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Language Acquisition

> [The acquisition of language] is doubtless the greatest intellectual feat any one of us is ever required to perform.
>
> **LEONARD BLOOMFIELD,** *Language*, 1933

> The capacity to learn language is deeply ingrained in us as a species, just as the capacity to walk, to grasp objects, to recognize faces. We don't find any serious differences in children growing up in congested urban slums, in isolated mountain villages, or in privileged suburban villas.
>
> **DAN SLOBIN,** *The Human Language Series program 2*, 1994

Language is extremely complex. Yet very young children—before the age of five—already know most of the intricate system that is the grammar of a language. Before they can add 2 + 2, children are conjoining sentences, asking questions, using appropriate pronouns, negating sentences, forming relative clauses, and inflecting verbs and nouns and in general have the creative capacity to produce and understand a limitless number of sentences.

It is obvious that children do not learn a language simply by memorizing the sentences of the language. Rather, they acquire a system of grammatical rules of the sort we have discussed in the preceding chapters. No one teaches children the rules of the grammar. Their parents are no more aware of the phonological, morphological, syntactic, and semantic rules than are the children. Even if you remember your early years, do you remember anyone telling you to form a sentence by adding a verb phrase to a noun phrase, or to add [s] or [z] to form plurals? No one told you "This is a grammatical utterance and that is not." Yet somehow you were able, as all children are, to quickly and effortlessly extract the intricate system of rules from the language you heard around you

and thereby "reinvent" the grammar of your parents. How the child accomplishes this phenomenal task is the subject of this chapter.

Mechanisms of Language Acquisition

There have been various proposals concerning the psychological mechanisms involved in acquiring a language. Early theories of language acquisition were heavily influenced by behaviorism, a school of psychology prevalent in the 1950s. As the name implies, behaviorism focused on people's behaviors, which are directly observable, rather than on the mental systems underlying these behaviors. Language was viewed as a kind of verbal behavior, and it was proposed that children learn language through imitation, reinforcement, analogy, and similar processes. B. F. Skinner, one of the founders of behaviorist psychology, proposed a model of language acquisition in his book *Verbal Behavior* (1957). Two years later, in a devastating reply to Skinner entitled *Review of Verbal Behavior* (1959), Noam Chomsky showed that language is a complex cognitive system that could not be acquired by behaviorist principles.

Do Children Learn through Imitation?

CHILD: My teacher holded the baby rabbits and we patted them.
ADULT: Did you say your teacher held the baby rabbits?
CHILD: Yes.
ADULT: What did you say she did?
CHILD: She holded the baby rabbits and we patted them.
ADULT: Did you say she held them tightly?
CHILD: No, she holded them loosely.

ANONYMOUS ADULT AND CHILD

At first glance the question of how children acquire language doesn't seem difficult to answer. Don't children just listen to what is said around them and imitate the speech they hear? Imitation is involved to some extent. An American child may hear *milk* and a Mexican child *leche* and each attempts to reproduce what is heard. But the early words and sentences that children produce show that they are not simply imitating adult speech. Many times the words are barely recognizable to an adult and the meanings are also not always like the adult's, as we will discuss below.

Children do not hear words like *holded* or *tooths* or sentences such as *Cat stand up table* or many of the other utterances they produce between the ages of two and three, such as the following:[1]

[1]Many of the examples of child language in this chapter are taken from CHILDES (Child Language Data Exchange System), a computerized database of the spontaneous speech of children acquiring English and many other languages. MacWhinney, B., and C. Snow. 1985. The child language data exchange system. *Journal of Child Language* 12:271–96.

a my pencil
two foot
what the boy hit?
other one pants
Mommy get it my ladder
cowboy did fighting me

Even when children are trying to imitate what they hear, they are unable to produce sentences outside of the rules of their developing grammar. The following are a child's attempt to imitate what the adult has said:

ADULT:	He's going out.	CHILD:	He go out.
ADULT:	That's an old-time train.	CHILD:	Old-time train.
ADULT:	Adam, say what I say. Where can I put them?	CHILD:	Where I can put them?

Imitation also fails to account for the fact that children who are unable to speak for neurological or physiological reasons are able to learn the language spoken to them and understand it. When they overcome their speech impairment, they immediately use the language for speaking.

Do Children Learn through Correction and Reinforcement?

CHILD: Nobody don't like me.
MOTHER: No, say "Nobody likes me."
CHILD: Nobody don't like me.
(dialogue repeated eight times)
MOTHER: Now, listen carefully; say "Nobody likes me."
CHILD: Oh, nobody don't likes me.

ANONYMOUS MOTHER AND CHILD

Another proposal, in the behaviorist tradition, is that children learn to produce correct (grammatical) sentences because they are positively reinforced when they say something grammatical and negatively reinforced (corrected) when they say something ungrammatical. Roger Brown and his colleagues at Harvard University studied parent–child interactions. They report that correction seldom occurs, and when it does, it is usually for mispronunciations or incorrect reporting of facts and not for "bad grammar." They note, for example, that the ungrammatical sentence "Her curl my hair" was not corrected because the child's mother was in fact curling her hair. However, when the child uttered the grammatical sentence "Walt Disney comes on Tuesday," she was corrected because the television program was shown on Wednesday. Brown concludes that it is "truth value rather than syntactic well-formedness that chiefly governs explicit verbal reinforcement by parents—which renders mildly paradoxical the fact that the usual product of such a training schedule is an adult whose speech is highly grammatical but not notably truthful."

Adults will sometimes **recast** children's utterances into an adultlike form, as in the following examples:

Child	Mother
It fall.	It fell?
Where is them?	They're at home.
It doing dancing.	It's dancing, yes.

In these examples, the mother provides the correct model without actually correcting the child. Although recasts are potentially helpful to the child, they are not used in a consistent way. One study of forty mothers of children two to four years old showed that only about 25 percent of children's ungrammatical sentences are recast and that overall, grammatical sentences were recast as often as bad sentences. Parents tend to focus on the correctness of content more than on grammaticality. So parents allow many ungrammatical utterances to "slip by" and change many grammatical utterances. A child who relied on recasts to learn grammar would be mightily confused.

Even if adults did correct children's syntax more often than they do, it would still not explain how or what children learn from such adult responses, or how children discover and construct the correct rules. Children do not know what they are doing wrong and are unable to make corrections even when they are pointed out, as shown by the preceding example and the following one:

CHILD: Want other one spoon, Daddy.
FATHER: You mean, you want *the other spoon*.
CHILD: Yes, I want other one spoon, please, Daddy.
FATHER: Can you say "the other spoon"?
CHILD: Other . . . one . . . spoon.
FATHER: Say . . . "other."
CHILD: Other.
FATHER: Spoon.
CHILD: Spoon.
FATHER: Other . . . spoon.
CHILD: Other . . . spoon. Now give me other one spoon?

Such conversations between parents and children do not occur often; this conversation was between a linguist studying child language and his child. Mothers and fathers are usually delighted that their young children are talking and consider every utterance a gem. The "mistakes" children make are cute and repeated endlessly to anyone who will listen.

Do Children Learn Language through Analogy?

It has also been suggested that children put words together to form phrases and sentences by **analogy**, by hearing a sentence and using it as a model to form other sentences. But this is also problematic, as Lila Gleitman, an expert on developmental psycholinguistics, points out:

> [S]uppose the child has heard the sentence "I painted a red barn." So now, by analogy, the child can say "I painted a blue barn." That's exactly the

> kind of theory that we want. You hear a sample and you extend it to all of the new cases by similarity. . . . In addition to "I painted a red barn" you might also hear the sentence "I painted a barn red." So it looks as if you take those last two words and switch their order. . . . So now you want to extend this to the case of seeing, because you want to look at barns instead of paint them. So you have heard, "I saw a red barn." Now you try (by analogy) a . . . new sentence—"I saw a barn red." Something's gone wrong. This is an analogy, but the analogy didn't work. It's not a sentence of English.[2]

This kind of problem arises constantly. Consider another example. The child hears the following pair of sentences:

The boy was sleeping. Was the boy sleeping?

Based on pairs of sentences like this, he formulates a rule for forming questions: "Move the auxiliary to the position preceding the subject." He then acquires the more complex relative clause construction:

The boy who is sleeping is dreaming about a new car.

He now wants to form a question. What does he do? If he forms a question on analogy to the simple yes-no question, he will move the first auxiliary *is* as follows:

*Is the boy who sleeping is dreaming about a new car?

Studies of spontaneous speech, as well as experiments, show that children never make mistakes of this sort. As discussed in chapter 2, syntactic rules, such as the rule that moves the auxiliary, are sensitive to the structure of the sentence and not to the linear order of words. The available evidence shows that children know about the structure dependency of rules at a very early age.

