E. Luria, *A Slot Machine, A Broken Test Tube, An Autobiography*

The nervous systems of all animals have a number of basic functions in common, most notably the control of movement and the analysis of sensation. What distinguishes the human brain is the variety of more specialized activities it is capable of learning. The preeminent example is language.

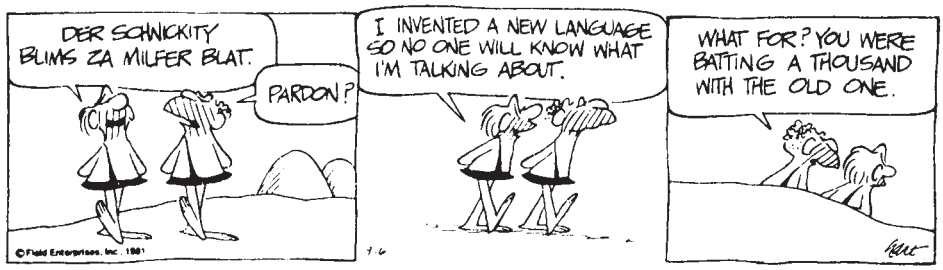
Norman Geschwind, 1979

Chapter 1

What Is Language?

When we study human language, we are approaching what some might call the "human essence," the distinctive qualities of mind that are, so far as we know, unique to man.

Noam Chomsky, *Language and Mind*



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Whatever else people do when they come together—whether they play, fight, make love, or make automobiles—they talk. We live in a world of language. We talk to our friends, our associates, our wives and husbands, our lovers, our teachers, our parents and in-laws. We talk to bus drivers and total strangers. We talk face-to-face and over the telephone, and everyone responds with more talk. Television and radio further swell this torrent of words. Hardly a moment of our waking lives is free from words, and even in our dreams we talk and are talked to. We also talk when there is no one to answer. Some of us talk aloud in our sleep. We talk to our pets and sometimes to ourselves.

The possession of language, perhaps more than any other attribute, distinguishes humans from other animals. To understand our humanity one must understand the nature of language that makes us human. According to the philosophy expressed in the myths and religions of many peoples, it is language that is the source of human life and power. To some people of Africa, a newborn child is a *kuntu*, a "thing," not yet a *muntu*, a "person." Only by the act of learning does the child become a human being. Thus, according to this tradition, we all become "human" because we all know at least one language. But what does it mean to "know" a language?

LINGUISTIC KNOWLEDGE

When you know a language, you can speak and be understood by others who know that language. This means you have the capacity to produce sounds that signify certain meanings and to understand or interpret the sounds produced by others. We are referring to normal-hearing individuals. Deaf persons produce and understand sign languages just as hearing persons produce and understand spoken languages. The languages of the deaf communities throughout the world are, except for their modality of expression, equivalent to spoken languages.

Everyone knows a language. Five-year-old children are almost as proficient at speaking and understanding as are their parents. Yet the ability to carry out the simplest conversation requires profound knowledge that most speakers are unaware of. This is as true of speakers of Japanese as of English, of Armenian as of Navajo. A speaker of English can produce a sentence having two relative clauses without knowing what a relative clause is, like

> My goddaughter who was born in Sweden and who now lives in Iowa is named Disa, after a Viking queen.

In a parallel fashion, a child can walk without understanding or being able to explain the principles of balance and support, or the neurophysiological control mechanisms that permit one to do so. The fact that we may know something unconsciously is not unique to language.

What, then, do speakers of English or Quechua or French or Mohawk or Arabic know?

Knowledge of the Sound System

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Knowing a language means knowing what sounds (or signs[1]) are in that language and what sounds are not. This unconscious knowledge is revealed by the way speakers of

[1] The sign languages of the deaf will be discussed throughout the book. As stated, they are essentially the same as spoken languages, except that they use gestures instead of sounds. A reference to 'language' then, unless speech sounds or spoken languages are specifically mentioned, includes both spoken and signed languages.

one language pronounce words from another language. If you speak only English, for example, you may substitute an English sound for a non-English sound when pronouncing "foreign" words. Most English speakers pronounce the name Bach with a final *k* sound because the sound represented by the letters *ch* in German is not an English sound. If you pronounce it as the Germans do, you are using a sound outside the English sound system. French people speaking English often pronounce words like *this* and *that* as if they were spelled *zis* and *zat.* The English sound represented by the initial letters *th* is not part of the French sound system, and the French mispronunciation reveals the speakers' unconscious knowledge of this fact.

Knowing the sound system of a language includes more than knowing the inventory of sounds. It includes knowing which sounds may start a word, end a word, and follow each other. The name of a former president of Ghana was *Nkrumah,* pronounced with an initial sound identical to the sound ending the English word *sing* (for most Americans). While this is an English sound, no word in English begins with the *ng* sound. Most speakers of English mispronounce this name (by Ghanaian standards) by inserting a short vowel before or after the *ng* sound. Children who learn English recognize this fact about our language, just as Ghanaian children learn that words in their language may begin with the *ng* sound.

We will learn more about sound systems in Chapters 6 and 7.

Knowledge of Words

Knowing the sounds and sound patterns in our language constitutes only one part of our linguistic knowledge. In addition, knowing a language is knowing that certain sound sequences signify certain concepts or **meanings.** Speakers of English know what *boy* means and that it means something different from *toy* or *girl* or *pterodactyl.* When you know a language you know words in that language, that is, the sound units that are related to specific meanings.

Arbitrary Relation of Form and Meaning

> The minute I set eyes on an animal I know what it is. I don't have to reflect a moment; the right name comes out instantly. I seem to know just by the shape of the creature and the way it acts what animal it is. When the dodo came along he [Adam] thought it was a wildcat. But I saved him. I just spoke up in a quite natural way and said "Well, I do declare if there isn't the dodo!"
>
> Mark Twain, *Eve's Diary*

If you do not know a language, the words (and sentences) will be mainly incomprehensible, because the relationship between speech sounds and the meanings they represent in the languages of the world is, for the most part, an **arbitrary** one. You have to learn (when you are acquiring the language) that the sounds represented by the letters *house* (in the written form of the language) signify the concept  ; if you know French, this same meaning is represented by *maison;* if you know Twi, it is represented by *ɔdaŋ;* if you know Russian, by *dom;* if you know Spanish, by *casa.* Similarly, the

 is represented by *hand* in English, *main* in French, *nsa* in Twi, and *ruka* in Russian.

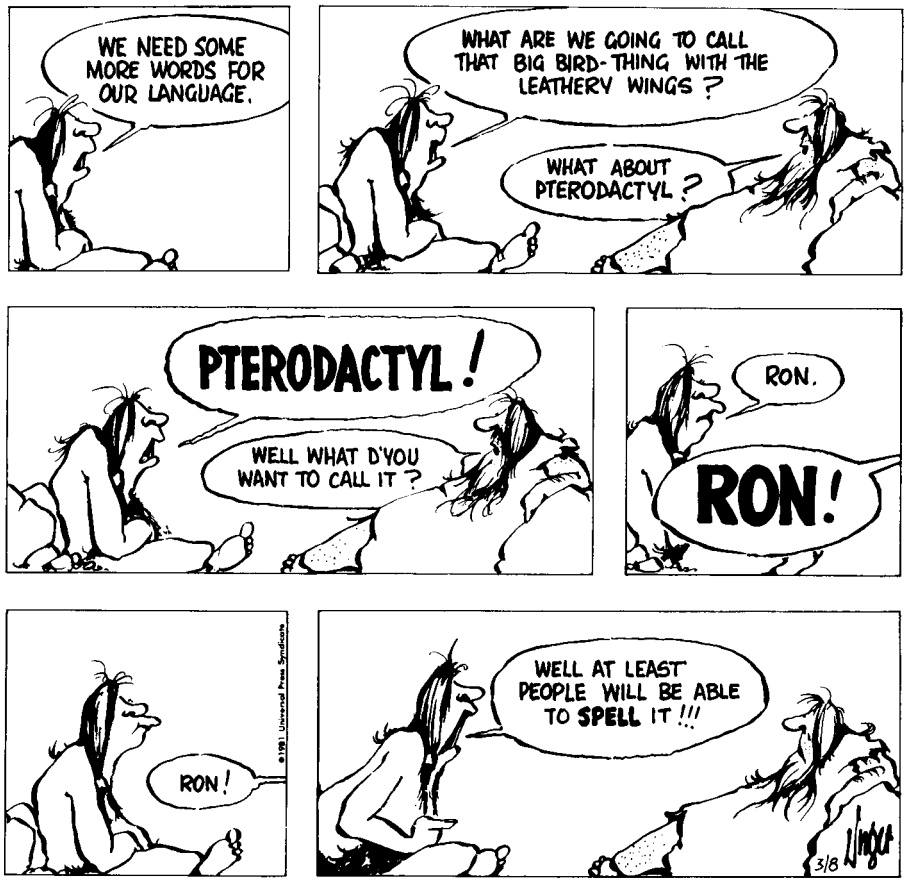
The following are words in some different languages. How many of them can you understand?

a. kyinii
b. doakam
c. odun
d. asa
e. toowq
f. bolna
g. wartawan
h. inaminatu
i. yawwa

Speakers of the languages from which these words are taken know that they have the following meanings:

a. a large parasol (in a Ghanaian language, Twi)
b. living creature (in a Native American language, Papago)
c. wood (in Turkish)
d. morning (in Japanese)
e. is seeing (in a California Indian language, Luiseño)
f. to speak (in a Pakistani language, Urdu); to ache (in Russian)
g. reporter (in Indonesian)
h. teacher (in a Venezuelan Indian language, Warao)
i. right on! (in a Nigerian language, Hausa)

These examples show that the sounds of words are only given meaning by the language in which they occur, despite what Eve says in Mark Twain's satire *Eve's Diary.* A pterodactyl could have been called *ron, blick,* or *kerplunkity.*



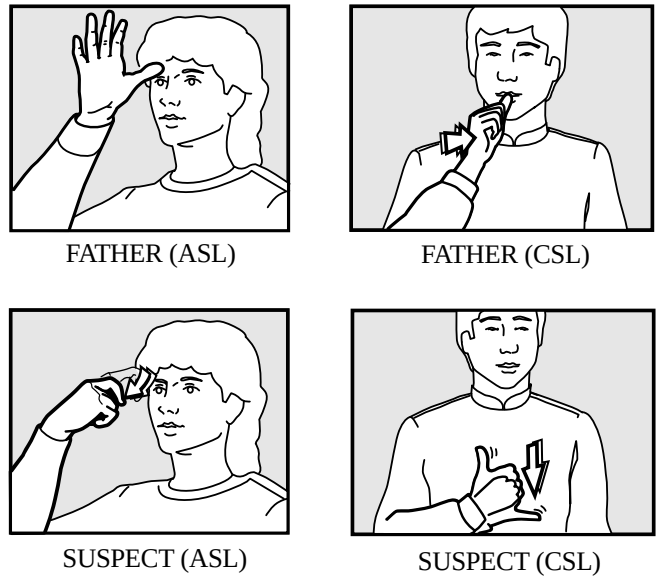
As Shakespeare has Juliet say:

> What's in a name? That which we call a rose
> By any other name would smell as sweet.

This arbitrary relationship between the **form** (sounds) and **meaning** (concept) of a word in spoken language is also true of the sign languages used by the deaf. If you see someone using a sign language you do not know, it is doubtful that you will understand the message from the signs alone. A person who knows Chinese Sign Language would find it difficult to understand American Sign, and vice versa.

Signs that may have originally been **mimetic** (similar to miming) or **iconic** (with a nonarbitrary relationship between form and meaning) change historically as do words, and the iconicity is lost. These signs become **conventional,** so knowing the shape or movement of the hands does not reveal the meaning of the gestures in sign languages.

FIGURE 1-1 Arbitrary relation between gestures and meanings of the signs for *father* and *suspect* in ASL and CSL.[2]



There is some **sound symbolism** in language—that is, words whose pronunciation suggests the meaning. A few words in most languages are **onomatopoeic**—the sounds of the words supposedly imitate the sounds of nature. Even here, the sounds differ from one language to another, reflecting the particular sound system of the language. In English we say *cockadoodledoo* to represent the rooster's crow, but in Russian they say *kukuriku.*

Sometimes particular sound sequences seem to relate to a particular concept. In English many words beginning with *gl* relate to sight, such as *glare, glint, gleam, glitter, glossy, glaze, glance, glimmer, glimpse,* and *glisten.* However, such words are a very small part of any language, and *gl* may have nothing to do with "sight" in another language, or even in other words in English, such as *gladiator, glucose, glory, glycerine, globe,* and so on.

English speakers know the *gl* words that relate to sight and those that do not; they know the onomatopoeic words and all the words in the basic vocabulary of the language. There are no speakers of English who know all 450,000 words listed in *Webster's Third New International Dictionary;* but even if there were and that were all they

[2] From *What the Hands Reveal about the Brain* by Howard Poizner, Edward S. Klima, Ursula Bellugi. 1987. Cambridge, MA: MIT Press.

knew, they would not know English. Imagine trying to learn a foreign language by buying a dictionary and memorizing words. No matter how many words you learned, you would not be able to form the simplest phrases or sentences in the language or understand a native speaker. No one speaks in isolated words. (Of course, you could search in your traveler's dictionary for individual words to find out how to say something like "car—gas—where?" After many tries, a native might understand this question and then point in the direction of a gas station. If you were answered with a sentence, however, you probably would not understand what was said or be able to look it up, because you would not know where one word ended and another began.) Chapter 5 will further explore word meanings.

The Creativity of Linguistic Knowledge

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Knowledge of a language enables you to combine words to form phrases, and phrases to form sentences. You cannot buy a dictionary of any language with all its sentences, because no dictionary can list all the possible sentences. Knowing a language means being able to produce new sentences never spoken before and to understand sentences never heard before. The linguist Noam Chomsky refers to this ability as part of the **creative aspect** of language use. Not every speaker of a language can create great literature, but you, and all persons who know a language, can and do create new sentences when you speak and understand new sentences created by others.

This creative ability is due to the fact that language use is not limited to stimulus-response behavior. It's true that if someone steps on our toes we will automatically respond with a scream or gasp or grunt, but these sounds are really not part of language; they are involuntary reactions to stimuli. After we automatically cry out, we can say "That was some clumsy act, you big oaf " or "Thank you very much for stepping on my toe because I was afraid I had elephantiasis and now that I can feel it hurt I know it isn't so," or any one of an infinite number of sentences, because the particular sentence we produce is not controlled by any stimulus.

Even some involuntary cries like *ouch* are constrained by our own language system, as are the filled pauses that are sprinkled through conversational speech—*er* or *uh* or *you know* in English. They contain only the sounds found in the language. French speakers, for example, often fill their pauses with the vowel sound that starts with their word for egg—*oeuf*—a sound that does not occur in English. Knowing a language includes knowing what sentences are appropriate in various situations. Saying "Hamburger costs $2.00 a pound" after someone has just stepped on your toe would hardly be an appropriate response, although it would be possible.

Consider the following sentence: "Daniel Boone decided to become a pioneer because he dreamed of pigeon-toed giraffes and cross-eyed elephants dancing in pink skirts and green berets on the wind-swept plains of the Midwest." You may not believe the sentence; you may question its logic; but you can understand it, although you probably never heard or read it before now.

Knowledge of a language, then, makes it possible to understand and produce new sentences. If you counted the number of sentences in this book that you have seen or heard before, the number would be small. Next time you write an essay or a letter, see how many of your sentences are new. Few sentences are stored in your brain, to be pulled out to fit some situation or matched with some sentence that you hear. Novel sentences never spoken or heard before cannot be stored in your memory.

Simple memorization of all the possible sentences in a language is impossible in principle. If for every sentence in the language a longer sentence can be formed, then there is no limit to the length of any sentence and therefore no limit to the number of sentences. In English you can say:

This is the house.

or

This is the house that Jack built.

or

This is the malt that lay in the house that Jack built.

or

This is the dog that chased the cat that killed the rat that ate the malt that lay in the house that Jack built.

And you need not stop there. How long, then, is the longest sentence? A speaker of English can say:

The old man came.

or

The old, old, old, old, old man came.

How many "olds" are too many? Seven? Twenty-three?

It is true that the longer these sentences become, the less likely we would be to hear or to say them. A sentence with 276 occurrences of "old" would be highly unlikely in either speech or writing, even to describe Methuselah; but such a sentence is theoretically possible. If you know English, you have the knowledge to add any number of adjectives as modifiers to a noun.

All human languages permit their speakers to form indefinitely long sentences; "creativity" is a universal property of human language.

To memorize and store an infinite set of sentences would require an infinite storage capacity. However, the brain is finite, and even if it were not, we could not store novel sentences.

Knowledge of Sentences and Nonsentences

When you learn a language you must learn something finite—your vocabulary is finite (however large it may be)—and that can be stored. If sentences in a language were formed by putting one word after another in any order, then language could simply be a set of words. You can see that words are not enough by examining the following strings of words:

(1) a. John kissed the little old lady who owned the shaggy dog.
b. Who owned the shaggy dog John kissed the little old lady.
c. John is difficult to love.
d. It is difficult to love John.
e. John is anxious to go.
f. It is anxious to go John.
g. John, who was a student, flunked his exams.
h. Exams his flunked student a was who John.

If you were asked to put a star or asterisk before the examples that seemed "funny" or "no good" to you, which ones would you star? Our "intuitive" knowledge about what is or is not an allowable sentence in English convinces us to star b, f, and h. Which ones did you star?

Would you agree with the following judgments?

(2) a. What he did was climb a tree.
b. *What he thought was want a sports car.[3]
c. Drink your beer and go home!
d. *What are drinking and go home?
e. I expect them to arrive a week from next Thursday.
f. *I expect a week from next Thursday to arrive them.
g. Linus lost his security blanket.
h. *Lost Linus security blanket his.

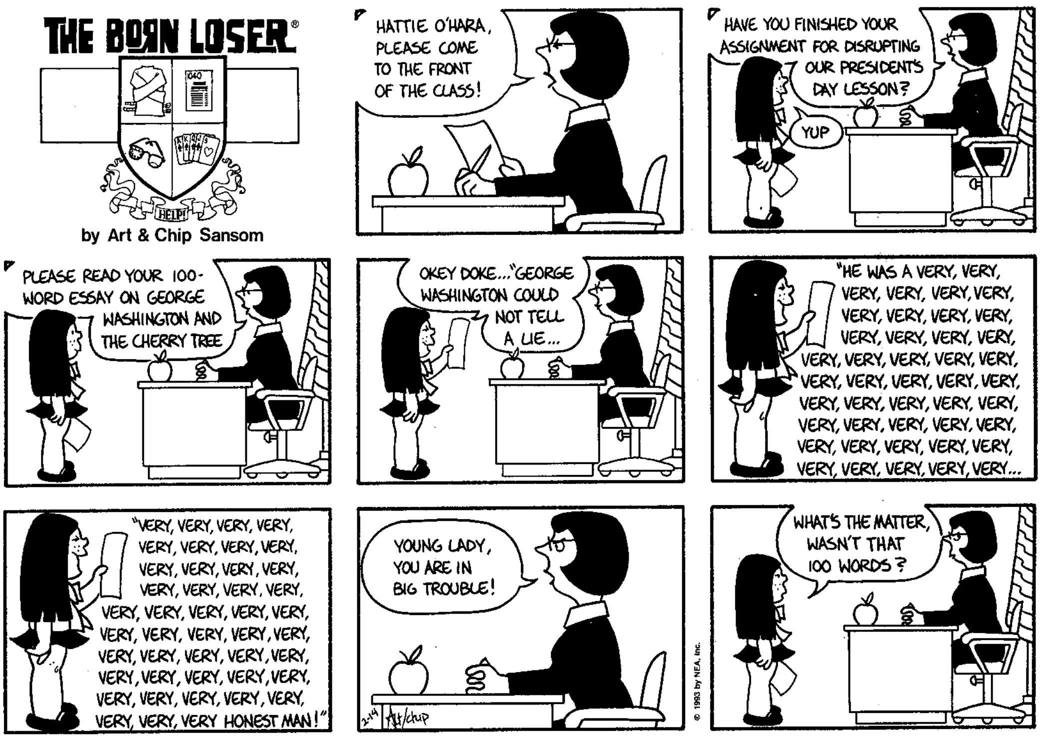
If you find the starred sentences unacceptable as we do, you see that every string of words does not constitute a well-formed sentence in a language. Knowledge of a language determines which strings of words are and which are not sentences. Therefore, in addition to knowing the words of the language, linguistic knowledge includes **rules** for forming sentences and making the kinds of judgments you made about the examples in (1) and (2). These rules must be finite in length and finite in number so that they can be stored in our finite brains; yet they must permit us to form and understand an infinite set of new sentences, as we discussed earlier. They are not rules determined by a judge or a legislature or even rules taught in a grammar class. They are unconscious constraints on sentence formation that children discover about the language.

A language, then, consists of all the sounds, words, and possible sentences. When you know a language, you know the sounds, the words, and the rules for their combination.

[3] The asterisk is used before examples that speakers, for any reason, find unacceptable. This notation will be used throughout the book.

LINGUISTIC KNOWLEDGE AND PERFORMANCE

> "What's one and one and one and one and one and one and one and one and one and one?" "I don't know," said Alice. "I lost count." "She can't do Addition," the Red Queen interrupted.
>
> Lewis Carroll, *Through the Looking-Glass*



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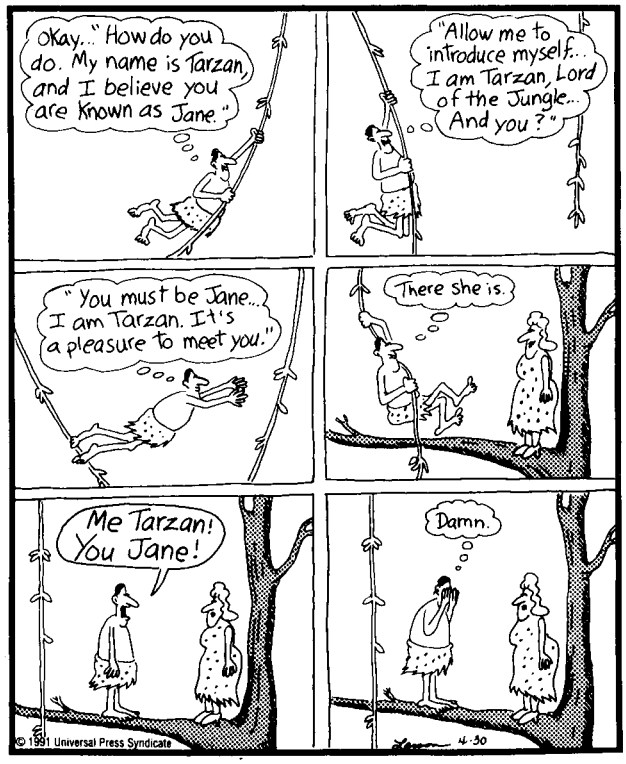
Speakers' linguistic knowledge permits them to form longer and longer sentences by joining sentences and phrases together or adding modifiers to a noun. Whether you stop at three, five, or eighteen adjectives, it is impossible to limit the number you could add if desired. Very long sentences are theoretically possible, but they are highly improbable. Evidently there is a difference between having the knowledge necessary to produce sentences of a language and applying this knowledge. It is a difference between what you know, which is your linguistic **competence,** and how you use this knowledge in actual speech production and comprehension, which is your linguistic **performance.**

Speakers of all languages—spoken and signed—have the knowledge to understand or produce sentences of any length. When they attempt to use that knowledge, though—when they perform linguistically—there are physiological and psychological reasons that limit the number of adjectives, adverbs, clauses, and so on. They may run out of

breath, their audience may leave, they may lose track of what they have said, and of course, no one lives forever.

When we speak we usually wish to convey some message. (Although it seems that some of us occasionally like to talk just to hear our own voices.) At some stage in the act of producing speech we must organize our thoughts into strings of words. Sometimes the message gets garbled. We may stammer, or pause, or produce **slips of the tongue.** We may even sound like Tarzan in the cartoon by Gary Larson, who illustrates the difference between linguistic knowledge and the way we use that knowledge in performance.



For the most part, linguistic knowledge is not conscious knowledge. The linguistic system—the sounds, structures, meanings, words, and rules for putting them all together—is learned subconsciously with no awareness that rules are being learned. Just as we may be unconscious of the rules that allow us to stand or walk, to crawl on all fours if we choose, to jump or catch a baseball, or to ride a bicycle, our unconscious ability to speak and understand and to make judgments about sentences reveals our knowledge of the rules of our language. This knowledge represents a complex cognitive system. The nature of this system is what this book is all about.

WHAT IS GRAMMAR?

> We use the term "grammar" with a systematic ambiguity. On the one hand, the term refers to the explicit theory constructed by the linguist and proposed as a description of the speaker's competence. On the other hand, it refers to this competence itself.
>
> N. Chomsky and M. Halle, *The Sound Pattern of English*

Descriptive Grammars

The sounds and sound patterns, the basic units of meaning, such as words, and the rules to combine them to form new sentences constitute the **grammar** of a language. The grammar, then, is what we know; it represents our linguistic competence. To understand the nature of language we must understand the nature of this internalized, unconscious set of rules, which is part of every grammar of every language.

Every human being who speaks a language knows its grammar. When linguists wish to describe a language, they attempt to describe the grammar of the language that exists in the minds of its speakers. There may be some differences among speakers' knowledge, but there must be shared knowledge, because it is this grammar that makes it possible to communicate through language. To the extent that the linguist's description is a true model of the speakers' linguistic capacity, it will be a successful description of the grammar and of the language itself. Such a model is called a **descriptive grammar.** It does not tell you how you should speak; it describes your basic linguistic knowledge. It explains how it is possible for you to speak and understand, and it tells what you know about the sounds, words, phrases, and sentences of your language.

We have used the word *grammar* in two ways: the first in reference to the **mental grammar** speakers have in their brains; the second as the model or description of this internalized grammar. Almost two thousand years ago the Greek grammarian Dionysius Thrax defined grammar as that which permits us either to speak a language or to speak about a language. From now on we will not differentiate these two meanings, because the linguist's descriptive grammar is an attempt at a formal statement (or theory) of the speakers' grammar.

When we say in later chapters that there is a rule in the grammar—such as "Every sentence has a noun phrase subject and a verb phrase predicate"—we posit the rule in both the mental grammar and the descriptive model of it, the linguist's grammar. When we say that a sentence is **grammatical,** we mean that it conforms to the rules of both grammars; conversely, an **ungrammatical** (starred, unacceptable) sentence deviates in some way from these rules. If, however, we posit a rule for English that does not agree with your intuitions as a speaker, then the grammar we are describing differs in some way from the mental grammar that represents your linguistic competence; that is, your language is not the one described. No language or variety of a language (called a **dialect**) is superior to any other in a linguistic sense. Every grammar is equally complex and logical and capable of producing an infinite set of sentences to express any thought. If something can be expressed in one language or one dialect, it can be expressed in any other language or dialect. It might involve different means and different words, but it can be expressed.

No grammar, therefore no language, is either superior or inferior to any other. Languages of technologically undeveloped cultures are not primitive or ill formed in any way.

Prescriptive Grammars

It is a rule up with which we should not put.

Winston Churchill

I don't want to talk grammar. I want to talk like a lady.

G. B. Shaw, *Pygmalion*

"So, then . . . Would that be 'us the people' or 'we the people?' "

The views expressed in the section above are not those of all grammarians now or in the past. From ancient times until the present, "purists" have believed that language change is corruption and that there are certain "correct" forms that all educated people should use in speaking and writing. The Greek Alexandrians in the first century, the Arabic scholars at Basra in the eighth century, and numerous English grammarians of the eighteenth and nineteenth centuries held this view. They wished to prescribe rather than describe the rules of grammar, which gave rise to the writing of **prescriptive grammars.**

With the rise of capitalism, a new middle class emerged who wanted their children to speak the dialect of the "upper" classes. This desire led to the publication of many prescriptive grammars. In 1762 an influential grammar, *A Short Introduction to English Grammar with Critical Notes*, was written by Bishop Robert Lowth. Lowth, influenced by Latin grammar and by personal preference, prescribed a number of new rules for English. Before the publication of his grammar, practically everyone—upper-class, middle-class, and lower-class speakers of English—said *I don't have none, You was wrong about that,* and *Mathilda is fatter than me.* Lowth, however, decided that "two negatives make a positive" and therefore one should say *I don't have any;* that even when *you* is singular it should be followed by the plural *were;* and that *I* not *me, he* not *him, they* not *them,* and so forth should follow *than* in comparative constructions. Many of these prescriptive rules were based on Latin grammar, which had already given way to different rules in the languages that developed from Latin. Because Lowth was influential and because the rising new class wanted to speak "properly," many of these new rules were legislated into English grammar, at least for the **prestige dialect.**

The view that dialects that regularly use double negatives are inferior cannot be justified if one looks at the standard dialects of other languages in the world. Romance languages, for example, utilize double negatives, as the following examples from French and Italian show:

French: Je ne veux parler avec personne.
I not want speak with no-one.
Italian: Non voglio parlare con nessuno.
not I-want speak with no-one.
English translation: "I don't want to speak with anyone."

Grammars such as Lowth's are different from the descriptive grammars we have been discussing. Their goal is not to describe the rules people know, but to tell them what rules they should know.

In 1908, a grammarian, Thomas R. Lounsbury, wrote: "There seems to have been in every period in the past, as there is now, a distinct apprehension in the minds of very many worthy persons that the English tongue is always in the condition approaching collapse and that arduous efforts must be put forth persistently to save it from destruction."

Today our bookstores are filled with books by language "purists" attempting to do just that. Edwin Newman, for example, in his books *Strictly Speaking* and *A Civil Tongue,* rails against those who use the word *hopefully* to mean "I hope," as in "Hopefully, it will not rain tomorrow," instead of using it "properly" to mean "with hope." What Newman fails to recognize is that language changes in the course of time and words change meaning, and the meaning of *hopefully* has been broadened for most English speakers to include both usages. Other "saviors" of the English language blame television, the schools, and even the National Council of Teachers of English for failing to preserve the standard language, and they mount attacks against those college and university professors who suggest that African American English (AAE)[4] and other

[4] AAE is also called African American Vernacular English (AAVE), Ebonics, and Black English (BE). This is a dialect spoken by some but by no means all African Americans.