In recent years, a computer model of language representation and acquisition called **connectionism** has been proposed that relies in part on behaviorist learning principles such as analogy and reinforcement. In the connectionist model, no grammatical rules are stored anywhere. Linguistic knowledge, such as knowledge of the past tense, is represented by a set of neuron-like connections between different phonological forms (e.g., between *play* and *played*, *dance* and *danced*, *drink* and *drank*). Repeated exposure to particular verb pairs in the input reinforces the connection between them, mimicking rule-like behavior. Based on similarities between words, the model can produce a past-tense form that it was not previously exposed to. On analogy to *dance-danced*, it will convert *prance* to *pranced*; on analogy to *drink-drank* it will convert *sink* to *sank*.

As a model of language acquisition, connectionism faces some serious challenges. The model assumes that the language of the child's environment has very specific properties. However, investigation of the input that children actually receive shows that it is not consistent with those assumptions. Another problem

[2]Gleitman, L. R., and E. Wanner. 1982. *Language acquisition: The state of the art*. Cambridge, UK: Cambridge University Press.

is that rules such as formation of past tense cannot be based on phonological form alone but must also be sensitive to information in the lexicon. For example, the past tense of a verb derived from a noun is always regular even if an irregular form exists. When a fly ball is caught in a baseball game, we say the batter *flied out*, not *flew out*. Similarly, when an irregular plural is part of a larger noun, it may be regularized. When we see several images of Walt Disney's famous rodent, we describe them as Mickey Mouses, not Mickey Mice.

Do Children Learn through Structured Input?

Yet another suggestion is that children are able to learn language because adults speak to them in a special "simplified" language sometimes called **motherese**, or **child-directed speech** (CDS) (or more informally, **baby talk**). This hypothesis places a lot of emphasis on the role of the environment in facilitating language acquisition.

In our culture adults do typically talk to young children in a special way. We tend to speak more slowly and more clearly, we may speak in a higher pitch and exaggerate our intonation, and sentences are generally grammatical. However, motherese is not syntactically simpler. It contains a range of sentence types, including syntactically complex sentences such as questions (*Do you want your juice now?*); embedded sentences (*Mommy thinks you should sleep now*); imperatives (*Pat the dog gently!*); and negatives with tag questions (*We don't want to hurt him, do we?*). And adults do not simplify their language by dropping inflections from verbs and nouns or by omitting function words such as determiners and auxiliaries, though children do this all the time. It is probably a good thing that motherese is not syntactically restricted. If it were, children might not have sufficient information to extract the rules of their language.

Although infants prefer to listen to motherese over normal adult speech, studies show that using motherese does not significantly affect the child's language development. In many cultures, adults do not use a special style of language with children, and there are even communities in which adults hardly talk to babies at all. Nevertheless, children around the world acquire language in much the same way, irrespective of these varying circumstances. Adults seem to be the followers rather than the leaders in this enterprise. The child does not develop linguistically because he is exposed to ever more adultlike language. Rather, the adult adjusts his language to the child's increasing linguistic sophistication. The exaggerated intonation and other properties of motherese may be useful for getting a child's attention and for reassuring the child, but it is not a driving force behind language development.

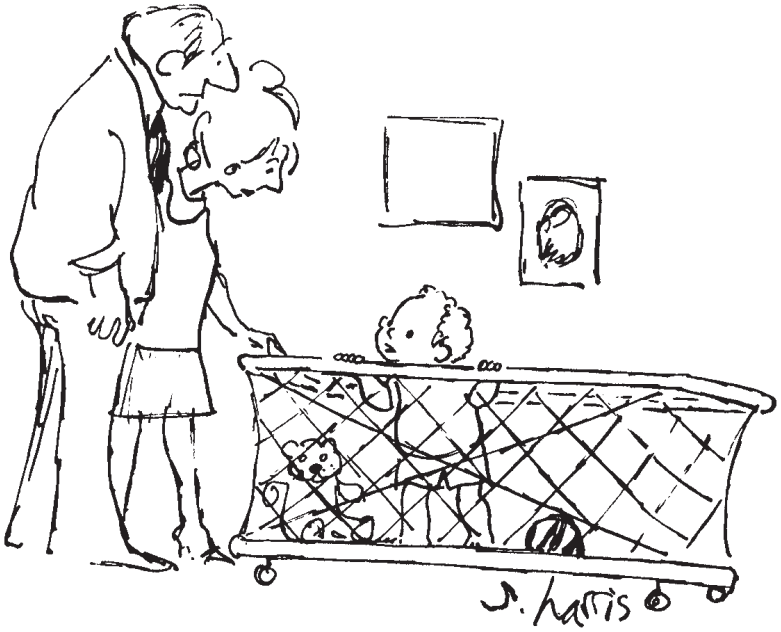
Analogy, imitation, and reinforcement cannot account for language development because they are based on the (implicit or explicit) assumption that what the child acquires is a set of sentences or forms rather than a set of grammatical rules. Theories that assume that acquisition depends on a specially structured input also place too much emphasis on the environment rather than on the grammar-making abilities of the child. These proposals do not explain the creativity that children show in acquiring language, why they go through stages, or why they make some kinds of "errors" but not others, for example, "Give me other one spoon" but not "Is the boy who sleeping is dreaming about a new car?"

Children Construct Grammars

> We are designed to walk. . . . That we are taught to walk is impossible. And pretty much the same is true of language. Nobody is taught language. In fact you can't prevent the child from learning it.
>
> **NOAM CHOMSKY,** *The Human Language Series* program 2, 1994

Language acquisition is a creative process. Children are not given explicit information about the rules, by either instruction or correction. They extract the rules of the grammar from the language they hear around them, and their linguistic environment does not need to be special in any way for them to do this. Observations of children acquiring different languages under different cultural and social circumstances reveal that the developmental stages are similar, possibly universal. Even deaf children of deaf signing parents go through stages in their signing development that parallel those of children acquiring spoken languages. These factors lead many linguists to believe that children are equipped with an innate template or blueprint for language—which we have referred to as Universal Grammar (UG)—and that this blueprint aids the child in the task of constructing a grammar for her language. This is referred to as the **innateness hypothesis.**

The Innateness Hypothesis



"WHAT'S THE BIG SURPRISE? ALL THE LATEST THEORIES OF LINGUISTICS SAY WE'RE BORN WITH THE INNATE CAPACITY FOR GENERATING SENTENCES."

The innateness hypothesis receives its strongest support from the observation that the grammar a person ends up with is vastly underdetermined by his linguistic experience. In other words, we end up knowing far more about language than is exemplified in the language we hear around us. This argument for the innateness of UG is called the **poverty of the stimulus**.

Although children hear many utterances, the language they hear is incomplete, noisy, and unstructured. We said earlier that child-directed speech is largely well formed, but children are also exposed to adult–adult interactions. These utterances include slips of the tongue, false starts, ungrammatical and incomplete sentences, and no consistent information as to which utterances are well formed and which are not. But most important is the fact that children come to know aspects of the grammar about which they receive *no* information. In this sense, the data they are exposed to is **impoverished**. It is less than what is necessary to account for the richness and complexity of the grammar they attain.

For example, we noted that the rules children construct are **structure dependent**. Children do not produce questions by moving the first auxiliary as in (1) below. Instead, they correctly invert the auxiliary of the main clause, as in (2). (We use ___ to mark the position from which a constituent moves.)

1. *Is the boy who ___ sleeping is dreaming of a new car?
2. Is the boy who is sleeping ___ dreaming of a new car?

To come up with a rule that moves the auxiliary of the main clause rather than the first auxiliary, the child must know something about the structure of the sentence. Children are not told about structure dependency. They are not told about constituent structure. Indeed, adults who have not studied linguistics do not explicitly know about structure dependency, constituent structure, and other abstract properties of grammar and so could not instruct their children even if they were so inclined. This knowledge is tacit or implicit. The input children get is a sequence of sounds, not a set of phrase structure trees. No amount of imitation, reinforcement, analogy, or structured input will lead the child to formulate a phrase structure tree, much less a principle of structure dependency. Yet, children do create phrase structures, and the rules they acquire are sensitive to this structure.

The child must also learn many aspects of grammar from her specific linguistic environment. English-speaking children learn that the subject comes first and that the verb precedes the object inside the VP, that is, that English is an SVO language. Japanese children acquire an SOV language. They learn that the object precedes the verb.

English-speaking children must learn that yes-no questions are formed by moving the auxiliary to the beginning of the sentence, as follows:

You will come home. → Will you ___ come home?