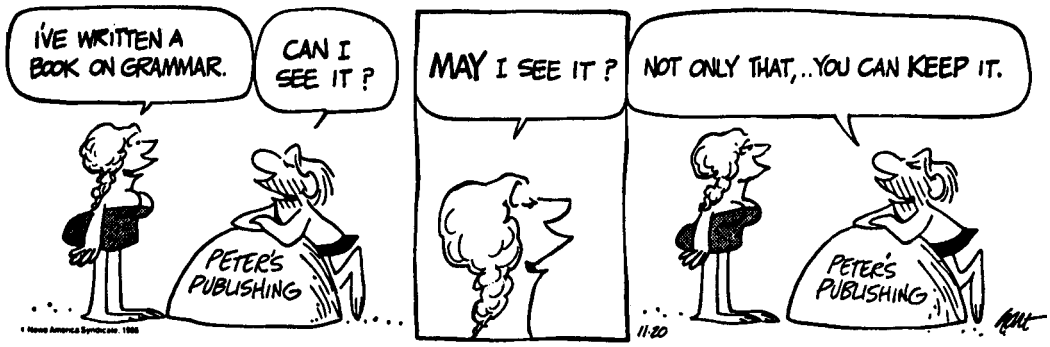
dialects are viable, living, complete languages. Although not mentioned by name, the authors of this textbook would clearly be among those who would be criticized by these new prescriptivists.

There is even a literary organization dedicated to the proper use of the English language, called the Unicorn Society of Lake Superior State College, which issues an annual "dishonor list" of words and phrases of which they do not approve, including the word "medication," which they say "We can no longer afford. It's too expensive. We've got to get back to the cheaper 'medicine.' "[5] At least these guardians of the English language have a sense of humor; but they as well as the other prescriptivists are bound to fail. Language is vigorous and dynamic and constantly changing. All languages and dialects are expressive, complete, and logical, as much so as they were 200 or 2000 years ago. If sentences are muddled, it is not because of the language but because of the speakers. Prescriptivists should be more concerned about the thinking of the speakers than about the language they use. Hopefully this book will convince you of this.

Linguists object to prescriptivism for a number of reasons. The views are elitist, in that they assume that the linguistic grammars and usages of a particular group in society (usually the more affluent and those with political power) are the only correct ones. Prescriptivists, for the most part, seem to have little knowledge of the history of the language and less about the nature of language. They seem to be unaware of the fact that all dialects are rule governed and that what is grammatical in one language may be ungrammatical in another (equally prestigious) language.

The **standard** dialect may indeed be a better dialect for someone wishing to obtain a particular job or achieve a position of social prestige. But linguistically it is not a better form of the language.

Teaching Grammars



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The descriptive grammar of a language attempts to describe everything speakers know about their language. It is different from a **teaching grammar,** which is used to learn another language or dialect. Teaching grammars are those we use in school to fulfill

[5] *Los Angeles Times,* Jan. 2, 1978, Part 1, p. 21.

language requirements. They can be helpful to those who do not speak the standard or prestige dialect but find it would be advantageous socially and economically to do so. Teaching grammars state explicitly the rules of the language, list the words and their pronunciations, and aid in learning a new language or dialect.

It is often difficult for adults to learn a second language without being instructed, even when living for an extended period in a country where the language is spoken. Teaching grammars assume that the student already knows one language and compares the grammar of the target language with the grammar of the native language. The meaning of a word is given by providing a **gloss**—the parallel word in the student's native language, such as *maison,* "house" in French. It is assumed that the student knows the meaning of the gloss "house," and so the meaning of the word *maison.*

Sounds of the target language that do not occur in the native language are often described by reference to known sounds. Thus the student might be aided in producing the French sound u in the word *tu* by instructions such as "Round your lips while producing the vowel sound in *tea.*"

The rules on how to put words together to form the grammatical sentences also refer to the learners' knowledge of their native language. Thus the teaching grammar *Learn Zulu* by Sibusiso Nyembezi states that "The difference between singular and plural is not at the end of the word but at the beginning of it," and warns that "Zulu does not have the indefinite and definite articles 'a' and 'the.' " Such statements assume students know the rules of their own grammar, in this case English. Although such grammars might be considered prescriptive in the sense that they attempt to teach the student what is or is not a grammatical construction in the new language, their aim is different from grammars that attempt to change the rules or usage of a language already learned.

This book is not primarily concerned with either prescriptive or teaching grammars. The matter, however, is considered in a later chapter in the discussion of standard and nonstandard dialects.

LANGUAGE UNIVERSALS

> In a grammar there are parts that pertain to all languages; these components form what is called the general grammar. In addition to these general (universal) parts, there are those that belong only to one particular language; and these constitute the particular grammars of each language.
>
> Du Marsais, c. 1750

The way we are using the word *grammar* differs in another way from its most common meaning. In our sense, the grammar includes everything speakers know about their language—the sound system, called **phonology;** the system of meanings, called **semantics;** the rules of word formation, called **morphology;** and the rules of sentence formation, called **syntax.** It also, of course, includes the vocabulary of words—the dictionary or **lexicon.** Many people think of the grammar of a language as referring solely to the syntactic rules. This latter sense is what students usually mean when they talk about their class in "English grammar."

Our aim is more in keeping with that stated in 1784 by the grammarian John Fell in *Essay towards an English Grammar:* "It is certainly the business of a grammarian to find out, and not to make, the laws of a language." This business is just what the linguist attempts—to find out the laws of a language, and the laws that pertain to all languages. Those laws that pertain to all human languages, representing the universal properties of language, constitute a **universal grammar.**

About 1630, the German philosopher Alsted first used the term *general grammar* as distinct from *special grammar.* He believed that the function of a general grammar was to reveal those features "which relate to the method and etiology of grammatical concepts. They are common to all languages." Pointing out that "general grammar is the pattern 'norma' of every particular grammar whatsoever," he implored "eminent linguists to employ their insight in this matter."[6]

Three and a half centuries before Alsted, the scholar Robert Kilwardby held that linguists should be concerned with discovering the nature of language in general. So concerned was Kilwardby with universal grammar that he excluded considerations of the characteristics of particular languages, which he believed to be as "irrelevant to a science of grammar as the material of the measuring rod or the physical characteristics of objects were to geometry."[7] Kilwardby was perhaps too much of a universalist; the particular properties of individual languages are relevant to the discovery of language universals, and they are of interest for their own sake.

Someone attempting to study Latin, Greek, French, or Swahili as a second language may assert, in frustration, that those ancient scholars were so hidden in their ivory towers that they confused reality with idle speculation; yet the more we investigate this question, the more evidence accumulates to support Chomsky's view that there is a universal grammar that is part of the human biologically endowed language faculty. It may be thought of "as a system of principles which characterizes the class of possible grammars by specifying how particular grammars are organized (what are the components and their relations), how the different rules of these components are constructed, how they interact, and so on."[8]

To discover the nature of this Universal Grammar whose principles characterize all human languages is a major aim of **linguistic theory.** The linguist's goal is to discover the "laws of human language" as the physicist's goal is to discover the "laws of the physical universe." The complexity of language, a product of the human brain, undoubtedly means this goal will never be fully achieved. But all scientific theories are incomplete; new hypotheses are proposed to account for more data. Theories are continually changing as new discoveries are made. Just as Newtonian physics was enlarged by Einstein's theories of relativity, so the linguistic theory of Universal Grammar develops, and new discoveries shed new light on what human language is.

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[6] V. Salmon. 1969. "Review of *Cartesian Linguistics* by N. Chomsky," *Journal of Linguistics* 5: 165–187.

[7] Ibid.

[8] Noam Chomsky. 1979. *Language and Responsibility* (based on conversations with Misou Ronat), New York: Pantheon, p. 180.

Sign Languages: Evidence for Language Universals

> It is not the want of organs that [prevents animals from making] . . . known their thoughts . . . for it is evident that magpies and parrots are able to utter words just like ourselves, and yet they cannot speak as we do, that is, so as to give evidence that they think of what they say. On the other hand, men who, being born deaf and mute . . . are destitute of the organs which serve the others for talking, are in the habit of themselves inventing certain signs by which they make themselves understood.
>
> René Descartes, *Discourse on Method*

The sign languages of the deaf provide some of the best evidence to support the notion that humans are born with the ability to acquire language, and that these languages are governed by the same universal properties.

Deaf children, who are unable to hear the sounds of spoken language, do not acquire spoken languages as hearing children do. However, deaf children of deaf parents who are exposed to sign language learn sign language in stages parallel to language acquisition by hearing children learning oral languages. As we noted earlier, these sign languages are human languages that do not utilize sounds to express meanings. Instead, sign languages are visual-gestural systems that use hand and body gestures as the forms used to represent words. Sign languages are fully developed languages, and those who know sign language are capable of creating and comprehending unlimited numbers of new sentences, just like speakers of spoken languages.

Current research on sign languages has been crucial in the attempt to understand the biological underpinnings of human language acquisition and use. Some understanding of sign languages is therefore essential.

About one in a thousand babies is born deaf or with a severe hearing deficiency. One major effect is the difficulty the deaf have in learning a spoken language. It is nearly impossible for those unable to hear language to learn to speak naturally. Normal speech depends to a great extent on constant auditory feedback. Hence a deaf child will not learn to speak without extensive training in special schools or programs designed especially for the deaf.

Although deaf persons can be taught to speak a language intelligibly, they can never understand speech as well as a hearing person. Seventy-five percent of the words spoken cannot be read on the lips with any degree of accuracy. The ability of many deaf individuals to comprehend spoken language is therefore remarkable; they combine lip reading with knowledge of the structure of language and the semantic redundancies.

If, however, human language is universal in the sense that all members of the human species have the ability to learn a language, it is not surprising that nonspoken languages have developed as a substitute for spoken languages among nonhearing individuals. The more we learn about the human linguistic ability, the more it is clear that language acquisition and use are not dependent on the ability to produce and hear sounds, but on a much more abstract cognitive ability, biologically determined, that accounts for the similarities between spoken and sign languages.

American Sign Language (ASL)

The major language used by the deaf in the United States is **American Sign Language** (or **AMESLAN** or **ASL**). ASL is an independent, fully developed language that historically is an outgrowth of the sign language used in France and brought to the United States in 1817 by the great educator Thomas Hopkins Gallaudet. Gallaudet was hired to establish a school for the deaf, and after studying the language and methods used in the Paris school founded by the Abbé de l'Épée in 1775, he returned to the United States with Laurent Clerc, a young deaf instructor, establishing the basis for ASL.

The grammar of ASL, like that of all human languages, has its own grammar which includes everything speakers know about their language—the system of gestures equivalent to the phonology of spoken languages,[9] the morphological, syntactic, and semantic systems, and a mental lexicon of signs.

The other sign language used in the United States is called **Signed English** (or **Siglish**). Essentially, it consists in the replacement of each spoken English word (and grammatical elements such as the *s* ending for plurals or the *ed* ending for past tense) by a sign. The syntax and semantics of Signed English are thus approximately the same as those of ordinary English. The result is unnatural in that it is similar to speaking French by translating every English word or ending into its French counterpart: Problems result because there are not always corresponding forms in the two languages.

If there is no sign in ASL, signers utilize another mechanism, the system of finger spelling. This method is also used to add new proper nouns or technical vocabulary. Sign interpreters of spoken English often finger spell such words. A manual alphabet consisting of various finger configurations, hand positions, and movements gives visible symbols for the alphabet and ampersand.

Signs, however, are produced differently than are finger-spelled words. "The sign DECIDE cannot be analyzed as a sequence of distinct, separable configurations of the hand. Like all other lexical signs in ASL, but unlike the individual finger-spelled letters in D-E-C-I-D-E taken separately, the ASL sign DECIDE does have an essential movement but the hand shape occurs simultaneously with the movement. In appearance, the sign is a continuous whole."[10] This sign is shown in Figure 1-2.

An accomplished signer can sign at a normal rate, even when there is a lot of finger spelling. Television stations sometimes have programs that are interpreted in sign for the deaf in a corner of the TV screen. If you have ever seen such a program, you will have seen how well the interpreter kept pace with the spoken sentences.

Language arts are not lost to the deaf. Poetry is composed in sign language, and stage plays such as Sheridan's *The Critic* have been translated into sign language and acted by the National Theatre of the Deaf (NTD). Sign Language was so highly thought of by the anthropologist Margaret Mead that, in an article discussing the possibilities of a universal second language, she suggests using some of the basic ideas that sign languages incorporate.

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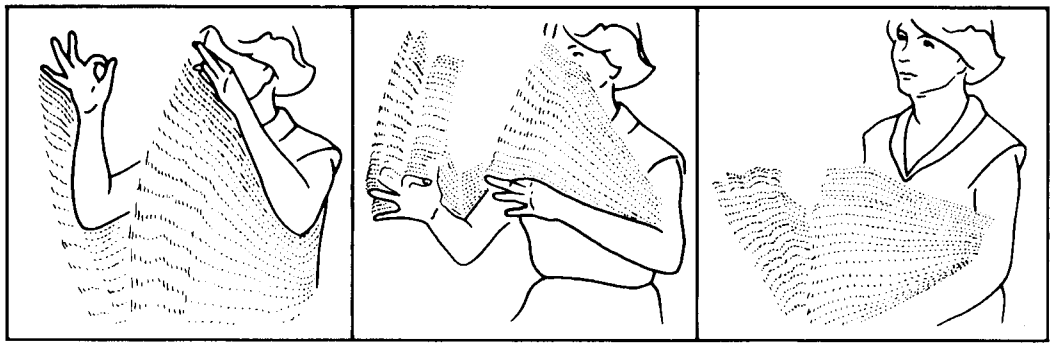
[9] The term *phonology*, which was first used to describe the sound systems of language, has been extended to include the gestural systems of sign languages.

[10] Klima and Bellugi, *The Signs of Language*, pp. 38 and 62.

FIGURE 1.2 The ASL sign DECIDE: (a) and (c) show transitions from the sign; (b) illustrates the single downward movement of the sign.



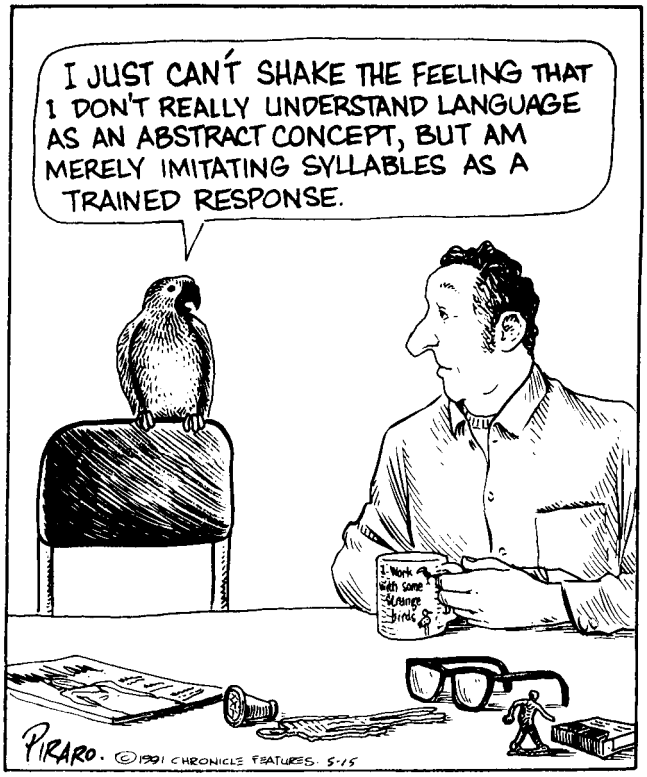
ANIMAL "LANGUAGES"

> No matter how eloquently a dog may bark, he cannot tell you that his parents were poor but honest.
>
> Bertrand Russell

Whether language is the exclusive property of the human species is an interesting question. The idea of talking animals probably is as old and as widespread among human societies as language is itself. No culture lacks a legend in which some animal plays a speaking role. All over West Africa, children listen to folktales in which a "spider-man" is the hero. "Coyote" is a favorite figure in many Native American tales, and there is hardly an animal who does not figure in Aesop's famous fables. Hugh Lofting's fictional Doctor Doolittle's major accomplishment was his ability to communicate with animals.

If language is viewed only as a system of communication, then many species communicate. Humans also use systems other than their language to relate to each other and to send "messages." The question is whether the kinds of grammars that represent linguistic knowledge acquired by children with no external instruction, and which are used creatively rather than as responses to internal or external stimuli, are unique to the human animal.

"Talking" Parrots



Most humans who acquire language utilize speech sounds to express meanings, but such sounds are not a necessary aspect of language, as evidenced by the sign languages of the deaf. The use of speech sounds is therefore not a basic part of what we have been calling language. The chirping of birds, the squeaking of dolphins, and the dancing of bees may potentially represent systems similar to human languages. If animal communication systems are not like human language, it will not be due to a lack of speech.

Conversely, when animals vocally imitate human utterances, it does not mean they possess language. Language is a system that relates sounds (or gestures) to meanings. "Talking" birds such as parrots and mynah birds are capable of faithfully reproducing words and phrases of human language that they have heard; but when a parrot says "Polly wants a cracker," she may really want a ham sandwich or a drink of water or nothing at all. A bird that has learned to say "hello" or "good-bye" is as likely to use one as the other, regardless of whether people are arriving or departing. The bird's utterances carry no meaning. They are speaking neither English nor their own language when they sound like us.

Talking birds do not dissect the sounds of their imitations into discrete units. Polly and Molly do not rhyme for a parrot. They are as different as *hello* and *good-bye* (or as

similar). One property of all human languages (which will be discussed further in Chapter 6) is the discreteness of the speech or gestural units, which are ordered and reordered, combined and split apart. Generally, a parrot says what it is taught, or what it hears, and no more. If Polly learns "Polly wants a cracker" and "Polly wants a doughnut" and also learns to imitate the single words *whiskey* and *bagel*, she will not spontaneously produce, as children do, "Polly wants whiskey" or "Polly wants a bagel" or "Polly wants whiskey and a bagel." If she learns *cat* and *cats* and *dog* and *dogs* and then learns the word *parrot,* she will be unable to form the plural *parrots* as children do by the age of three; nor can a parrot form an unlimited set of utterances from a finite set of units nor understand utterances never heard before. Recent reports of an African gray parrot named Alex studied by Dr. Irene M. Pepperberg of the University of Arizona suggest that new methods of training may result in more learning than was previously believed possible. When the trainer uses words in context, Alex seems to relate some sounds with their meanings. This is more than simply imitation, but it is not in any way similar to the way children acquire the complexities of the grammar of any language. It is more like a dog learning to associate certain sounds with meanings, such as *heel, sit, fetch,* etc. Alex's ability may go somewhat beyond that. However, the ability to produce sounds similar to those used in human language even if meanings are related to these sounds cannot be equated with the ability to acquire the complex grammar of a human language.

The Birds and the Bees

> The birds and animals are all friendly to each other, and there are no disputes about anything. They all talk, and they all talk to me, but it must be a foreign language for I cannot make out a word they say.
>
> Mark Twain, *Eve's Diary*

Most animals possess some kind of "signaling" communication system. Among the spiders there is a complex system for courtship. The male spider, before he approaches his lady love, goes through an elaborate series of gestures to inform her that he is indeed a spider and not a crumb or a fly to be eaten. These gestures are invariant. One never finds a creative spider changing or adding to the particular courtship ritual of his species.

A similar kind of gesture language is found among the fiddler crabs. There are forty different varieties, and each variety uses its own particular claw-waving movement to signal to another member of its "clan." The timing, movement, and posture of the body never change from one time to another or from one crab to another within the particular variety. Whatever the signal means, it is fixed. Only one meaning can be conveyed. There is not an infinite set of fiddler crab sentences.

The imitative sounds of talking birds have little in common with human language, but the calls and songs of many species of birds do have a communicative function, and they resemble human languages in that there may be "dialects" within the same species. **Bird calls** (consisting of one or more short notes) convey messages associated with the immediate environment, such as danger, feeding, nesting, flocking, and so on. **Bird songs** (more complex patterns of notes) are used to stake out territory and to attract mates. There is no evidence of any internal structure to these songs, nor can they be

segmented into independently meaningful parts as words of human language can be. In a study of the territorial song of the European robin,[11] it was discovered that the rival robins paid attention only to the alternation between high-pitched and low-pitched notes, and which came first did not matter. The message varies only to the extent of how strongly the robin feels about his possession and to what extent he is prepared to defend it and start a family in that territory. The different alternations therefore express intensity and nothing more. The robin is creative in his ability to sing the same thing in many different ways, but not creative in his ability to use the same units of the system to express many different messages with different meanings.

Despite certain superficial similarities to human language, bird calls and songs are fundamentally different kinds of communicative systems. The number of messages that can be conveyed is finite, and messages are stimulus controlled.

This distinction is also true of the system of communication used by honeybees. For a long time it has been believed that a forager bee is able to return to the hive and tell other bees where a source of food is located. It does so by forming a dance on a wall of the hive that reveals the location and quality of the food source. For one species of Italian honeybee, the dancing behavior may assume one of three possible patterns: round (which indicates locations near the hive, within twenty feet or so), sickle (which indicates locations at twenty- to sixty-feet distance from the hive), and tail-wagging (for distances that exceed sixty feet). The number of repetitions per minute of the basic pattern in the tail-wagging dance indicates the precise distance; the slower the repetition rate, the longer the distance.

The bees' dance is an effective system of communication for bees. It is capable, in principle, of infinitely many different messages, like human language; but unlike human language, the system is confined to a single subject—distance from the hive. The inflexibility was shown by an experimenter who forced a bee to walk to the food source. When the bee returned to the hive, it indicated a distance twenty-five times farther away than the food source actually was. The bee had no way of communicating the special circumstances in its message. This absence of creativity makes the bees' dance qualitatively different from human language.[12]

In the seventeenth century, the philosopher and mathematician René Descartes pointed out that the communication systems of animals are qualitatively different from the language used by humans:

> It is a very remarkable fact that there are none so depraved and stupid, without even excepting idiots, that they cannot arrange different words together, forming of them a statement by which they make known their thoughts; while, on the other hand, there is no other animal, however perfect and fortunately circumstanced it may be, which can do the same.[13]

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[11] R. G. Busnel and J. Bremond. 1962. "Recherche du Support de l'Information dans le Signal Acoustique de Défense Territoriale du Rougegorge," *C. R. Acad. Sci. Paris* 254: 2236–2238.

[12] K. Von Frisch. *The Dance Language and Orientation of the Bees,* translated by L. E. Chadwick, Cambridge, MA: Belknap Press of Harvard University Press, 1967.

[13] René Descartes. 1967. "Discourse on Method," *The Philosophical Works of Descartes,* Vol. I, trans. by E. S. Haldane and G. R. Ross, Cambridge, England: Cambridge University Press, p. 116.

Descartes goes on to state that one of the major differences between humans and animals is that human use of language is not just a response to external, or even internal, emotional stimuli, as are the sounds and gestures of animals. He warns against confusing human use of language with "natural movements which betray passions and may be . . . manifested by animals."

To hold that animals communicate by systems qualitatively different from human language systems is not to claim human superiority. Humans are not inferior to the one-celled amoeba because they cannot reproduce by splitting in two; they are just different sexually. They are not inferior to hunting dogs, whose sense of smell is far better than human animals. All the studies of animal communication systems, including those of chimpanzees (discussed in Chapter 8), provide evidence for Descartes' distinction between other animal communication systems and the linguistic creative ability possessed by the human animal.

WHAT WE KNOW ABOUT LANGUAGE

There are many things we do not yet know about the nature of human languages, their structures and use. The science of linguistics is concerned with these questions. The investigations of linguists throughout history and the analysis of spoken languages date back at least to 1600 B.C. in Mesopotamia. We have learned a great deal since that time. A number of facts pertaining to all languages can be stated.

1. Wherever humans exist, language exists.
2. There are no "primitive" languages—all languages are equally complex and equally capable of expressing any idea in the universe. The vocabulary of any language can be expanded to include new words for new concepts.
3. All languages change through time.
4. The relationships between the sounds and meanings of spoken languages and between the gestures and meanings of sign languages are for the most part arbitrary.
5. All human languages utilize a finite set of discrete sounds (or gestures) that are combined to form meaningful elements or words, which themselves form an infinite set of possible sentences.
6. All grammars contain rules for the formation of words and sentences of a similar kind.
7. Every spoken language includes discrete sound segments, like p, n, or a, that can all be defined by a finite set of sound properties or features. Every spoken language has a class of vowels and a class of consonants.
8. Similar grammatical categories (for example, noun, verb) are found in all languages.
9. There are semantic universals, such as "male" or "female," "animate" or "human," found in every language in the world.
10. Every language has a way of referring to past time, negating, forming questions, issuing commands, and so on.

11. Speakers of all languages are capable of producing and comprehending an infinite set of sentences. Syntactic universals reveal that every language has a way of forming sentences such as:

    Linguistics is an interesting subject.

    I know that linguistics is an interesting subject.

    You know that I know that linguistics is an interesting subject.

    Cecelia knows that you know that I know that linguistics is an interesting subject.

    Is it a fact that Cecelia knows that you know that I know that linguistics is an interesting subject?

12. Any normal child, born anywhere in the world, of any racial, geographical, social, or economic heritage, is capable of learning any language to which he or she is exposed. The differences we find among languages cannot be due to biological reasons.

It seems that Alsted and Du Marsais (and we could add many other universalists from all ages) were not spinning idle thoughts. We all speak human language.

SUMMARY

We are all intimately familiar with at least one language, our own. Yet few of us ever stop to consider what we know when we know a language. There is no book that contains the English or Russian or Zulu language. The words of a language can be listed in a dictionary, but not all the sentences can be; and a language consists of these sentences as well as words. Speakers use a finite set of rules to produce and understand an infinite set of possible sentences.

These rules comprise the **grammar** of a language, which is learned when you acquire the language and includes the sound system (the **phonology**), the structure of words (the **morphology**) how words may be combined into phrases and sentences (the **syntax**), the ways in which sounds and meanings are related (the **semantics**), and the words or **lexicon.** The sounds and meanings of these words are related in an **arbitrary** fashion. If you had never heard the word *syntax* you would not, by its sounds, know what it meant. The gestures used by deaf signers are also arbitrarily related to their meanings. Language, then, is a system that relates sounds (or hand and body gestures) with meanings; when you know a language you know this system.

This knowledge (linguistic **competence**) is different from behavior (linguistic **performance**). If you woke up one morning and decided to stop talking (as the Trappist monks did after they took a vow of silence), you would still have knowledge of your language. This ability or competence underlies linguistic behavior. If you do not know the language, you cannot speak it; but if you know the language, you may choose not to speak.

Grammars are of different kinds. The **descriptive grammar** of a language represents the unconscious linguistic knowledge or capacity of its speakers. Such a grammar

is a model of the **mental grammar** every speaker of the language knows. It does not teach the rules of the language; it describes the rules that are already known. A grammar that attempts to legislate what your grammar should be is called a **prescriptive grammar.** It prescribes; it does not describe, except incidentally. **Teaching grammars** are written to help people learn a foreign language or a dialect of their own language.

The more linguists investigate the thousands of languages of the world and describe the ways in which they differ from each other, the more they discover that these differences are limited. There are linguistic universals that pertain to all parts of grammars, the ways in which these parts are related and the forms of rules. These principles comprise **Universal Grammar,** which forms the basis of the specific grammars of all possible human languages.

If language is defined merely as a system of communication, then language is not unique to humans. There are, however, certain characteristics of human language not found in the communication systems of any other species. A basic property of human language is its **creative aspect**—a speaker's ability to combine the basic linguistic units to form an infinite set of "well-formed" grammatical sentences, most of which are novel, never before produced or heard.

The fact that deaf children learn **sign language** shows that the ability to hear or produce sounds is not a necessary prerequisite for language learning. All the sign languages in the world, which differ like spoken languages do, are visual-gestural systems that are as fully developed and as structurally complex as spoken languages. The major sign language used in the United States is **American Sign Language** (also referred to as **Ameslan** or **ASL**).

We thus see that the ability to hear or produce sounds is not a necessary condition for the acquisition of language; nor is the ability to imitate the sounds of human language a sufficient basis for learning language. "Talking" birds imitate sounds but can neither segment these sounds into smaller units, nor understand what they are imitating, nor produce new utterances to convey their thoughts.

Birds, bees, crabs, spiders, and most other creatures communicate in some way, but the information imparted is severely limited and stimulus-bound, confined to a small set of messages. The system of language represented by intricate mental grammars, which are not stimulus-bound and which generate infinite messages, is unique to the human species.

Because of linguistic research throughout history, we have learned much about Universal Grammar, the properties shared by all languages.

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EXERCISES

1. An English speaker's knowledge includes the sound sequences of the language. When new products are put on the market, the manufacturers have to think up new names for them that conform to the allowable sound patterns. Suppose you were hired by a manufacturer of soap products to name five new products. What names might you come up with? List them.

We are interested not in the spelling of the words but in how they are pronounced. Therefore, describe in any way you can how the words you list should be pronounced. Suppose, for example, you named one detergent *Blick.* You could describe the sounds in any of the following ways:

bl as in *blood,*
i as in *pit,*
ck as in *stick*

bli as in *bliss,*
ck as in *tick*

b as in *boy,*
lick as in *lick*

2. Consider the following sentences. Put a star (*) after those that do not seem to conform to the rules of your grammar, that are ungrammatical for you. State, if you can, why you think the sentence is ungrammatical.

a. Robin forced the sheriff go.

b. Napoleon forced Josephine to go.

c. The Devil made Faust go.
d. He passed by a large sum of money.
e. He came by a large sum of money.
f. He came a large sum of money by.
g. Did in a corner little Jack Horner sit?
h. Elizabeth is resembled by Charles.
i. Nancy is eager to please.
j. It is easy to frighten Emily.
k. It is eager to love a kitten.
l. That birds can fly amazes.
m. The fact that you are late to class is surprising.
n. Has the nurse slept the baby yet?
o. I was surprised for you to get married.
p. I wonder who and Mary went swimming.
q. Myself bit John.
r. What did Alice eat the toadstool with?
s. What did Alice eat the toadstool and?

3. It was pointed out in this chapter that a small set of words in languages may be onomatopoeic; that is, their sounds "imitate" what they refer to. *Ding-dong, tick-tock, bang, zing, swish,* and *plop* are such words in English. Construct a list of ten new words. Test them on at least five friends to see if they are truly nonarbitrary as to sound and meaning.

4. Although sounds and meanings of most words in all languages are arbitrarily related, there are some communication systems in which the "signs" unambiguously reveal their "meaning."

a. Describe (or draw) five different signs that directly show what they mean. Example: a road sign indicating an S curve.
b. Describe any other communication system that, like language, consists of arbitrary symbols. Example: traffic signals, where red means stop and green means go.

5. Consider these two statements: I learned a new word today. I learned a new sentence today. Do you think the two statements are equally probable, and if not, why not?

6. What do the barking of dogs, the meowing of cats, and the singing of birds have in common with human language? What are some of the basic differences?

7. A wolf is able to express subtle gradations of emotion by different positions of the ears, the lips, and the tail. There are eleven postures of the tail that

express such emotions as self-confidence, confident threat, lack of tension, uncertain threat, depression, defensiveness, active submission, and complete submission. This system seems to be complex. Suppose there were a thousand different emotions that the wolf could express in this way. Would you then say a wolf had a language similar to a human's? If not, why not?