Japanese children learn that to form a yes-no question, the morpheme *-ka* is suffixed to a verb stem.

Tanaka ga sushi o tabete iru	"Tanaka is eating sushi."
Tanaka ga sushi o tabete iru**ka**	"Is Tanaka eating sushi?"

In Japanese questions, sentence constituents are not rearranged.

According to the innateness hypothesis, the child extracts from the linguistic environment those rules of grammar that are language specific, such as word order and movement rules. But he does not need to learn universal principles like structure dependency, or general principles of sentence formation such as the fact that heads of categories can take complements. All these principles are part of the innate blueprint for language that children use to construct the grammar of their language.

The innateness hypothesis provides an answer to *the logical problem of language acquisition* posed by Chomsky: What accounts for the ease, rapidity, and uniformity of language acquisition in the face of impoverished data? The answer is that children acquire a complex grammar quickly and easily without any particular help beyond exposure to the language because they do not start from scratch. UG provides them with a significant head start. It helps them to extract the rules of their language and to avoid many grammatical errors. Because the child constructs his grammar according to an innate blueprint, all children proceed through similar developmental stages, as we will discuss in the next section.

The innateness hypothesis also predicts that all languages will conform to the principles of UG. We are still far from understanding the full nature of the principles of UG. Research on more languages provides a way to test any principles that linguists propose. If we investigate a language in which a posited UG principle is absent, we will have to correct our theory and substitute other principles, as scientists must do in any field. But there is little doubt that human languages conform to abstract universal principles and that the human brain is specially equipped for acquisition of human language grammars.

Stages in Language Acquisition

> . . . for I was no longer a speechless infant; but a speaking boy. This I remember; and have since observed how I learned to speak. It was not that my elders taught me words . . . in any set method; but I . . . did myself . . . practice the sounds in my memory. . . . And thus by constantly hearing words, as they occurred in various sentences . . . I thereby gave utterance to my will.
>
> **ST. AUGUSTINE,** *Confessions*, 398 C.E.

Children do not wake up one fine morning with a fully formed grammar in their heads. Relative to the complexity of the adult grammar that they eventually attain, the process of language acquisition is fast, but it is not instantaneous. From first words to virtual adult competence takes three to five years, during which time children pass through linguistic stages. They begin by babbling, they then acquire their first words, and in just a few months they begin to put words together into sentences.

Observations of children acquiring different languages reveal that the stages are similar, possibly universal. The earliest studies of child language acquisition come from diaries kept by parents. More recent studies include the use of tape recordings, videotapes, and controlled experiments. Linguists record the

spontaneous utterances of children and purposefully elicit other utterances to study the child's production and comprehension. Researchers have also invented ingenious techniques for investigating the linguistic abilities of infants, who are not yet speaking.

Children's early utterances may not look exactly like adult sentences, but child language is not just a degenerate form of adult language. The words and sentences that the child produces at each stage of development conform to the set of grammatical rules he has developed to that point. Although child grammars and adult grammars differ in certain respects, they also share many formal properties. Like adults, children have grammatical categories such as NP and VP, rules for building phrase structures and for moving constituents, as well as phonological, morphological, and semantic rules, and they adhere to universal principles such as structure dependency.

From the perspective of the adult grammar, sentences such as *Nobody don't like me* and *Want other one spoon, Daddy* contain grammatical errors, but such "errors" often reflect the child's current stage of grammatical competence and therefore provide researchers with a window into their grammar.

The Perception and Production of Speech Sounds

An infant crying in the night:
An infant crying for the light:
And with no language but a cry.

ALFRED LORD TENNYSON, *In Memoriam A.H.H.*, 1849

The notion that a person is born with a mind like a blank slate is belied by a wealth of evidence that newborns are reactive to some subtle distinctions in their environment and not to others. That is, the mind appears to be attuned at birth to receive certain kinds of information. Infants will respond to visual depth and distance distinctions, to differences between rigid and flexible physical properties of objects, and to human faces rather than to other visual stimuli.

Infants also show a very early response to different properties of language. Experiments demonstrate that infants will increase their sucking rate—measured by ingeniously designed pacifiers—when stimuli (visual or auditory) presented to them are varied, but will decrease the sucking rate when the same stimuli are presented repeatedly. Early in acquisition when tested with a preferential listening technique, they will also turn their heads toward and listen longer to sounds, stress patterns, and words that are familiar to them. These instinctive responses can be used to measure a baby's ability to discriminate and recognize different linguistic stimuli.

A newborn will respond to phonetic contrasts found in human languages even when these differences are not phonemic in the language spoken in the baby's home. A baby hearing a human voice over a loudspeaker saying [pa] [pa] [pa] will slowly decrease her rate of sucking. If the sound changes to [ba] or even [p^ha], the sucking rate increases dramatically. Controlled experiments show that adults find it difficult to differentiate between the allophones of one phoneme, but for infants it comes naturally. Japanese infants can distinguish between [r] and [l] whereas their parents cannot; babies can hear the difference between

aspirated and unaspirated stops even if students in an introductory linguistics course cannot. Babies can discriminate between sounds that are phonemic in other languages and nonexistent in the language of their parents. For example, in Hindi, there is a phonemic contrast between a retroflex "t" [ʈ] (made with the tongue curled back) and the alveolar [t]. To English-speaking adults, these may sound the same; to their infants, they do not.

Infants can perceive voicing contrasts such as [pa] versus [ba], contrasts in place of articulation such as [da] versus [ga], and contrasts in manner of articulation such as [ra] versus [la], or [ra] versus [wa], among many others. Babies will not react, however, to distinctions that never correspond to phonemic contrasts in any human language, such as sounds spoken more or less loudly or sounds that lie between two phonemes. Furthermore, a vowel that we perceive as [i], for example, is a different physical sound when produced by a male, female, or child, but babies ignore the nonlinguistic aspects of the speech signal just as adults do.

Infants appear to be born with the ability to perceive just those sounds that are phonemic in some language. It is therefore possible for children to learn any human language they are exposed to. During the first year of life, the infant's job is to uncover the sounds of the ambient language. From around six months, he begins to lose the ability to discriminate between sounds that are not phonemic in his own language. His linguistic environment molds the infant's initial perceptions. Japanese infants can no longer hear the difference between [r] and [l], which do not contrast in Japanese, whereas babies in English-speaking homes retain this perception. They have begun to learn the sounds of the language of their parents. Before that, they appear to know the sounds of human language in general.

Babbling

"Hi & Lois" © King Features Syndicate

The shaping by the linguistic environment that we see in perception also occurs in the speech the infant is producing. At around six months, the infant begins to babble. The sounds produced in this period include many sounds that do not occur in the language of the household. However, **babbling** is not linguistic chaos. The twelve most frequent consonants in the world's languages make up

95 percent of the consonants infants use in their babbling. There are linguistic constraints even during this very early stage. The early babbles consist mainly of repeated consonant-vowel sequences, like *mama*, *gaga*, and *dada*. Later babbles are more varied.

By the end of the first year the child's babbles come to include only those sounds and sound combinations that occur in the target language. Babbles begin to sound like words, although they may not have any specific meaning attached to them. At this point adults can distinguish the babbles of an English-babbling infant from those of an infant babbling in Cantonese or Arabic. During the first year of life, the infant's perceptions and productions are being fine-tuned to the surrounding language(s).

Deaf infants produce babbling sounds that are different from those of hearing children. Babbling is related to auditory input and is linguistic in nature. Studies of vocal babbling of hearing children and manual babbling of deaf children support the view that babbling is a linguistic ability related to the kind of language input the child receives. These studies show that four- to seven-month-old hearing infants exposed to spoken language produce a restricted set of phonetic forms. At the same age, deaf children exposed to sign language produce a restricted set of signs. In each case the forms are drawn from the set of possible sounds or possible gestures found in spoken and signed languages.

Babbling illustrates the readiness of the human mind to respond to linguistic input from a very early stage. During the babbling stage, the intonation contours produced by hearing infants begin to resemble the intonation contours of sentences spoken by adults. The different intonation contours are among the first linguistic contrasts that children perceive and produce. During this same period, the vocalizations produced by deaf babies are random and nonrepetitive. Similarly, the manual gestures produced by hearing babies differ greatly from those produced by deaf infants exposed to sign language. The hearing babies move their fingers and clench their fists randomly with little or no repetition of gestures. The deaf infants, however, use more than a dozen different hand motions repetitively, all of which are elements of American Sign Language or the sign languages used in deaf communities of other countries.

The generally accepted view is that humans are born with a predisposition to discover the units that serve to express linguistic meanings, and that at a genetically specified stage in neural development, the infant will begin to produce these units—sounds or gestures—depending on the language input the baby receives. This suggests that babbling is the earliest stage in language acquisition, in opposition to an earlier view that babbling was prelinguistic and merely neuromuscular in origin. The "babbling as language acquisition" hypothesis is supported by recent neurological studies that link babbling to the language centers of the left hemisphere, also providing further evidence that the brain specializes for language functions at a very early age, as discussed in the introduction.

First Words

> From this golden egg a man, Prajapati, was born. . . . A year having passed, he wanted to speak. He said "bhur" and the earth was created. He said "bhuvar" and the space of the air was created. He said "suvar" and the sky was created. That is why a child wants to speak

after a year. . . . When Prajapati spoke for the first time, he uttered one or two syllables. That is why a child utters one or two syllables when he speaks for the first time.

HINDU MYTH

Some time after the age of one, the child begins to repeatedly use the same string of sounds to mean the same thing. At this stage children realize that sounds are related to meanings. They have produced their first true words. The age of the child when this occurs varies and has nothing to do with the child's intelligence. (It is reported that Einstein did not start to speak until he was three or four years old.)

The child's first utterances differ from adult language. The following words of one child, J. P., at the age of sixteen months, illustrate the point:

[ʔaʊ]	"not," "no," "don't"	[sː]	"aerosol spray"
[bʌʔ]/[mʌʔ]	"up"	[sʲuː]	"shoe"
[da]	"dog"	[haɪ]	"hi"
[iʔo]/[siʔo]	"Cheerios"	[sr]	"shirt," "sweater"
[sa]	"sock"	[sæː]/[əsæː]	"what's that?"/"hey, look!"
[aɪ]/[ʌɪ]	"light"	[ma]	"mommy"
[baʊ]/[daʊ]	"down"	[dæ]	"daddy"

Most children go through a stage in which their utterances consist of only one word. This is called the **holophrastic** or "whole phrase" stage because these one-word utterances seem to convey a more complex message. For example, when J. P. says "down" he may be making a request to be put down, or he may be commenting on a toy that has fallen down from the shelf. When he says "cheerios" he may simply be naming the box of cereal in front of him, or he may be asking for some Cheerios. This suggests that children have a more complex mental representation than their language allows them to express. Comprehension experiments confirm the hypothesis that children's productive abilities do not fully reflect their underlying grammatical competence.

It has been claimed that deaf babies develop their first signs earlier than hearing children speak their first words. This has led to the development of Baby Sign, a technique in which hearing parents learn and model for their babies various "signs," such as a sign for "milk," "hurt," and "mother." The idea is that the baby can communicate his needs manually even before he is able to articulate spoken words. Promoters of Baby Sign (and many parents) say that this leads to less frustration and less crying. The claim that signs appear earlier than words is controversial. Some linguists argue that what occurs earlier in both deaf and hearing babies are pre-linguistic gestures that lack the systematic meaning of true signs. Baby Sign may perhaps be exploiting this earlier manual dexterity, and not a precocious linguistic development. More research is needed.

Segmenting the Speech Stream

I scream, you scream, we all scream for ice cream.

TRANSCRIBED FROM VOCALS BY TOM STACKS, performing with Harry Reser's Six Jumping Jacks, January 14, 1928

The acquisition of first words is an amazing feat. How do infants discover where one word begins and another leaves off? Speech is a continuous stream broken only by breath pauses. Children are in the same fix that you might be in if you tuned in a foreign-language radio station. You wouldn't have the foggiest idea of what was being said or what the words were. Intonation breaks that do exist do not necessarily correspond to word, phrase, or sentence boundaries. The adult speaker with knowledge of the lexicon and grammar of a language imposes structure on the speech he hears, but a person without such knowledge cannot. How then do babies, who have not yet learned the lexicon or rules of grammar, extract the words from the speech they hear around them? The ability to segment the continuous speech stream into discrete units—words—is one of the remarkable feats of language acquisition.

Studies show that infants are remarkably good at extracting information from continuous speech. They seem to know what kind of cues to look for in the input that will help them to isolate words. One of the cues that English-speaking children attend to that helps them figure out word boundaries is stress.

As noted in chapter 5, every content word in English has a stressed syllable. (Function words such as *the*, *a*, *am*, *can*, etc. are ordinarily unstressed.) If the content word is monosyllabic, then that syllable is stressed as in *dóg* or *hám*. Bisyllabic content words can be **trochaic**, which means that stress is on the first syllable, as in *páper* or *dóctor*, or **iambic**, which means stress is on the second syllable, as in *giráffe* or *devíce*. The vast majority of English words have trochaic stress. In controlled experiments adult speakers are quicker to recognize words with trochaic stress than words with iambic stress. This can be explained if English-speaking adults follow a strategy of taking a stressed syllable to mark the onset of a new word.

But what about children? Could they avail themselves of the same strategy? Stress is very salient to infants, and they are quick to acquire the rhythmic structure of their language. Using the preferential listening technique mentioned earlier, researchers have shown that at just a few months old infants are able to discriminate native and non-native stress patterns. Before the end of the first year their babbling takes on the rhythmic pattern of the ambient language. At about nine months old, English-speaking children prefer to listen to bisyllabic words with initial rather than final stress. And most notably, studies show that infants acquiring English can indeed use stress cues to segment words in fluent speech. In a series of experiments, infants who were seven and a half months old listened to passages with repeated instances of a trochaic word such as *púppy*, and passages with iambic words such as *guitár*. They were then played lists of words, some of which had occurred in the previous passage and others that had not. Experimenters measured the length of time that they listened to the familiar versus unfamiliar words. The results showed that children listened significantly longer (indicated by turning their head in the direction of the loudspeaker) to words that they had heard in the passage, but only when the words had the trochaic pattern (*púppy*). For words with the iambic pattern (*guitár*), the children responded only to the stressed syllable (tár), though the monosyllabic word *tar* had not appeared in the passage. These results suggest that the infants—like adults—are taking the stressed syllable to mark the onset of a new word. Following such a strategy will sometimes lead to errors (for iambic words

and unstressed function words), but it provides the child with a way of getting started. This is sometimes referred to as **prosodic bootstrapping**. Infants can use the stress pattern of the language as a start to word learning.

Infants are also sensitive to phonotactic constraints and to the distribution of allophones in the target language. For example, we noted in chapter 5 that in English aspiration typically occurs at the beginning of a stressed syllable—[pʰɪt] versus [spɪt]—and that certain combinations of sounds are more likely to occur at the end of a word rather than at the beginning, for example [rt]. Studies show that nine-month-olds can use this information to help segment speech into words in English.

Languages differ in their stress patterns as well as in their allophonic variation and phonotactics. Wouldn't the infant then need some way to first figure out what stress pattern he is dealing with, or what the allophones and possible sound combinations are, before he could use this information to extract the words of his language from fluent speech? This seems to be a classic chicken and egg problem—he has to know the language to learn the language. A way out of this conundrum is provided by the finding that infants may also rely on statistical properties of the input to segment words, such as the frequency with which particular sequences of sounds occur.

In one study, eight-month-old infants listened to two minutes of speech formed from four nonsense words, *pabiku*, *tutibu*, *golabu*, *babupu*. The words were produced by a speech synthesizer and strung together in three different orders, analogous to three different sentences, without any pauses or other phonetic cues to the word boundaries. Here is an example of what the children heard:

golabupabikututibubabupugolabubabupututibu. . . . .