8. Suppose you taught a dog to *heel*, *sit up*, *beg*, *roll over*, *play dead*, *stay*, *jump*, and *bark* on command, using the italicized words as cues. Would you be teaching it language? Why or why not?

9. State some rule of grammar that you have learned is the correct way to say something, but that you do not generally use in speaking. For example, you may have heard that *It's me* is incorrect and that the correct form is *It's I*. Nevertheless you always use *me* in such sentences; your friends do also, and in fact, *It's I* sounds odd to you.

Write a short essay presenting arguments against someone who tells you that you are wrong. Discuss how this disagreement demonstrates the difference between descriptive and prescriptive grammars.

Chapter 2
Brain and Language

The functional asymmetry of the human brain is unequivocal, and so is its anatomical asymmetry. The structural differences between the left and the right hemispheres are visible not only under the microscope but to the naked eye. The most striking asymmetries occur in language-related cortices. It is tempting to assume that such anatomical differences are an index of the neurobiological underpinnings of language.

Antonio and Hanna Damasio, University of Iowa, School of Medicine, Department of Neurology

[The brain is] the messenger of the understanding [and the organ whereby] in an especial manner we acquire wisdom and knowledge.

Hippocratic Treatise on the Sacred Disease, c. 377 B.C.E.

The attempts to understand the complexities of human cognitive abilities and especially the acquisition and use of language are as old and as continuous as history. Three long-standing problems of science include: the nature of the brain, the nature of human language, and the relationship between the two. The view that the brain is the source of human language and cognition goes back over 2000 years. Assyrian and Babylonian cuneiform tablets mention disorders of intelligence that may develop "when man's brain holds fire." Egyptian doctors in 1700 B.C.E. noted in their papyrus records that "the breath of an outside god" had entered their patients who became "silent in sadness." The philosophers of ancient Greece also speculated about the brain/mind relationship but neither Plato nor Aristotle recognized the brain's crucial function in cognition or language. Aristotle's wisdom failed him when he suggested that the brain is a cold sponge whose function is to cool the blood. But others writing in the same period showed greater insight, as shown by the Hippocratic treatises dealing with epilepsy quoted above.

A major approach in the study of the brain/mind relationship has been through an investigation of language. Research on the brain in humans and nonhuman primates, anatomically, psychologically, and behaviorally, is, for similar reasons, helping to answer the questions concerning the neurological basis for language. The study concerned with the biological and neural foundations of language is called **neurolinguistics.**

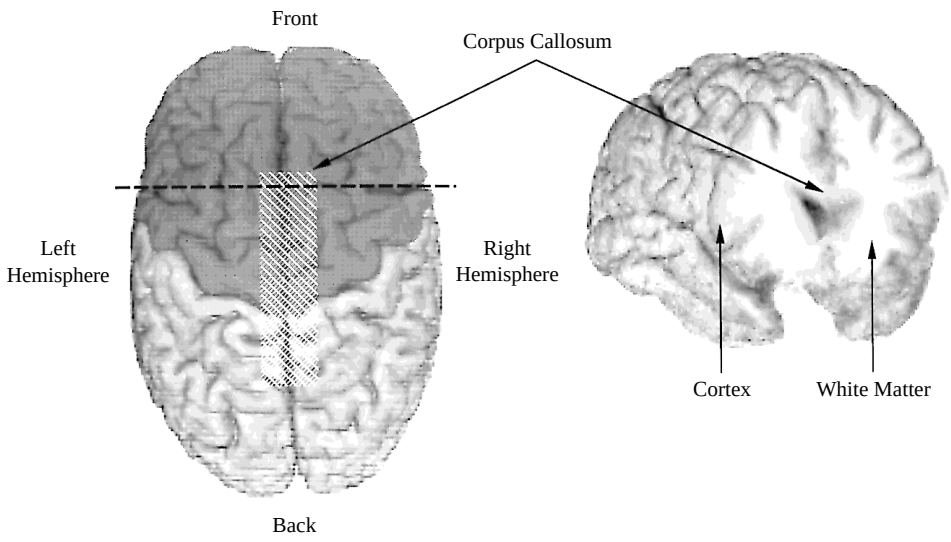
THE HUMAN BRAIN

"Rabbit's clever," said Pooh thoughtfully.
"Yes," said Piglet, "Rabbit's clever."
"And he has Brain."
"Yes," said Piglet, "Rabbit has Brain."
There was a long silence.
"I suppose," said Pooh, "that that's why he never understands anything."

A. A. Milne, *The House at Pooh Corner*[1]

We have learned a great deal about the brain—the most complicated organ of the body—in the last two millennia. It lies under the skull and consists of approximately ten billion nerve cells (neurons) and billions of fibers that interconnect them. The neurons or gray matter form the **cortex,** the surface of the brain, under which is the white matter, which consists primarily of connecting fibers. The cortex is the decision-making organ of the body. It receives messages from all the sensory organs, and it initiates all voluntary actions. It is "the seat of all which is exclusively human in the mind" and the storehouse of "memory." Somewhere in this gray matter the grammar that represents our knowledge of language resides.

FIGURE 2-1 3-D reconstruction of the normal living human brain. The images were obtained from magnetic resonance data using the Brainvox technique. Left panel = view from the top. Right panel = view from the front following virtual coronal section at the level of the dashed line. (Courtesy Hanna Damasio)

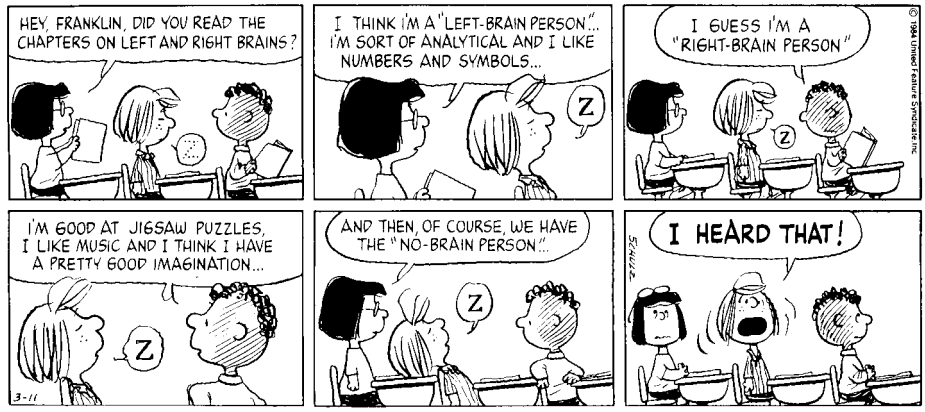


[1] A. A. Milne. 1928. *House at Pooh Corner,* New York: E. P. Dutton.

The brain is divided into two parts (called **cerebral hemispheres**), one on the right and one on the left. These hemispheres are connected like conjoined twins right down the middle, by the **corpus callosum.** This "freeway" between the two brain halves consists of two million fibers connecting the cells of the left and right hemispheres, as shown in Figure 2-1.

In general, the left hemisphere controls the movements of the right side of the body, and the right hemisphere the movements of the left side. If you point with your right hand, it is the left hemisphere which has "directed" your action. This is referred to as **contralateral** brain function.

The Modularity of the Brain



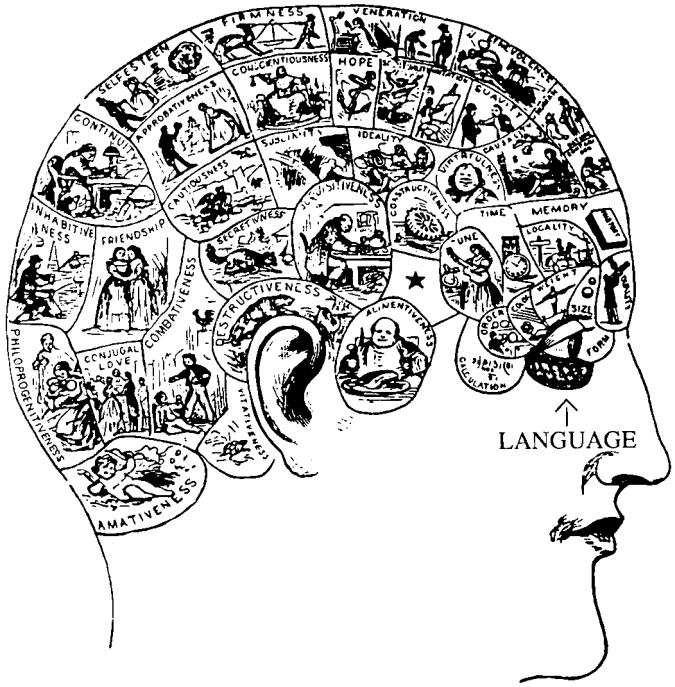
PEANUTS reprinted by permission of UFS, Inc.

> It only takes one hemisphere to have a mind.
>
> A. W. Wigan, 1844

Since the middle of the nineteenth century, there has been a basic assumption that it is possible to find a direct relation between language and the brain, and a continuous effort to discover direct centers where language capacities (competence and performance) may be localized.

In the early part of the nineteenth century Franz Joseph Gall put forth theories of **localization,** that is, that different human abilities and behaviors were traceable to specific parts of the brain. Some of Gall's views are amusing when looked at from our present state of knowledge. For example, he suggested that the frontal lobes of the brain were the locations of language because when he was young he had noticed that the most articulate and intelligent of his fellow students had protruding eyes, which he believed reflected overdeveloped brain material. He also put forth a pseudoscientific theory called "organology" that later came to be known as **phrenology,** the practice of determining personality traits, intellectual capacities and other matters by examination of the "bumps" on the skull. A disciple of Gall's, Johann Spurzheim, introduced phrenology to America, constructing elaborate maps and skull models such as the one shown in Figure 2-2, in which language is located directly under the eye.

FIGURE 2-2 Phrenology skull model.



Although phrenology has long been discarded as a scientific theory—except for a few remaining adherents like a current writer who refers to herself as "a practicing witch"—Gall's view that the brain is not a uniform mass and that linguistic capacities are functions of localized brain areas has been upheld. Gall was in fact a pioneer and a courageous scientist in arguing against the prevailing view that the brain was an unstructured organ. He instead argued in favor of **modularity,** with the brain divided into distinct anatomical faculties (referred to as cortical organs) that were directly responsible for specific cognitive functions, including language.

Language was the first distinct cognitive module to be supported by scientific evidence. In 1861, Paul Broca specifically related language to the left side of the brain. At a scientific meeting in Paris, he stated that we speak with the left hemisphere on the basis of his finding that damage to the front part of the left hemisphere (now called **Broca's area**) resulted in loss of speech, whereas damage to the right side did not.[2] He

[2] Broca, though a major figure in the history of neuroscience, held extremely racist and sexist views based on incorrect measurements of the brains of men and women and different races. His false view correlating brain size with intelligence is thoroughly demolished by Stephen Jay Gould (1981) in *The Mismeasure of Man,* New York: W. W. Norton.

determined this by autopsy investigations after the death of patients with language deficits following brain injury. Language, then, is said to be **lateralized,** the term used to refer to any cognitive functions which are primarily localized to one side of the brain or the other.

Today, patients with such damage or lesions in Broca's area are said to have **Broca's aphasia. Aphasia** is the neurological term used to refer to language disorders that follow brain lesions caused by a stroke, a tumor, a gunshot wound, other traumas, or an infection. The speech output of many Broca's aphasia patients is characterized by labored speech, word-finding pauses, loss of "function" words, and quite often, disturbed word order. Auditory comprehension for colloquial conversation gives the impression of being generally good although controlled testing reveals considerable impairments when comprehension depends on the syntactic structure, that is, how words are combined into phrases and sentences.

Thousands of years before Broca, the relation between the left hemisphere and language was intuitively recognized. In the 135th Psalm, there is an implicit recognition of the role of the left brain in speech (although contralateral brain function was of course not understood) in the verse that states: "If I will forget thee, Jerusalem, let my right hand die—let my tongue stick to the roof of my mouth."

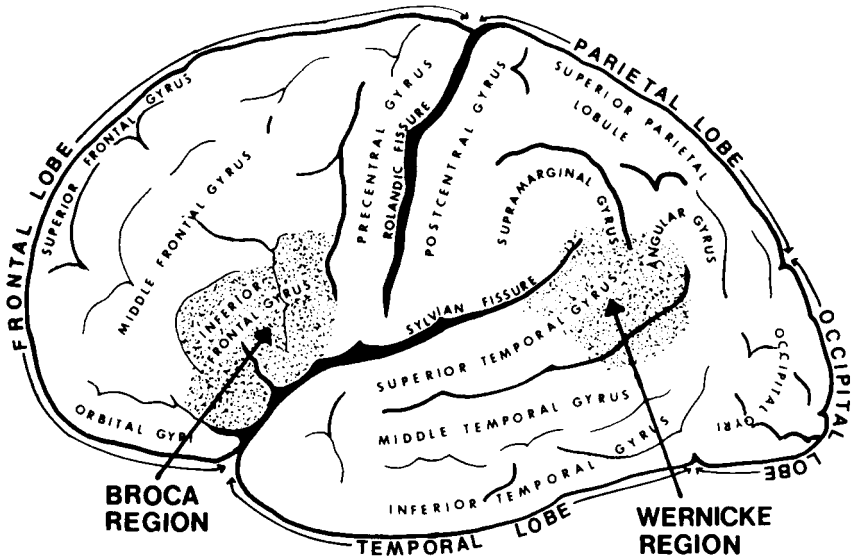
The Hippocratic physicians, mentioned above, also reported that loss of speech often occurred simultaneously with paralysis of the right side of the body. But it was Broca whose name is most closely associated with the left lateralization of language.

In 1874, thirteen years after Broca's Paris paper, Carl Wernicke presented a paper that described also on the basis of autopsy studies another variety of aphasia shown by patients with lesions in the back portion of the left hemisphere. Unlike Broca's patients, Wernicke's spoke fluently with good intonation and pronunciation, but with numerous instances of lexical errors (word substitutions) often producing **jargon** and **nonsense words.** They also had difficulty in comprehending speech.

The area of the brain that, when damaged, seems to lead to these symptoms is now, not surprisingly, known as **Wernicke's area,** and the patients are said to suffer from **Wernicke's aphasia.** The view of the left side of the brain, as constructed by the neurologist Hanna Damasio, in Figure 2-3, shows Broca's and Wernicke's areas of the brain.

We no longer have to depend on surgical investigations of the brain or wait until patients die to determine where their brain lesions are. New technologies such as MRI

FIGURE 2-3 Lateral (external) view of the left hemisphere of the human brain, showing the position of Broca and Wernicke regions—two key areas of the cortex related to language processing.



(an acronym for *M*agnetic *R*esonance *I*maging) makes it possible to see where the sites of lesions are in the living brain. In addition, the new technique called PET (*P*ositron *E*mission *T*omography) has revolutionized the study of the brain, making it possible to detect changes in brain activities and relate these changes to focal brain damage and cognitive tasks. PET permits experimenters to look into a living normal brain and see what areas are affected when different stimuli are involved, since degrees of metabolic activity can be viewed and one can see what areas of the brain are more active than others dependent on the function being carried out. MRI and PET studies reaffirm the lateralization of language.

Figures 2-4 and 2-5 show the MRI scans of the brains of a Broca's aphasic and a Wernicke's aphasic patient. The black areas show the sites of the lesions. Each diagram represent a brain "slice."

There is now a consensus that the so-called higher mental functions are greatly lateralized. Research shows that though the nervous system is generally symmetrical—what exists on the left exists on the right and vice versa—the two sides of the brain form an exception.