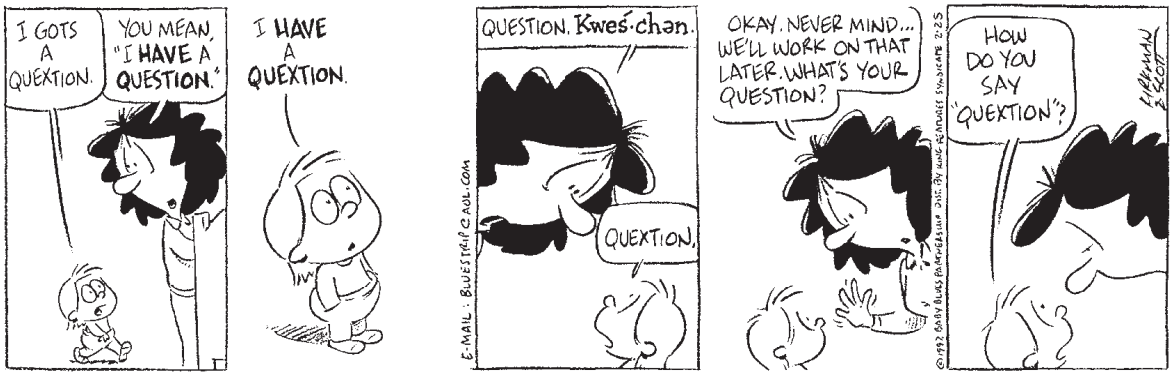
After listening to the strings the infants were tested to see if they could distinguish the "words" of the language, for example *pabiku* (which, recall, they had never heard in isolation before), from sequences of syllables that spanned word boundaries, such as *bubabu* (also in the input). Despite the very brief exposure and the lack of boundary cues, the infants were able to distinguish the words from the nonwords. The authors of the study conclude that the children do this by tracking the frequency with which the different sequences of syllables occur: the sequences inside the words (e.g., pa-bi-ku) remain the same whatever order the words are presented in, but the sequences of syllables that cross word boundaries will change in the different presentations and hence these sequences will occur much less frequently. Though it is still unclear how much such statistical procedures can accomplish with real language input, which is vastly larger and more varied, this experiment and others like it suggest that babies are sensitive to statistical information as well as to linguistic structure to extract words from the input. It is possible that they first rely on statistical properties to isolate some words, and then, based on these words, they are able to detect the rhythmic, allophonic, and phonotactic properties of the language, and with this further knowledge they can do further segmentation. Studies that measure infants' reliance on statistics versus stress for segmenting words support this two stage model: younger infants (seven-and-a-half months old) respond to frequency

while older infants (nine months old) attend to stress, allophonic, and phonotactic information.

The Development of Grammar

Children are biologically equipped to acquire all aspects of grammar. In this section we will look at development in each of the components of language, and we will illustrate the role that Universal Grammar and other factors play in this development.

The Acquisition of Phonology



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In terms of his phonology, J. P. is like most children at the one-word stage. The first words are generally monosyllabic with a CV (consonant-vowel) form. The vowel part may be a diphthong, depending on the language being acquired. The phonemic inventory is much smaller than is found in the adult language. It appears that children first acquire the small set of sounds common to all languages regardless of the ambient language(s), and in later stages acquire the less common sounds of their own language. For example, most languages have the sounds [p] and [s], but [θ] is a rare sound. J. P.'s sound system followed this pattern. His phonological inventory at an early stage included the consonants [b,m,d,k], which are frequently occurring sounds in the world's languages.

In general, the order of acquisition of classes of sounds begins with vowels and then goes by *manner* of articulation for consonants: nasals are acquired first, then glides, stops, liquids, fricatives, and affricates. Natural classes characterized by *place* of articulation features also appear in children's utterances according to a more or less ordered series: labials, velars, alveolars, and palatals. It is not surprising that *mama* is an early word for many children.

The distribution and frequency of sounds in a language can also influence the acquisition of certain segments. Sounds that are expected to be acquired late may appear earlier in children's language when they are frequently occurring. For example, the fricative [v] is a very late acquisition in English but it is an early phoneme in Estonian, Bulgarian, and Swedish, languages that have several [v]-initial words that are common in the vocabularies of young children.

If the first year is devoted to figuring out the sounds of the target language, the second year involves learning how these sounds are used in the phonology of

the language, especially which contrasts are phonemic. When children first begin to contrast one pair of a set (e.g., when they learn that /p/ and /b/ are distinct phonemes due to a voicing difference), they also begin to distinguish between other similar pairs (e.g., /t/ and /d/, /s/ and /z/, and all the other voiceless–voiced phonemic pairs). As we would expect, the generalizations refer to natural classes of speech sounds.

Controlled experiments show that children at this stage can perceive or comprehend many more phonological contrasts than they can produce. The same child who says [wæbɪt] instead of "rabbit," and who does not seem to distinguish [w] and [r], will not make mistakes on a picture identification task in which she must point to either a ring or a wing. In addition, children sometimes produce two different sounds in a way that makes them indiscernible to adult observers. Acoustic analyses of children's utterances show that although a child's pronunciation of *wing* and *ring* may seem the same to the adult ear, they are physically different sounds. As a further example, a spectrographic analysis of *ephant*, "elephant," produced by a three-year-old child, clearly showed an [l] in the representation of the word, even though the adult experimenter could not hear it.

Many anecdotal reports also show the disparity between the child's production and perception at this stage. An example is the exchange between the linguist Neil Smith and his two-year-old son Amahl. At this age Amahl's pronunciation of "mouth" is [maʊs].

NS: What does [maʊs] mean?
A: Like a cat.
NS: Yes, what else?
A: Nothing else.
NS: It's part of your head.
A: (*fascinated*)
NS: (*touching A's mouth*) What's this?
A: [*maʊs*]

According to Smith, it took Amahl a few seconds to realize his word for "mouse" and his word for "mouth" were the same. It is not that Amahl and other children do not hear the correct adult pronunciation. They do, but they are unable in these early years to produce it themselves. Another linguist's child (yes, linguists love to experiment on their own children) pronounced the word *light* as *yight* [jaɪt] but would become very angry if someone said to him, "Oh, you want me to turn on the yight." "No no," he would reply, "not yight—yight!"

Therefore, even at this stage, it is not possible to determine the extent of the grammar of the child—in this case, the phonology—simply by observing speech production. It is sometimes necessary to use various experimental and instrumental techniques to tap the child's competence.

A child's first words show many substitutions of one feature for another or one phoneme for another. In the preceding examples, *mouth* [maʊθ] is pronounced *mouse* [maʊs], with the alveolar fricative [s] replacing the less common interdental fricative [θ]; *light* [laɪt] is pronounced *yight* [jaɪt], with the glide [j] replacing the liquid [l]; and *rabbit* is pronounced *wabbit*, with the glide [w] replacing the liquid [r]. Glides are acquired earlier than liquids, and hence substitute for them.

These substitutions are simplifications of the adult pronunciation. They make articulation easier until the child achieves greater articulatory control.

Children's early pronunciations are not haphazard, however. The phonological substitutions are rule governed. The following is an abridged lexicon for another child, Michael, between the ages of eighteen and twenty-one months:

[pun]	"spoon"	[maɪtl]	"Michael"
[peɪn]	"plane"	[daɪtər]	"diaper"
[tɪs]	"kiss"	[pati]	"Papi"
[taʊ]	"cow"	[mani]	"Mommy"
[tin]	"clean"	[bərt]	"Bert"
[polər]	"stroller"	[bərt]	"(Big) Bird"

Michael systematically substituted the alveolar stop [t] for the velar stop [k] as in his words for "cow," "clean," "kiss," and his own name. He also replaced labial [p] with [t] when it occurred in the middle of a word, as in his words for "Papi" and "diaper." He reduced consonant clusters in "spoon," "plane," and "stroller," and he devoiced final stops as in "Big Bird." In devoicing the final [d] in "bird," he created an ambiguous form [bərt] referring both to Bert and Big Bird. No wonder only parents understand their children's first words!

Michael's substitutions are typical of the phonological rules that operate in the very early stages of acquisition. Other common rules are reduplication—"bottle" becomes [baba], "water" becomes [wawa]; and the dropping of a final consonants—"bed" becomes [be], "cake" becomes [ke]. These two rules show that the child prefers a simple CV syllable.

Of the many phonological rules that children create, no child will necessarily use all rules. Early phonological rules generally reflect natural phonological processes that also occur in adult languages. For example, various adult languages have a rule of syllable-final consonant devoicing (German does—/bʊnd/ is pronounced [bʊnt]—English doesn't). Children do not create bizarre or whimsical rules. Their rules conform to the possibilities made available by Universal Grammar.

The Acquisition of Word Meaning

> Suddenly I felt a misty consciousness as of something forgotten—a thrill of returning thought; and somehow the mystery of language was revealed to me. . . . Everything had a name, and each name gave birth to a new thought.
>
> **HELEN KELLER,** *The Story of My Life*, 1903

In addition to what it tells us about phonological regularities, the child's early vocabulary also provides insight into how children use words and construct word meaning. For J. P. the word *up* was originally used only to mean "Get me up!" when he was either on the floor or in his high chair, but later he used it to mean "Get up!" to his mother as well. J. P. used his word for *sock* not only for socks but also for other undergarments that are put on over the feet, such

as undershorts. This illustrates how a child may extend the meaning of a word from a particular referent to encompass a larger class.