Evidence from Childhood Brain Lesions

Children who have suffered prenatal, perinatal, or childhood brain lesions provide additional evidence that language is lateralized and that the brain is differentiated in regard to language and nonlanguage abilities.

FIGURE 2-4[3] 3-D reconstruction of the brain of a living patient with Broca's aphasia. Note area of damage in left frontal region (dark gray), which was caused by a stroke. (Courtesy Hanna Damasio)

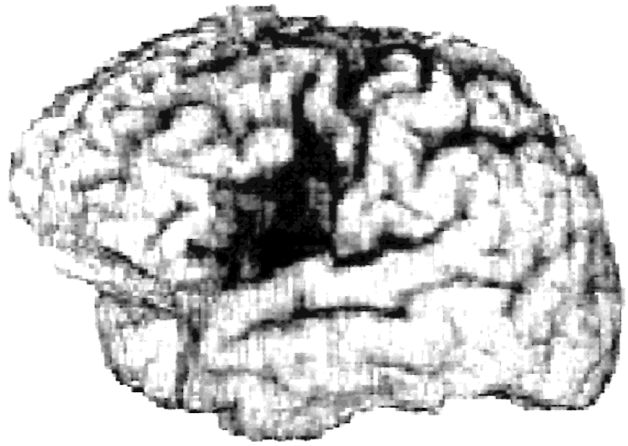
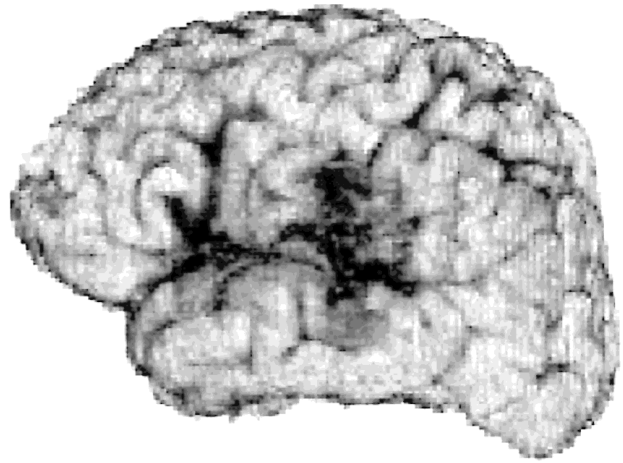


FIGURE 2-5[4] 3-D reconstruction of the brain of a living patient with Wernicke's aphasia. Note area of damage in left posterior temporal and lower parietal region (dark gray), which was caused by a stroke. (Courtesy Hanna Damasio)



[3] Hanna and Antonio R. Damasio. 1989. *Lesion Analysis in Neuropsychology,* New York: Oxford University Press, p. 53.

[4] Ibid., p. 107.

Studies of **hemiplegic** children, those with acquired unilateral lesions of the brain who retain both hemispheres (one normal and one diseased), show differential cognitive abilities. Those with left damaged hemispheres show deficiency in language acquisition and performance with the greatest impairments in their syntactic ability, whereas children with right hemisphere lesions acquire language as do normal children.

There have also been studies of children with one hemisphere removed (called **hemidecorticates**) either within the first year of life or later in childhood. Although the IQ scores and cognitive skills proved to be equivalent no matter which hemisphere was removed, children whose left hemisphere was removed outperformed those with right hemisphere removal in visual and spatial abilities. In language, the right hemidecorticates (those with removal of the right hemisphere) surpassed the left hemidecorticates. Both hemispheres appear to be equivalent in the ability to acquire the meaning and referential structure of common words, but the ability to acquire the complex syntactic rules for sentence formation was impaired in left but not right hemidecorticates.

It appears that even from birth the human brain is lateralized to the left for language since language usually does not develop normally in children with early left hemisphere brain lesions.

Split Brains

Aphasia studies and those of early childhood brain lesions provide good evidence that language is primarily processed in the left hemisphere. Other evidence is provided by mature patients who have one of the hemispheres removed. If the right hemisphere is cut out, language remains intact, although other cognitive losses may result. Because language is such an important aspect of our daily life, surgical removal of the left hemisphere is only performed in dire cases of malignant brain tumor.

Split-brain patients also provide evidence for language lateralization and for understanding brain functions. In recent years it was found that persons suffering from serious epilepsy could be treated by cutting the corpus callosum, the membrane connecting the two hemispheres, illustrated in Figure 2-1. When this pathway is split there is no communication between the "two brains."

The psychologist Michael Gazzaniga states:

> With [the corpus callosum] intact, the two halves of the body have no secrets from one another. With it sectioned, the two halves become two different conscious mental spheres, each with its own experience base and control system for behavioral operations. . . . Unbelievable as this may seem, this is the flavor of a long series of experimental studies first carried out in the cat and monkey.[5]

When the brain is split surgically, certain information from the left side of the body is received only by the right side of the brain and vice versa (because of the crisscross contralateral phenomenon discussed above). For example, suppose a monkey is trained to respond with its hands to a certain visual stimulus, such as a flashing light. If the brain is split after the training period, and the stimulus is shown only to the left visual field (the right brain), the monkey will perform only with the left hand, and vice versa. Many such experiments have been done on animals. They all show the independence of the two sides of the brain.

Persons with split brains have been tested by psychologists, showing that, like the monkey brain, the two human hemispheres are distinct. However, these tests showed that messages sent to the two sides of the brain result in different responses, depending on which hemisphere receives the message. As noted earlier, sensory information is received in the contralateral, opposite, side of the brain from the side of the body from which it is sent. In a split-brain patient, the information in the right hemisphere cannot get access to the left hemisphere. If an apple is put in the left hand of a split-brain human whose vision is cut off, the person can use it appropriately but cannot name it. The right brain senses the apple and distinguishes it from other objects, but the information cannot be relayed to the left brain for linguistic naming. By contrast, if a banana is placed in the right hand, the subject is immediately able to name it as well as to describe it.

Various experiments of this sort have been performed, all providing information on the different capabilities of the "two brains." The right brain does better than the left in pattern-matching tasks, in recognizing faces, and in spatial orientation. The left hemisphere is superior for language, for rhythmic perception, for temporal-order judgments, and for mathematical thinking. According to Gazzaniga, "the right hemisphere as well as the left hemisphere can emote and while the left can tell you why, the right cannot."

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[5] Michael Gazzaniga. 1970. *The Bisected Brain,* New York: Appleton-Century-Crofts.

Studies of human split-brain patients have shown that when the interhemispheric visual connections are severed, visual information from the right and left visual fields becomes confined to the left and right hemispheres respectively. Because of the crucial endowment of the left hemisphere for language, written material delivered to the right hemisphere cannot be read if the brain is split, because the information cannot be transferred to the left hemisphere.

An image or picture that is flashed to the right visual field of a split-brain patient (and is therefore processed by the left hemisphere) can be named. However, when the picture is flashed in the left visual field and lands in the right hemisphere, it cannot be named.

More Experimental Evidence

Since Broca's proposal that "we speak with the left hemisphere," evidence to support the left lateralization of language continues to grow. All the early research involved brain-damaged patients. As mentioned earlier, in the last few decades new technologies like PET and MRI and also *f*unctional MRI or *f* MRI permit us to explore the specialized capabilities of the two hemispheres in normal individuals, as well as brain-damaged patients. Another experimental technique that has been used with normal subjects, called **dichotic listening,** uses auditory signals. Subjects hear two different sound signals simultaneously through earphones. For example, a subject may hear *boy* in one ear and *girl* in the other, or *crocodile* in one ear and *alligator* in the other; or the subject may hear a horn tooting in one ear and rushing water in the other. When asked to state what they heard in each ear, subjects are more frequently correct in reporting linguistic stimuli (words, nonsense syllables, and so on) delivered directly to the right ear but are more frequently correct in reporting nonverbal stimuli (musical chords, environmental sounds, and so on) delivered to the left ear. That is, if subjects hear *boy* in the right ear and *girl* in the left ear, they are more likely to report the word heard in the right ear correctly. If they hear coughing in the right ear and laughing in the left, they are more apt to report the laughing stimulus correctly. The same acoustic signal may be processed in one hemisphere or the other depending on whether the subjects perceive it as part of their language system or not. Thai speakers show a right ear advantage (left hemisphere) in distinguishing between syllables that contrast in tone (pitch contours); Thai is a tone language in which such syllables pronounced with different pitch are words with different meanings. English subjects do not show the right ear advantage when they hear the same stimuli, because English is not a tone language.

Both hemispheres receive signals from both ears, but the contralateral stimuli compete successfully with the "same side" **ipsilateral** stimuli (right to right and left to left), either because they are received earlier, or because they are not weakened by having to cross the corpus callosum. The fact that the left hemisphere has an edge in linguistic processing and the right hemisphere is better at nonverbal material determines the accuracy with which subjects report on what they have heard.

These experiments are important not only because they show that language is lateralized but also because they show that the left hemisphere is not superior for processing all sounds, but only for those that are linguistic in nature. That is, the left side of the brain is specialized for language, not sounds.

Other experimental techniques are also being used to map the brain and to investigate the independence of different aspects of language and the extent of the independence of language from other cognitive systems. Even before the spectacular new technologies were introduced in the 1970s, researchers were taping electrodes to different areas of the skull and investigating the electrical activity of the brain. In such experiments the electrical signals emitted from the brain in response to different kinds of stimuli (called **event related brain potentials** or **ERPs**) are measured. For example, electrical differences may result when the subject hears speech sounds and nonspeech sounds. One study showed electrical potential differences in timing and area of response when subjects heard sentences that were meaningless, such as

> *The man admired Don's headache of the landscape.[6]

as opposed to meaningful sentences like:

> The man admired Don's sketch of the landscape.

These experiments show that neuronal activity in different locations varies with different stimuli and different tasks.

The results of these studies, using different techniques and diverse subjects, both normal and brain damaged, are converging to provide the information we seek on the relationship between the brain and various language and nonlanguage cognitive systems.

More Evidence for Modularity

> . . . the human mind is not an unstructured entity but consists of components which can be distinguished by their functional properties.
>
> Neil Smith and Ianthi-Maria Tsimpli. 1995. *The Mind of a Savant.* Oxford: Blackwell's.

Although neurolinguistics is still in its infancy, our understanding has progressed a great deal since a day in September 1848, when a foreman of a road construction gang named Phineas Gage became a famous figure in medical history. He achieved his "immortality" when a four-foot-long iron rod was blown through his head. Despite the gaping tunnel in his brain, Gage maintained the ability to speak and understand and retained whatever intellectual abilities he had prior to the injury, although he suffered major changes in his personality (he became "cranky" and "inconsiderate"), in his sexual behavior, and in his ability to control his emotions or make plans. Both Gage and science benefited from this explosion. Phineas gained monetarily by becoming a one-man touring circus; he traveled all over the country charging money to those curious enough to see him and the iron rod. Nevertheless, he died penniless twelve years after the accident. Science benefited because brain researchers were stimulated to learn why his intelligence remained intact.

No autopsy was performed when Gage died in 1861 (the year Broca delivered his seminal paper). Dr. John Harlowe, the doctor first called after Gage's accident,

[6] The asterisk, *, shows that there is something unacceptable about the sentence as discussed in Chapter 1.

convinced Gage's sister that his body should be exhumed and his skull preserved for science. This was done and the skull and the iron bar have been kept in the Harvard Medical School since that time. Dr. Harlowe did indeed contribute to scientific knowledge in this way. Approximately one hundred and thirty years after the exhumation, Dr. Hanna Damasio, a neurologist at the University of Iowa School of Medicine, using the most advanced neuro-imaging techniques and a computer program called Brainvox was able to reconstruct Gage's brain showing the area through which the bar had traveled and the hole it had left. She was able to show unequivocally that the damage was neither to the motor area nor the language areas of the brain, but to that section called the prefrontal cortices.[7] Furthermore, Dr. Antonio Damasio and his colleagues have further shown that patients with damage to this area show the same kind of personality changes as did Gage.[8]

That damage to some parts of the brain results in language loss whereas damage to other parts of the brain shows intact language with other kinds of deficits supports Gall's view of a structured brain with separate faculties.

Aphasia

In the discussion above, we saw that aphasia has been an important area of research in the attempts to understand the relation between brain and language. The interest in aphasia did not start with Broca. In the New Testament, St. Luke reports that Zacharias could not speak but could write, showing the early recognition of the autonomy of different aspects of linguistic knowledge. And in 30 B.C.E. the Roman writer Valerius Maximus describes an Athenian who was unable to remember his "letters" after being hit in the head with a stone. Pliny, who lived from 23 to 79 C.E., also refers to this same Athenian, noting that "with the stroke of a stone, he fell presently to forget his letters only, and could read no more; otherwise his memory served him well enough."

Numerous clinical descriptions of patients with language deficits and preserved nonlinguistic cognitive systems were published from the fifteenth to the eighteenth century. Johanne Gesner in 1770 did not attribute these language difficulties to either general intellectual deficits or loss of memory in general but instead to a specific impairment to language memory, stating: "Just as some verbal powers can become weakened without injury to others, memory also can be specifically impaired to a greater or lesser degree with respect to only certain classes of ideas."

Other reports describe patients suffering from acquired dyslexia (loss of ability to read) who nevertheless preserved their ability to write, and patients who could write to dictation but could not read back what they had written.

Carl Linnaeus in 1745 published a case study of a man suffering from **jargon aphasia,** who spoke "as it were a foreign language, having his own names for all words." An important observation regarding word substitution errors was made by Ryklof Michel von Goens in 1789 in his reference to a patient whom he described as follows: "After an illness, she was suddenly afflicted with a forgetting, or, rather, an incapacity or

[7] H. Damasio, T. Grabowski, R. Frank, A. M. Galaburda, and A. R. Damasio. 1994. "The Return of Phineas Gage: The Skull of a Famous Patient Yields Clues about the Brain," *Science* 264: 1102–05.

[8] Antonio R. Damasio. 1994. *Descartes' Error: Emotion, Reason, and the Human Brain,* New York: Avon Books.

confusion of speech. . . . If she desired a chair, she would ask for a table. . . . Sometimes she herself perceived that she misnamed objects; at other times, she was annoyed when a *fan*, which she had asked for, was brought to her, instead of the *bonnet*, which she thought she had requested."

The description of this and other similarly afflicted patients reveals that they substituted words that were semantically or phonologically similar to the intended ones, producing errors similar to normal word substitution errors or to those produced by the patient who called Ronald Reagan "John Wayne."

Other kinds of linguistic breakdown were also described in detail. In 1770 Johann Gesner discussed bilingual asymmetry in which, for example, an abbot retained his ability following brain damage to read Latin but not German.

Such detailed historical descriptions of language loss following brain damage, together with the controlled scientific studies of aphasia that have been conducted in the last fifty years, provide unequivocal evidence that language is predominantly and most frequently a left-hemisphere function. In the great majority of cases, lesions to the left hemisphere result in aphasia but injuries to the right do not (although such lesions result in perceptual difficulties, defects in pattern recognition, and other cognitive deficits). If both hemispheres were equally involved with language this should not be the case.[9]

The language impairments suffered by aphasics are not due to any general cognitive or intellectual impairments. Nor are they due to loss of motor or sensory controls of the nerves and muscles of the speech organs or hearing apparatus. Aphasics can produce sounds and hear sounds. Whatever loss they suffer has to do only with the production or comprehension of language (or specific parts of the grammar).