When J. P. began to use words, the object had to be physically present, but that requirement did not last very long. He first used "dog" only when pointing to a real dog, but later he used the word for pictures of dogs in various books. A new word that entered J. P.'s vocabulary at seventeen months was "uh-oh," which he would say after he had an accident like spilling juice, or when he deliberately poured his yogurt over the side of his high chair. His use of this word shows his developing use of language for social purposes. At this time he added two new words meaning "no," [do:] and [no], which he used when anyone attempted to take something from him that he wanted, or tried to make him do something he did not want to do. He used them either with the imperative meaning of "Don't do that!" or with the assertive meaning of "I don't want to do that." Even at this early stage, J. P. was using words to convey a variety of ideas and feelings, as well as his social awareness.

But how do children learn the meanings of words? Most people do not see this aspect of acquisition as posing a great problem. The intuitive view is that children look at an object, the mother says a word, and the child connects the sounds with the object. However, this is not as easy as it seems:

> A child who observes a cat sitting on a mat also observes . . . a mat supporting a cat, a mat under a cat, a floor supporting a mat and a cat, and so on. If the adult now says "The cat is on the mat" even while pointing to the cat on the mat, how is the child to choose among these interpretations of the situation?

Even if the mother simply says "cat," and the child accidentally associates the word with the animal on the mat, the child may interpret cat as "Cat," the name of a particular animal, or of an entire species. In other words, to learn a word for a class of objects such as "cat" or "dog," children have to figure out exactly what the word refers to. Upon hearing the word *dog* in the presence of a dog, how does the child know that "dog" can refer to any four-legged, hairy, barking creature? Should it include poodles, tiny Yorkshire terriers, bulldogs, and Great Danes, all of which look rather different from one another? What about cows, lambs, and other four-legged mammals? Why are they not "dogs"? The important and very difficult question is: What relevant features define the class of objects we call *dog*, and how does a child acquire knowledge of them? Even if a child succeeds in associating a word with an object, nobody provides explicit information about how to extend the use of that word to all the other objects to which that word refers.

It is not surprising, therefore, that children often **overextend** a word's meaning, as J. P. did with the word *sock*. A child may learn a word such as *papa* or *daddy*, which she first uses only for her own father, and then extend its meaning to apply to all men, just as she may use the word *dog* to mean any four-legged creature. After the child has acquired her first seventy-five to one hundred words, the overextended meanings start to narrow until they correspond to those of the other speakers of the language. How this occurs is still not entirely understood.

On the other hand, early language learning may involve **underextension**, in which a lexical item is used in an overly restrictive way. It is common for children

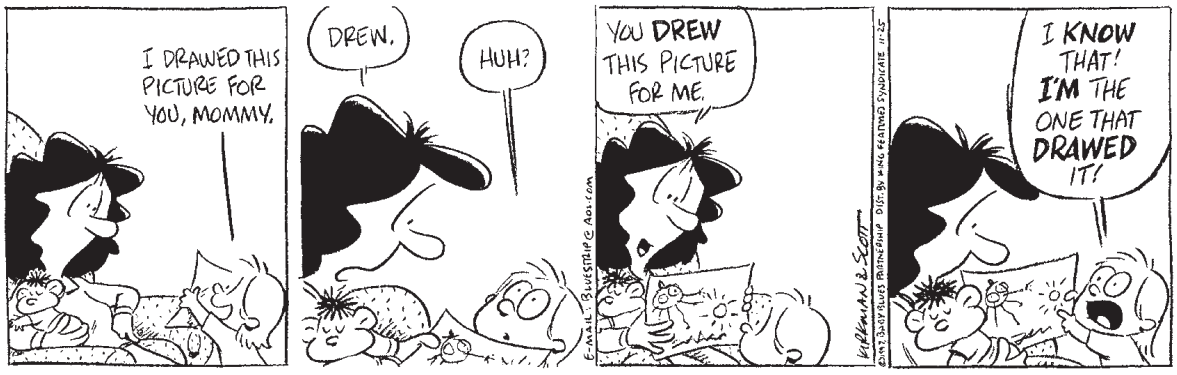
to first apply a word like *bird* only to the family's pet canary without making a connection to birds in the tree outside, as if the word were a proper noun. And just as overextended meanings narrow in on the adult language, underextended meanings broaden their scope until they match the target language.

The mystery surrounding the acquisition of word meanings has intrigued philosophers and psychologists as well as linguists. We know that all children view the world in a similar fashion and apply the same general principles to help them determine a word's meaning. For example, overextensions are usually based on physical attributes such as size, shape, and texture. *Ball* may refer to all round things, *bunny* to all furry things, and so on. However, children will not make overextensions based on color. In experiments, children will group objects by shape and give them a name, but they will not assign a name to a group of red objects.

If an experimenter points to an object and uses a nonsense word like *blick*, saying *that's a blick*, the child will interpret the word to refer to the whole object, not one of its parts or attributes. Given the poverty of stimulus for word learning, principles like the "form over color principle" and the "whole object principle" help the child organize his experience in ways that facilitate word learning. Without such principles, it is doubtful that children could learn words as quickly as they do. Children learn approximately fourteen words a day for the first six years of their lives. That averages to about 5,000 words per year. How many students know 10,000 words of a foreign language after two years of study?

There is also experimental evidence that children can learn the meaning of one class of words—verbs—based on the syntactic environment in which they occur. If you were to hear a sentence such as *John blipped Mary the gloon*, you would not know exactly what John did, but you would likely understand that the sentence is describing a transfer of something from John to Mary. Similarly, if you heard *John gonked that Mary. . . .*, you would conclude that the verb *gonk* was a verb of communication like *say* or a mental verb like *think*. The complement types that a verb selects can provide clues to its meaning and thereby help the child. This learning of word meaning based on syntax is referred to as **syntactic bootstrapping**.

The Acquisition of Morphology



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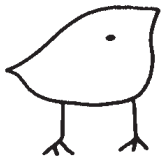
The child's acquisition of morphology provides the clearest evidence of rule learning. Children's errors in morphology reveal that the child acquires the regular rules of the grammar and then overgeneralizes them. This **overgeneralization** occurs when children treat irregular verbs and nouns as if they were regular. We have probably all heard children say *bringed*, *goed*, *drawed*, and *runned*, or *foots*, *mouses*, *and sheeps*.

These mistakes tell us much about how children learn language because such forms could not arise through imitation; children use them in families in which the parents never speak "bad English." In fact, children generally go through three phases in the acquisition of an irregular form:

Phase 1	Phase 2	Phase 3
broke	breaked	broke
brought	bringed	brought

In phase 1 the child uses the correct term such as *brought* or *broke*. At this point the child's grammar does not relate the form *brought* to *bring*, or *broke* to *break*. The words are treated as separate lexical entries. Phase 2 is crucial. This is when the child constructs a rule for forming the past tense and attaches the regular past-tense morpheme to all verbs—*play*, *hug*, *help*, as well as *break* and *bring*. Children look for general patterns. What they do not know at phase 2 is that there are exceptions to the rule. Now their language is more regular than the adult language. During phase 3 the child learns that there are exceptions to the rule, and then once again uses *brought* and *broke*, with the difference being that these irregular forms will be related to the root forms.

The child's morphological rules emerge quite early. In a classic study, preschool children and children in the first, second, and third grades were shown a drawing of a nonsense animal like the funny creature shown in the following picture. Each "animal" was given a nonsense name. The experimenter would then say to the child, pointing to the picture, "This is a wug."



Then the experimenter would show the child a picture of two of the animals and say, "Now here is another one. There are two of them. There are two ___."

The child's task was to give the plural form, "wugs" [wʌgz]. Another little make-believe animal was called a "bik," and when the child was shown two biks, he or she again was to say the plural form [bɪks]. The children applied regular plural formation to words they had never heard, showing that they had acquired the plural rule. Their ability to add [z] when the animal's name ended with a voiced sound, and [s] when there was a final voiceless consonant, showed that the children were also using rules based on an understanding of natural classes of phonological segments, and not simply imitating words they had previously heard.

More recently, studies of children acquiring languages with richer inflectional morphologies than English reveal that they learn agreement at a very early age. For example, Italian verbs must be inflected for number and person to agree with the subject. This is similar to the English agreement rule "add *s* to the verb" for third-person, singular subjects—*He giggles a lot* but *We giggle a lot*—except that in Italian more verb forms must be acquired. Italian-speaking children between the ages of 1;10 (one year, ten months) and 2;4 correctly inflect the verb, as the following utterances of Italian children show:

Tu legg**i** il libro.	"You (second person singular) read the book."
Io vad**o** fuori.	"I go (first person singular) outside."
Dorm**e** miao dorme.	"Sleeps (third person singular) cat sleeps."
Legg**iamo** il libro.	"(We) read (first person plural) the book."

Children acquiring other richly inflected languages such as Spanish, German, Catalan, and Swahili quickly acquire agreement morphology. It is rare for them to make agreement errors, just as it is rare for an English-speaking child to say "I goes."