This is dramatically shown by the fact that deaf signers with damage to the left hemisphere show aphasia for sign language similar to the language breakdown in hearing aphasics. Bellugi and her colleagues at the Salk Institute have found that deaf patients with lesions in Broca's area show language deficits similar to those found in hearing patients—severe dysfluent, agrammatic sign production.[10] While deaf aphasic patients show marked sign language deficits, they have no difficulty in processing nonlinguistic visual spatial relationships, just as hearing aphasics have no problem with processing nonlinguistic auditory stimuli. Thus, the left hemisphere is not lateralized for hearing or speech, but for language.

As shown by the different symptoms of Broca's and Wernicke's aphasias, many aphasics do not show total language loss. Rather, different aspects of language are impaired. Broca's aphasics are often referred to as **agrammatic** because of their particular problems with syntax—putting words together to form phrases and clauses and sentences—as the following sample of the speech of an agrammatic patient with damage to Broca's area illustrates. The patient was asked what brought him back to the hospital and answered:

> Yes—ah—Monday ah—Dad—and Dad—ah—Hospital—and ah—Wednesday—Wednesday—nine o'clock and ah Thursday—ten o'clock ah

[9] For some people—about a third of all left-handers—there is still lateralization, yet it is the right side that is specialized for language. In other words, the special functions are switched, but asymmetry still exists.

[10] H. Poizner, E. Klima, and U. Bellugi. 1987. *What the Hands Reveal about the Brain*, Cambridge, MA: MIT Press.

> doctors—two—two—ah doctors and—ah—teeth—yah. And a doctor—ah girl—and gums, and I.[11]

As this patient illustrates, agrammatic aphasics produce ungrammatical utterances, frequently omitting function words like *a* or *the* or *was* and parts of words like the past tense suffix *-ed.* They also have difficulty in interpreting sentences correctly when comprehension depends on syntactic structure. Thus, they have a problem with determining "who did what to whom" in sentences such as:

(a) The cat was chased by the dog

where either the subject or the object of the sentence can logically be doing the chasing since in real life cats and dogs can chase each other. But they have less difficulty with

(b) The car was chased by the dog

where the meaning of the sentence is provided by nonlinguistic knowledge. They know that cars do not under normal circumstances chase dogs and so use that knowledge to interpret the sentence, whereas in the first sentence the interpretation depends on knowledge of the English passive construction. Normal speakers will have no difficulty because they use their knowledge of syntax—of the fact that a *by* phrase shows a passive construction in which the subject of the sentence is acted upon by the noun following the *by.*

Wernicke's aphasics, on the other hand, produce fluent, but often unintelligible speech, have serious comprehension problems and difficulty in lexical selection. One patient replied to a question about his health with:

> I felt worse because I can no longer keep in mind from the mind of the minds to keep me from mind and up to the ear which can be to find among ourselves.

Some aphasics have difficulty in naming objects that are presented to them, which shows a lexical defect. Others produce semantically meaningless jargon such as the patient who described a fork as "a need for a schedule"; another, when asked about his poor vision said "My wires don't hire right." While some of these aphasics substitute words that bear no semantic relationship to the correct word, such as calling a chair an engine, others substitute words which, like normal speech errors, are related semantically, substituting for example, *table* for *chair* or *boy* for *girl.*

Another kind of aphasia called **jargon aphasia** results in the substitution of one sound for another. Patients with Wernicke's aphasia often produce such jargon. Thus *table* might be pronounced as *sable.* An extreme variety of phonemic jargon results in the production of nonsense forms—nonoccurring but possible words. One patient, a physician prior to his aphasia, when asked if he was a doctor, replied:

> Me? Yes sir. I'm a male demaploze on my own. I still know my tubaboys what for I have that's gone hell and some of them go.

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[11] Harold Goodglass. 1973. "Studies on the Grammar of Aphasics," in *Psycholinguistics and Aphasia,* Goodglass and S. Blumstein, eds., Baltimore, MD: John Hopkins University Press.

The kinds of language impairments found in aphasics provide information on the nature of the grammar. If we find that damage to different parts of the brain leads to impairment of different components of the grammar, this is good evidence to support the models proposed by linguistics.

Patients that produce long strings of jargon that sound like well-formed grammatical language but that are uninterpretable show that knowledge of the sound sequences by which we represent words in our mental dictionaries can be disassociated from their meanings. That is, we may look at a picture, know what it is, but be unable to produce the string of sounds that relates to the concept.

The substitution of semantically related words provides evidence as to the organization of our mental dictionaries. The aphasics' errors are similar to word substitution errors of normals in that the substituted words are not just randomly selected but are similar to the intended words either in their sounds or in their meanings. Some of the most interesting examples of such substitutions are produced by aphasic patients who become dyslexic after brain damage. They are called **acquired dyslexics** because prior to the brain lesion they were normal readers (unlike developmental dyslexics who have difficulty learning to read). One group of these patients, when reading aloud words printed on cards, produced the kinds of substitutions shown in the following examples.[12]

Stimulus	**Response 1**	**Response 2**
act	*play*	*play*
applaud	*laugh*	*cheers*
example	*answer*	*sum*
heal	*pain*	*medicine*
south	*west*	*east*

Note that these patients did not always substitute the same words in two different testing periods. In fact, at times they would read the correct word, showing that the problem was in performance (accessing the correct form in the lexicon) not in competence, since they could sometimes get to the right word and produce it.

The substitution of phonologically similar words, such as *pool* for *tool* or *crucial* for *crucible,* also provides information on the organization of the lexicon. Words in the lexicon seem to be connected to other words by both phonology and semantics. Words are not simply represented in one list, but in a network of connections.

The difference between word classes that constitute different parts of speech is revealed in aphasia cases by the omission of function words[13] in the speech of Broca's aphasics and in some cases of acquired dyslexia. Patient G. R., who produced the semantically similar word substitutions cited above, was unable to read these function words at all; when presented with words like *which* or *would,* he just said, "No" or "I hate those little words"; but he can read, though with many semantic mistakes, as shown in the following reading errors.

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[12] Patient G. R., as reported in F. Newcombe and J. Marshall. 1984. "Varieties of Acquired Dyslexia: A Linguistic Approach," *Seminars in Neurology* 4, no. 2: 181–195.

[13] Function words and word endings like the *s* that forms plurals or the *ed* that forms past tense are called grammatical morphemes and will be discussed in Chapter 3.

Stimulus	Response	Stimulus	Response
witch	*witch*	which	*no!*
bean	*soup*	been	*no!*
hour	*time*	our	*no!*
eye	*eyes*	I	*no!*
hymn	*bible*	him	*no!*
wood	*wood*	would	*no!*

These errors suggest that the mental dictionary in our brains is divided into parts, one consisting of major content words and the other of grammatical words. Furthermore, it suggests that these two classes of words are processed in different areas or by different neural mechanisms, further supporting the view that the brain is structured in a complex fashion. One can think of the grammar as a mental module in the brain with submodular parts.

Most of us have experienced word-finding difficulties in speaking if not in reading, as Alice did when she said:

> "And now, who am I? I will remember, if I can. I'm determined to do it!" But being determined didn't help her much, and all she could say, after a great deal of puzzling, was "L, I know it begins with L."

This **"tip-of-the-tongue" (TOT** as it is often referred to) phenomenon is not uncommon. But if you never can find the word you want, you can imagine how serious a problem aphasics have. Aphasics with such problems are said to suffer from **anomia.**

Distinct Categories of Conceptual Knowledge

Dramatic evidence for a differentiated and structured brain is provided by studies of both normal individuals and patients with lesions in other than Broca's and Wernicke's areas. Some patients have difficulty naming individuals (unique persons); others have problems with naming animals, and still others cannot name tools. The patients in each group have brain lesions in separate and distinct regions of the left temporal lobe. Through use of MRI techniques the exact shape and location of the brain lesions of these patients were located. No overlap in the lesion sites in the three groups was found. In a follow-up study of normal subjects in a PET word-retrieval experiment, the experimenters at the University of Iowa found differential activation when asked to name persons, animals, or tools of just those sites damaged in the lesion patients.[14] Further evidence for the separation of cognitive systems is provided by the neurological and behavioral findings that following brain damage some patients lose the ability to recognize sounds or colors or familiar faces while retaining all other perceptual abilities. A patient may not be able to recognize his wife when she walks in the room until she starts to talk; then he will know who she is.

[14] H. Damasio, T. J. Grabowski., D. Tranel, R. D. Hichwa, and A. R. Damasio. 1996. "A Neural Basis for Lexical Retrieval," *Nature* 380 (11, April): 499–505.

THE AUTONOMY OF LANGUAGE

In addition to brain-damaged individuals who had acquired and lost language, there are cases of children (without brain lesions) who have difficulties in acquiring language or are much slower than the average child. These children show no other cognitive deficits; they are not autistic or retarded and have no perceptual problems. They are said to be suffering from a **Specific Language Impairment (SLI).** It is only their linguistic ability that is affected.

As children with SLI show, language may be impaired with general intelligence intact. But can language develop normally with general intelligence impaired? If such individuals can be found, it argues strongly for the view that language does not derive from some general cognitive ability. The question as to whether the language faculty from birth is domain specific—is in our genes—or whether it is derivative of more general intelligence is a controversial question receiving much attention and debate among linguists, psychologists, and neuropsychologists. There is a growing body of evidence to support the view that the human animal is biologically equipped from birth with an autonomous language faculty that itself is highly specific and that does not derive from the human general intellectual ability.

Asymmetry of Abilities

The psychological literature documents numerous cases of intellectually handicapped individuals who, despite their disabilities in certain spheres, show remarkable talents in others. The classic cases include individuals who are superb musicians or artists or draftsmen but lack the simple abilities required to take care of themselves. These people were traditionally known as "idiot savants" but now, fortunately, are generally referred to simply as **savants.** Some of the most famous savants are human calculators who can perform complex arithmetic processes at phenomenal speed, or calendrical calculators who can tell you almost instantaneously on which day of the week falls any date in the last or next century.

Until recently, most of the savants have been reported to be linguistically handicapped. They may be good mimics who can repeat speech like parrots but show meager creative language ability.

While such cases strongly argue for domain specific abilities and suggest that certain talents do not require general intelligence, they do not decisively respond to the suggestion that language is one ability that is derivative of general cognitive abilities.

The more recent literature is now reporting on cases of language savants who have acquired the highly complex grammar of their language (as well as other languages in some cases) without parallel nonlinguistic abilities of equal complexity.

Laura

Jeni Yamada[15] has studied one severely retarded young woman, named Laura, with a nonverbal IQ of 41– 44. Laura lacks almost all number concepts including basic

[15] Jeni E. Yamada. 1990. *Laura: A Case for the Modularity of Language,* Cambridge, MA: Bradford Books, MIT Press.

counting principles, can draw only at a preschool level, and has an auditory memory span limited to three units. Yet, when at the age of sixteen she was asked to name some fruits, she responded with *pears*, *apples*, and *pomegranates*, and in this same period produced syntactically complex sentences like *He was saying that I lost my battery powered watch that I loved; I just loved that watch* or *Last year at school when I first went there, three tickets were gave out by a police last year.*

Laura cannot add 2 + 2. She is not sure of when "last year" is or whether it is before or after "last week" or "an hour ago," nor does she know how many tickets were "gave out" nor whether three is larger or smaller than two. Although Laura produces sentences with multiple embeddings; can conjoin verb phrases, produce passives, inflect verbs for number and person to agree with the grammatical subject; and forms past tenses when the time adverbial structurally refers to a previous time, she can neither read nor write nor tell time. She does not know who the president of the United States is or what country she lives in or even her own age. Her drawings of humans resemble potatoes with stick arms and legs. Yet, in a sentence imitation task she both detected and corrected surface syntactic and morphological errors.

Laura is but one of many examples of children who display well-developed phonological, morphological, and syntactic linguistic abilities; seemingly less-developed lexical, semantic, or referential aspects of language; and severe deficits in nonlinguistic cognitive development.

In addition, any notion that linguistic ability results simply from communicative abilities or develops to serve communication functions is also negated by studies of children with fully developed structural linguistic knowledge but with almost a total absence of pragmatic or communicative skills. The ability to communicate in a social setting seems to depend on different cognitive skills than the acquisition of language.

Christopher

Another dramatic case of a linguistic savant named Christopher[16] has been reported. Christopher has a nonverbal IQ between 60 and 70 and is institutionalized because he is unable to take care of himself. Christopher finds the tasks of buttoning a shirt, cutting his fingernails, or vacuuming the carpet too difficult. According to the detailed investigation of Christopher, his "linguistic competence in his first language is as rich and as sophisticated as that of any native speaker." Furthermore, when given written texts in some fifteen to twenty languages, he translates them immediately into English. The languages include Germanic languages like Danish, Dutch, and German; Romance languages like French, Italian, Portuguese, and Spanish; as well as Polish, Finnish, Greek, Hindi, Turkish, and Welsh. He learned them either from speakers who used the languages in his presence or from grammar books. The investigators of this interesting man conclude that his linguistic ability is independent of his general conceptual or intellectual ability.

[16] Neil Smith and Ianthi-Maria Tsimpli. 1995. *The Mind of a Savant: Language Learning and Modularity,* Oxford, England: Blackwell's.

Such cases argue against the view that linguistic ability derives from general intelligence, since in these cases language develops against a background of deficits in nonlinguistic intellectual abilities.

Genetic Evidence for Language Autonomy

Studies of genetic disorders also reveal that one cognitive domain can develop normally simultaneous with abnormal development in other domains. Children with Turner's syndrome (a chromosomal anomaly) reveal normal or advanced language simultaneous with serious nonlinguistic cognitive deficits. Similarly, the studies of the language development in children with Williams syndrome reveal a unique behavioral profile in which there appears to be a selective preservation of linguistic functions in the face of severe general cognitive deficits.

Thus evidence from aphasia, Specific Language Impairments, and other genetic disorders, along with the asymmetry of abilities as revealed in linguistic savants, supports the view of the language faculty as an autonomous, genetically determined, independent, brain (mind) module.

THE EVOLUTION OF LANGUAGE

> As the voice was used more and more, the vocal organs would have been strengthened and perfected through the principle of the inherited effects of use; and this would have reacted on the power of speech. But the relation between the continued use of language and the development of the brain has no doubt been far more important. The mental powers in some early progenitor of man must have been more highly developed than in any existing ape, before even the most imperfect form of speech could have come into use.
>
> Charles Darwin, *The Descent of Man*

If the human brain is structured and wired for the acquisition and use of language, how (and when) did this development occur? Two scholarly societies, the American Anthropological Association and the New York Academy of Sciences, held forums in 1974 and 1976 to review research on this question. It is not a new question, and seems to have arisen with the origin of the species.

In the Beginning: The Origin of Language

> Nothing, no doubt, would be more interesting than to know from historical documents the exact process by which the first man began to lisp his first words, and thus to be rid for ever of all the theories on the origin of speech.
>
> M. Muller, 1871

Drawing by Leo Cullum; © 1995 The New Yorker Magazine, Inc.

All religions and mythologies contain stories of language origin. Philosophers through the ages have argued the question. Scholarly works have been written on the subject. Prizes have been awarded for the "best answer" to this eternally perplexing problem. Theories of divine origin, evolutionary development, and language as a human invention have all been suggested.

The difficulties inherent in answering this question are immense. Anthropologists think that the species has existed for at least one million years, and perhaps for as long as five or six million years. But the earliest deciphered written records are barely six thousand years old, dating from the writings of the Sumerians of 4000 B.C.E. These records appear so late in the history of the development of language that they provide no clue to its origin.

For these reasons, scholars in the latter part of the nineteenth century, who were only interested in "hard science," ridiculed, ignored, and even banned discussions of language origin. In 1886, the Linguistic Society of Paris passed a resolution "outlawing" any papers concerned with this subject.

Despite the difficulty of finding scientific evidence, speculations on language origin have provided valuable insights into the nature and development of language, which prompted the learned scholar Otto Jespersen to state that "linguistic science cannot refrain forever from asking about the whence (and about the whither) of linguistic evolution." A brief look at some of these speculative notions will reveal this.

God's Gift to Mankind?

> And out of the ground the Lord God formed every beast of the field, and every fowl of the air, and brought them unto Adam to see what he would call them; and whatsoever Adam called every living creature, that was the name thereof.
>
> Genesis 2:19

According to Judeo-Christian beliefs, God gave Adam the power to name all things. Similar beliefs are found throughout the world. According to the Egyptians, the creator of speech was the god Thoth. Babylonians believed the language giver was the god Nabu, and the Hindus attributed our unique language ability to a female god; Brahma was the creator of the universe, but language was given to us by his wife, Sarasvati.

Belief in the divine origin of language is closely intertwined with the magical properties that have been associated with language and the spoken word. Children in all cultures utter "magic" words like *abracadabra* to ward off evil or bring good luck. Despite the childish jingle "Sticks and stones may break my bones, but names will never hurt me," name-calling is insulting, cause for legal punishment, and feared. In some cultures, when certain words are used, one is required to counter them by "knocking on wood."

In many religions only special languages may be used in prayers and rituals. The Hindu priests of the fifth century B.C.E. believed that the original pronunciations of Vedic Sanskrit had to be used. This led to important linguistic study, since their language had already changed greatly since the hymns of the Vedas had been written. The first linguist known to us is Panini, who, in the fourth century B.C.E., wrote a detailed grammar of Sanskrit in which the phonological rules revealed the earlier pronunciation for use in religious worship.

While myths and customs and superstitions do not tell us very much about language origin, they do tell us about the importance ascribed to language.

There is no way to prove or disprove the divine origin of language, just as one cannot argue scientifically for or against the existence of God.

The First Language

> Imagine the Lord talking French! Aside from a few odd words in Hebrew, I took it completely for granted that God had never spoken anything but the most dignified English.
>
> Clarence Day, *Life with Father*

Among the proponents of the divine origin theory a great interest arose in the language used by God, Adam, and Eve. For millennia, "scientific" experiments have reportedly been devised to verify particular theories of the first language. In the fifth century B.C.E. the Greek historian Herodotus reported that the Egyptian pharaoh Psammetichus (664–610 B.C.E.) sought to determine the most primitive "natural" language by experimental methods. The monarch was said to have placed two infants in an isolated

mountain hut, to be cared for by a mute servant. The Pharaoh believed that without any linguistic input the children would develop their own language and would thus reveal the original tongue of man. Patiently the Egyptian waited for the children to become old enough to talk. According to the story, the first word uttered was *bekos,* the word for "bread" in Phrygian, the language spoken in a province of Phrygia in the northwest corner of what is now modern Turkey. This ancient language, which has long since died out, was thought, on the basis of this "experiment," to be the original language.

History is replete with other proposals. In the thirteenth century, the Holy Roman Emperor Frederick II of Hohenstaufen was said to have carried out a similar test, but the children died before they uttered a single word. James IV of Scotland (1473–1513), however, supposedly succeeded in replicating the experiment with the surprising results, according to legend, that the Scottish children "spak very guid Ebrew," providing "scientific evidence" that Hebrew was the language used in the Garden of Eden.

But J. G. Becanus in the sixteenth century argued that German must have been the primeval language, since God would have used the most perfect language. In 1830 the lexicographer Noah Webster asserted that the "proto-language" must have been Chaldee (Aramaic), the language spoken in Jerusalem during the time of Jesus. In 1887, Joseph Elkins maintained that "there is no other language which can be more reasonably assumed to be the speech first used in the world's gray morning than can Chinese."

The belief that all languages originated from a single source—the **monogenetic theory of language origin**—is not only found in the Tower of Babel story in Genesis, but also in a similar legend of the Toltecs, early inhabitants of Mexico, and in the myths of other peoples as well.

We are no further along today in discovering the original language (or languages) than was Psammetichus, given the obscurities of prehistory.

Human Invention or the Cries of Nature?

> Language was born in the courting days of mankind; the first utterances of speech I fancy to myself like something between the nightly love lyrics of puss upon the tiles and the melodious love songs of the nightingale.
>
> Otto Jespersen, *Language, Its Nature, Development and Origin*

The Greeks speculated about everything in the universe, including language. The earliest surviving linguistic treatise that deals with the origin and nature of language is Plato's *Cratylus.* A commonly held view among the classical Greeks, expressed by Socrates in this dialogue, was that at some ancient time there was a "legislator" who gave the correct, natural name to everything, and that words echoed the essence of their meanings.

Despite all the contrary evidence, the idea that the earliest form of language was imitative, or echoic, was proposed up to the twentieth century. Called the bow-wow theory, it claimed that a dog would be designated by the word *bow-wow* because of the sounds of his bark.

A parallel view states that language at first consisted of emotional ejaculations of pain, fear, surprise, pleasure, anger, and so on. This proposal that the earliest manifestations of language were "cries of nature" was proposed by Jean Jacques Rousseau in the middle of the eighteenth century.

Another hypothesis suggests that language arose out of the rhythmical grunts of men working together. A more charming view was suggested by Jespersen, who proposed that language derived from song as an expressive rather than a communicative need, with love being the greatest stimulus for language development.

Just as with the beliefs in a divine origin of language, these proposals are untestable.

The Development of Language in the Species

There is much interest today among biologists as well as linguists in the relationship between the development of language and the evolutionary development of the human species. There are those who view language ability as a difference in degree between humans and other primates—a continuity view—and those who see the onset of language ability as a qualitative leap—the discontinuity view. There are those on both sides of the "discontinuity" view who believe that language is species-specific.

In trying to understand the development of language, scholars past and present have debated the role played by the vocal tract and the ear. For example, it has been suggested that speech could not have developed in nonhuman primates because their vocal tracts were anatomically incapable of producing a large enough inventory of speech sounds. According to this hypothesis, the development of language is linked to the evolutionary development of the speech production and perception apparatus. This, of course, would be accompanied by changes in the brain and the nervous system toward greater complexity. Such a view implies that the languages of our human ancestors of millions of years ago may have been syntactically and phonologically simpler than any language known to us today. The notion "simpler," however, is left undefined. One suggestion is that this primeval language had a smaller inventory of sounds.

One evolutionary step must have resulted in the development of a vocal tract capable of producing the wide variety of sounds utilized by human language, as well as the mechanism for perceiving and distinguishing them. That this step is insufficient to explain the origin of language is evidenced by the existence of mynah birds and parrots, which have the ability to imitate human speech, but not the ability to acquire language.

More importantly, we know from the study of humans who are born deaf and learn sign languages that are used around them that the ability to hear speech sounds is not a necessary condition for the acquisition and use of language. In addition, the lateralization evidence from brain-damaged deaf signers discussed above shows that the brain is neurologically equipped to learn language rather than speech.

The ability to produce and hear a wide variety of sounds therefore appears to be neither necessary nor sufficient for the development of language in the human species.

A major step in the development of language most probably relates to evolutionary changes in the brain. One view of this is expressed by the MIT linguist Noam Chomsky:

> It could be that when the brain reached a certain level of complexity it simply automatically had certain properties because that's what happens when you pack 10^{10} neurons into something the size of a basketball.[17]

This is similar to the view expressed by the Harvard biologist Stephen Jay Gould:

[17] N. Chomsky. 1994. Video. The Human Language Series. Program Three. By Gene Searchinger.

> The Darwinist model would say that language, like other complex organic systems, evolved step by step, each step being an adaptive solution. Yet language is such an integrated "all or none" system, it is hard to imagine it evolving that way. Perhaps the brain grew in size and became capable of all kinds of things which were not part of the original properties.[18]

Stephen Pinker, however, supports a more Darwinian natural selection development of what he calls "the language instinct":

> All the evidence suggests that it is the precise wiring of the brain's microcircuity that makes language happen, not gross size, shape, or neuron packing.[19]

More research is clearly needed in the attempt to resolve this controversy. Another thing that is not yet clear is what role, if any, hemispheric lateralization played in language evolution. Lateralization certainly makes greater specialization possible. Research conducted with birds and monkeys, however, shows that lateralization is not unique to the human brain. Thus, while it may constitute a necessary step in the evolution of language, it is not a sufficient one.

While we do not yet have definitive answers to the origin of language in the brain of the human species, the search for these answers goes on and provides new insights into the nature of language and the nature of the human brain.

SUMMARY

The attempt to understand what makes human language acquisition and use possible has led to research on the brain-mind-language relationship. **Neurolinguistics** studies the brain mechanisms and anatomical structures underlying language representation and use.

The brain is the most complicated organ of the body, controlling motor and sensory activities and thought processes. Research conducted for over a century reveals that different parts of the brain control different body functions. The nerve cells that form the surface of the brain are called the **cortex,** which serves as the intellectual decision maker, receiving messages from the sensory organs and initiating all voluntary actions. The brain of all higher animals is divided into two parts called the **cerebral hemispheres,** which are connected by the **corpus callosum,** a pathway that permits the left and right hemispheres to communicate with each other.

Although each hemisphere appears to be a mirror image of the other, the left hemisphere controls the right hand, leg, visual field, and so on, and the right brain controls the left side of the body, which is referred to as **contralateral** control of functions. Despite the general symmetry of the human body, there is much evidence that the brain is asymmetric; the left and right hemispheres are specialized for different functions.

Evidence from **aphasia**—language dysfunction as a result of brain injuries—and from surgical removal of parts of the brain, electrical stimulation studies, emission

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[18] S. J. Gould. 1994. Video. The Human Language Series. Program Three. By Gene Searchinger.

[19] S. Pinker. 1995. *The Language Instinct,* New York: Morrow.

tomography results, dichotic listening, and experiments measuring brain electrical activity show a lack of symmetry of function of the two hemispheres. These results are further supported by studies of split-brain patients, who, for medical reasons, have had the corpus callosum severed. In the past, the studies of the brain and language depended on surgery or autopsy. Today, new technologies such as **MRI (Magnetic Resonance Imaging)** and **PET (Positron Emission Tomography)** makes it possible to see the sites of lesions in the living brain to detect changes in brain activities and to relate these changes to focal brain damage and cognitive tasks.

For normal right-handers and many left-handers, the left side of the brain is specialized for language. This **lateralization** of functions is genetically and neurologically conditioned. Lateralization refers to any cognitive functions that are primarily localized to one side of the brain or the other.

In addition to aphasia, other evidence supports the lateralization of language. Children with early brain lesions in the left hemisphere resulting in the surgical removal of parts or the whole of the left brain show specific linguistic deficits with other cognitive abilities remaining intact. If the right brain is damaged, however, language is not disordered but other cognitive disorders may result.

Aphasia studies show impairment of different parts of the grammar. Patients with **Broca's aphasia** exhibit impaired syntax and speech problems, whereas **Wernicke's aphasia** patients are fluent speakers who produce semantically empty utterances and have difficulty in comprehension. **Anomia** is a form of aphasia in which the patient has word-finding difficulties. **Jargon aphasia** patients may substitute words unrelated semantically to their intended messages; others produce phonemic substitution errors, sometimes resulting in nonsense forms, making their utterances uninterpretable.

The **modularity** of the language faculty—its independence from other cognitive systems with which it interacts—is supported by brain-damage studies and by children with **Specific Language Impairments (SLI)** who are normal in all other regards. The ability to acquire language seems to be genetically determined, as shown by the cases of linguistic **savants**—individuals who are fluent in language and deficient in general intelligence. Given such individuals, linguistic ability does not seem to be derived from some general cognitive ability but specific to language.

An important question is how language developed in the course of evolution of the human brain. The origin of language in the species has been a topic for much speculation throughout history.

The idea that language was God's gift to humanity is found in religions throughout the world. The continuing belief in the miraculous powers of language is tied to this notion. The assumption of the divine origin of language stimulated interest in discovering the first primeval language. There are legendary experiments in which children were isolated in the belief that their first words would reveal the original language.

Opposing views suggest that language is a human invention. The Greeks believed that an ancient "legislator" gave the true names to all things. Others have suggested that language developed from "cries of nature," early gestures, onomatopoeic words, or even from songs to express love.

There is currently research being conducted by linguists, evolutionary biologists, and neurologists concerning the evolution of language. Some scholars suggest that language and the human animal arose simultaneously, and that from the start the human

animal was genetically equipped to learn language. Studies of the evolutionary development of the brain provide some evidence for physiological and anatomic preconditions for language development.

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EXERCISES

1. The Nobel Prize laureate Roger Sperry has argued that split brain patients have two minds:

> Everything we have seen so far indicates that the surgery has left these people with two separate minds, that is, two separate spheres of consciousness. What is experienced in the right hemisphere seems to lie entirely outside the realm of experience of the left hemisphere.

Another Nobel Prize winner in physiology, Sir John Eccles, disagrees. He does not think the right hemisphere can think; he distinguishes between

"mere consciousness," which animals possess as well as humans, and language, thought, and other purely human cognitive abilities. In fact, according to him, the human aspect of human nature is all in the left hemisphere.

Write a short essay discussing these two opposing points of view, stating your own opinion on how to define "the mind."

2. A. Some aphasic patients, when asked to read a list of words, substitute other words for those printed. In many cases there are similarities between the printed words and the substituted words. The data given below are from actual aphasic patients. In each case state what the two words have in common and how they differ:

	Printed Word	**Word Spoken by Aphasic**
a.	liberty	freedom
	canary	parrot
	abroad	overseas
	large	long
	short	small
	tall	long
b.	decide	decision
	conceal	concealment
	portray	portrait
	bathe	bath
	speak	discussion
	remember	memory

B. What do the words in groups a and b reveal about how words are likely to be stored in the brain?

3. The following are some sentences spoken by aphasic patients, collected and analyzed by Dr. Harry Whitaker. In each case state how the sentence deviates from normal nonaphasic language.

a. There is under a horse a new sidesaddle.

b. In girls we see many happy days.

c. I'll challenge a new bike.

d. I surprise no new glamour.

e. Is there three chairs in this room?

f. Mike and Peter is happy.

g. Bill and John likes hot dogs.

h. Proliferate is a complete time about a word that is correct.

i. Went came in better than it did before.

4. The investigation of individuals with brain damage has been a major source of information as to the neural basis of language and other cognitive systems. One might suggest that this is like trying to understand how an automobile

engine works by looking at a damaged engine. Is this a good analogy? If so, why? If not, why not? In your answer discuss how a damaged system can or cannot provide information about the normal system.

5. What are the arguments and evidence that have been put forth to support the notion that there are two separate parts of the brain?

6. Discuss the statement by A. W. Wigan that "It only takes one hemisphere to have a mind."

7. In this chapter, dichotic listening tests in which subjects hear different kinds of stimuli in each ear were discussed. These tests showed that though there were fewer errors made in reporting linguistic stimuli such as the syllables *pa*, *ta*, *ka* when heard through an earphone on the right ear; other nonlinguistic sounds such as a police car siren were processed with fewer mistakes if heard by the left ear. This is due to the contralateral control of the brain. There is also a technique which permits visual stimuli to be received either by the right visual field (going directly to the left hemisphere) or the left visual field (going directly to the right hemisphere). (The eye is divided in this way.) What might some visual stimuli be that could be used in an experiment to further test the lateralization of language?