In these languages there is also gender and number agreement between the head noun and the article and adjectives inside the noun phrase. Children as young as two years old respect these agreement requirements when producing NPs, as shown by the following Italian examples:

E mi**a** gonn**a**.	"(It) is my (feminine singular) skirt."
Quest**o** mi**o** bimb**o**.	"This my (masculine singular) baby."
Guarda **la** mel**a** piccolin**a**.	"Look at the little (feminine singular) apple."
Guarda **il** top**o** piccolin**o**.	"Look at the little (masculine singular) mouse."

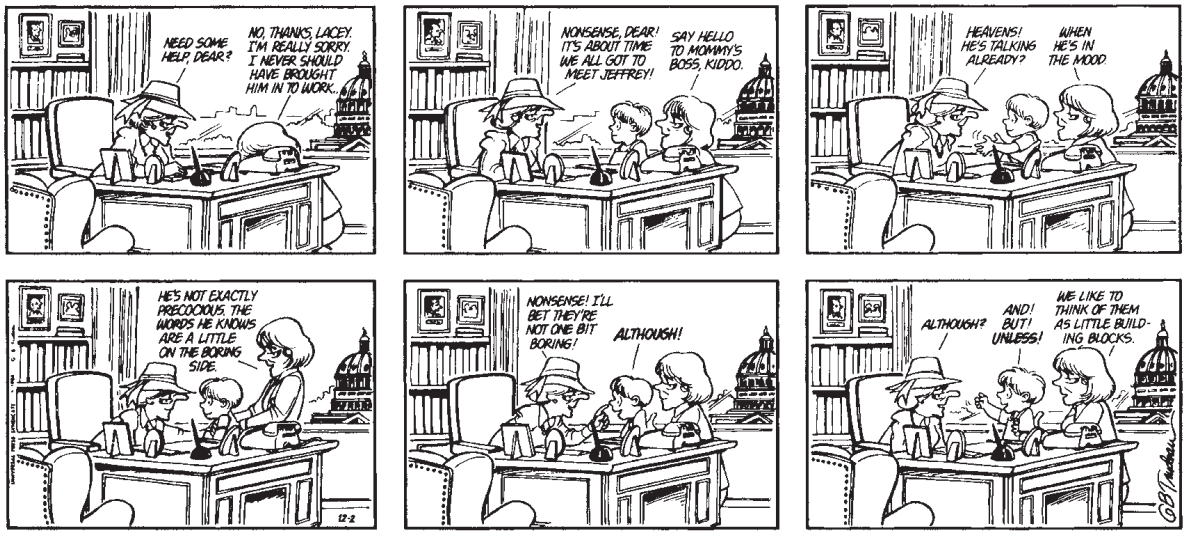
Experimental studies with twenty-five-month-old French-speaking children also show that they use gender information on determiners to help identify the subsequent noun, for example, *le ballon* (the-masc. balloon) versus *la banane* (the-fem. banana).

Children also show knowledge of the derivational rules of their language and use these rules to create novel words. In English, for example, we can derive verbs from nouns. From the noun *microwave* we now have a verb *to microwave*; from the noun *e(lectronic) mail* we derived the verb *to e-mail*. Children acquire this derivational rule early and use it often because there are lots of gaps in their verb vocabulary.

Child Utterance	Adult Translation
You have to scale it.	"You have to weigh it."
I broomed it up.	"I swept it up."
He's keying the door.	"He's opening the door (with a key)."

These novel forms provide further evidence that language acquisition is a creative process and that children's utterances reflect their internal grammars, which include both derivational and inflectional rules.

The Acquisition of Syntax



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When children are still in the holophrastic stage, adults listening to the one-word utterances often feel that the child is trying to convey a more complex message. Experimental techniques show that at that stage (and even earlier), children have knowledge of some syntactic rules. In these experiments the infant sits on his mother's lap and hears a sentence over a speaker while seeing two video displays depicting different actions, one of which corresponds to the sentence. Infants tend to look longer at the video that matches the sentence they hear. This methodology allows researchers to tap the linguistic knowledge of children who are using only single words or who are not talking at all. Results show that children as young as seventeen months can understand the difference between sentences such as "Ernie is tickling Bert" and "Bert is tickling Ernie." Because these sentences have all the same words, the child cannot be relying on the words alone to understand the meanings. He must also understand the word-order rules and how they determine the grammatical relations of subject and object. This same preferential looking technique has shown that eighteen-month-olds can distinguish between subject and object *wh* questions, such as *What is the apple hitting?* and *What hit the apple?* These results and many others strongly suggest that children's syntactic competence is ahead of their productive abilities, which is also how their phonology develops.

Around the time of their second birthday, children begin to put words together. At first these utterances appear to be strings of two of the child's earlier holophrastic utterances, each word with its own single-pitch contour. Soon, they begin to form actual two-word sentences with clear syntactic and semantic relations. The intonation contour of the two words extends over the whole utterance rather than being separated by a pause between the two words. The

following utterances illustrate the kinds of patterns that are found in children's utterances at this stage:

allgone sock	hi Mommy
bye bye boat	allgone sticky
more wet	it ball
Katherine sock	dirty sock

These early utterances can express a variety of semantic and syntactic relations. For example, noun + noun sentences such as *Mommy sock* can express a subject + object relation in the situation when the mother is putting the sock on the child, or a possessive relation when the child is pointing to Mommy's sock. Two nouns can also be used to show a subject-locative relation, as in *sweater chair* to mean "The sweater is on the chair," or to show attribution as in *dirty sock*. Children often have a variety of modifiers such as *allgone*, *more*, and *bye bye*.

Because children mature at different rates and the age at which children start to produce words and put words together varies, chronological age is not a good measure of a child's language development. Instead, researchers use the child's **mean length of utterances** (MLU) to measure progress. MLU is the average length of the utterances the child is producing at a particular point. MLU can be measured in terms of morphemes, so words like *boys*, *danced*, and *crying* each have a value of two (morphemes). MLU can also be measured in term of words, which is a more revealing measure when comparing children acquiring languages with different morphological systems. Children with the same MLU are likely to have similar grammars even though they are different ages.

In their earliest multiword utterances, children are inconsistent in their use of function words (grammatical morphemes) such as *a* and *the*, subject pronouns, auxiliary verbs such as *can* and *is*, and verbal inflection. Many (though not all) utterances consist only of open-class or content words, while some or all of the function words, auxiliaries, and verbal inflection may be missing. During this stage children often sound as if they are sending an e-message or reading an old-fashioned telegram (containing only the required words for basic understanding), which is why such utterances are sometimes called "telegraphic speech," and we call this the **telegraphic stage** of the child's language development.

Cat stand up table.
What that?
He play little tune.
Andrew want that.
Cathy build house.
No sit there.
Ride truck.
Show Mommy that.

J. P.'s early sentences were similar (the words in parentheses are missing from J. P.'s sentences):

Age in Months		
25	[danʔ ɪʔ tsɪʔ]	"Don't eat (the) chip."
	[bʷaʔ tat]	"Block (is on) top."
26	[mamis tu hæs]	"Mommy's two hands."
	[mo bʌs go]	"Where bus go?"
	[dædi go]	"(Where) Daddy go?"
27	[ʔaɪ gat tu dʲus]	"I got two (glasses of) juice."
	[do baɪʔ mi]	"Don't bite (kiss) me."
	[kʌder sʌni ber]	"Sonny color(ed a) bear."
28	[ʔaɪ gat pwe dɪs]	"I('m) play(ing with) this."
	[mamis tak mɛns]	"Mommy talk(ed to the) men."

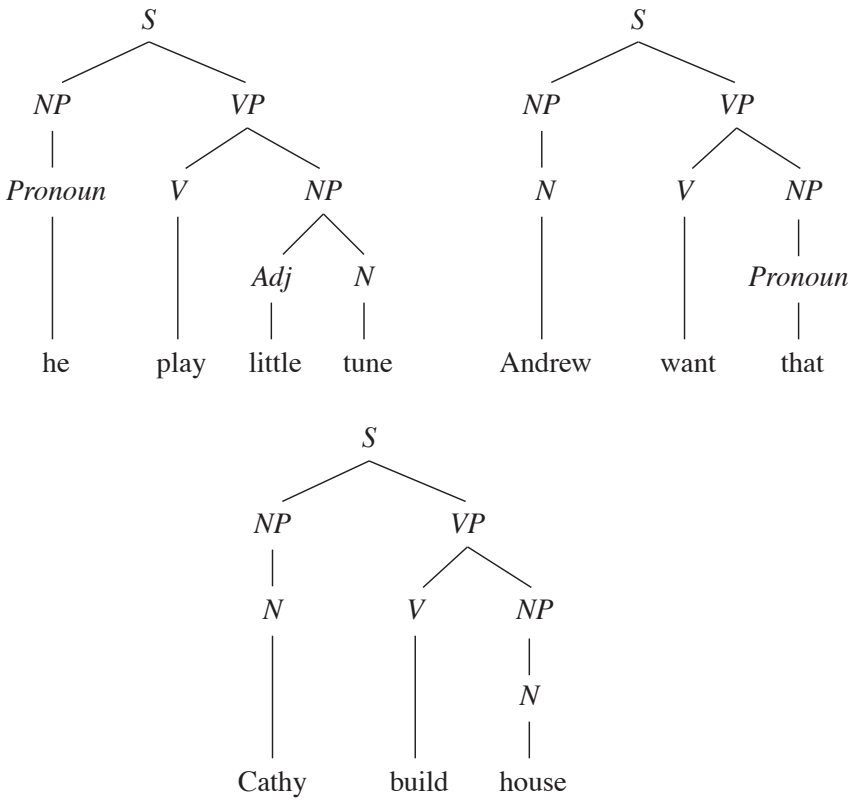
It can take many months before children use all the grammatical morphemes and auxiliary verbs consistently. However, the child does not deliberately leave out function words as would an adult sending a twitter. The sentences reflect the child's linguistic capacity at that particular stage of language development.

There is a great deal of debate among linguists about how to characterize telegraphic speech: Do children omit function morphemes because of limitations in their ability to produce longer, more complex sentences, or do they omit these morphemes because their grammar permits such elements to be unexpressed? On the first account, telegraphic speech is due to performance limitations: Since there is an upper limit on the length of utterance a child can produce, and function morphemes are prosodically and semantically weak, they are omitted. On the second view, telegraphic speech is an early grammatical stage similar to languages like Italian or Spanish that allow subject pronouns to be dropped, as in *Hablo ingles* "(I) speak English," or Chinese, which lacks many types of determiners.

Although these sentences may lack certain morphemes, they nevertheless appear to have hierarchical constituent structures and syntactic rules similar to those in the adult grammar. For example, children almost never violate the word-order rules of their language. In languages with relatively fixed word order such as English and Japanese, children use the required order (SVO in English, SOV in Japanese) from the earliest stage. In languages with freer word order, like Turkish and Russian, grammatical relations such as subject and object are generally marked by inflectional morphology, such as case markers. Children acquiring these languages quickly learn the morphological case markers. For example, Russian- and German-speaking children mark subjects with nominative case and objects with accusative case with very few errors.

Telegraphic speech is also very good evidence against the hypothesis that children learn sentences by imitation. Adults—even when speaking motherese—do not drop function words when they talk to children.

The correct use of word order, case marking, and agreement rules shows that even though children may often omit function morphemes, they are aware of constituent structure and syntactic rules. Their utterances are not simply words randomly strung together. From a very early stage onward, children have a grasp of the principles of phrase and sentence formation and of the kinds of structure dependencies mentioned in chapter 2, as revealed by these constituent structure trees:



In order to apply morphological and syntactic rules the child must know what syntactic categories the words in his language belong to. But how exactly does the child come to know that *play* and *want* are verbs and *tune* and *house* are nouns? One suggestion is that children first use the meaning of the word to figure out its category. This is called **semantic bootstrapping**. The child may have rules such as "if a word refers to a physical object, it's a noun" or "if a word refers to an action, it's a verb," and so on. However, the rules that link certain meanings to specific categories are not foolproof. For example, the word *action* denotes an action but it is not a verb, *know* is not an action but is a verb, and *justice* is a noun though it is not a physical object. But the rules that drive semantic bootstrapping might be helpful for the kind of words children learn early on which tend to refer to objects and actions.

Word frames may also help the child to determine when words belong to the same category. Studies of the language used to children show that there are certain frames that occur frequently enough to be reliable for categorization, for example, "you __ it" and "the __ one." Most typically, verbs such as *see*, *do*, *did*, *win*, *fix*, *turned*, and *get* occur in the first frame, while adjectives like *red*, *big*, *wrong*, and *light* occur in the second. If a child knows that *see* is a verb, then he could also deduce that all the other words appearing in the same frame are also verbs. Like semantic bootstrapping, the distributional evidence is not foolproof. For example, "it __ the" can frame a verb, *it **hit** the ball*, but also a preposition, *I hit it **across** the street*. And also like semantic bootstrapping, this evidence may

well be reliable enough to give the child a head start into the complex task of learning the syntactic categories of words.

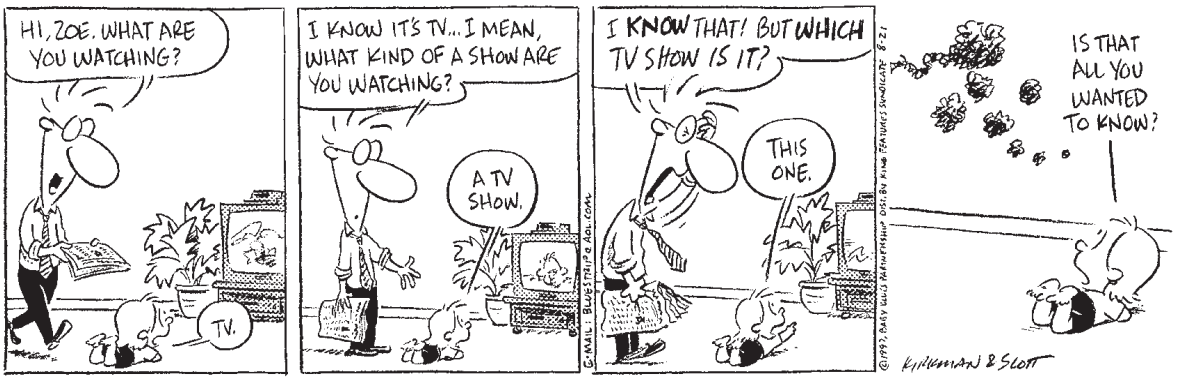
The most frequent frames typically consist of function words, determiners such as *the* or *a* or pronouns like *it* or *one*. This suggests that children can learn from function morphemes in the input even though they omit these elements in their own speech. Indeed, comprehension studies show that children pay attention to function words. Two-year-olds respond more appropriately to grammatical commands such as *Find the bird* than to commands with an ungrammatically positioned function word as in *Find was bird*. Other studies suggest that function morphemes such as determiners help children in word segmentation and categorization.

Sometime between the ages of 2;6 and 3;6, a virtual language explosion occurs. At this point it is difficult to identify distinct stages because the child is undergoing so much development so rapidly. By the age of 3;0, most children are consistent in their use of function morphemes. Moreover, they have begun to produce and understand complex structures, including coordinated sentences and embedded sentences of various kinds, such as the following:

He was stuck and I got him out.
I want this doll because she's big.
I know what to do.
I like to play with something else.
I think she's sick.
Look at the train Ursula bought.
I gon' make it like a rocket to blast off with.
It's too early for us to eat.

Past the age of 3;6 children can generally form grammatical *wh* questions with the proper Aux inversion such as *What can I do tomorrow?* They can produce and understand relative clauses such as *This is the lion that chased the giraffe*, as well as other embedded clauses such as *I know that Mommy is home*. They can use reflexive pronouns correctly such as *I saw myself in the camera*. Somewhat beyond 4;0, depending on the individual, much of the adult grammar has been acquired.

The Acquisition of Pragmatics



"Baby Blues" © Baby Blues Partnership. Reprinted with permission of King Features Syndicate.

In addition to acquiring the rules of grammar, children must learn the appropriate use of language in context, or pragmatics. The cartoon is funny because of the inappropriateness of the interaction, showing that Zoe hasn't completely acquired the pragmatic "maxims of conversation" discussed in chapter 3.

Context is needed to determine the reference of pronouns. A sentence such as "Amazingly, he loves her anyway" is uninterpretable unless both speaker and hearer understand who the pronouns *he* and *her* refer to. If the sentence were preceded by "I saw John and Mary kissing in the park," then the referents of the pronouns would be clear. Children are not always sensitive to the needs of their interlocutors, and they may fail to establish the referents for pronouns. It is not unusual for a three- or four-year-old (or even older children) to use pronouns out of the blue, like the child who cries to her mother "He hit me" when mom has no idea who did the deed.

The speaker and listener form part of the context of an utterance. The meaning of *I* and *you* depends on who is talking and who is listening, which changes from situation to situation. Younger children (around age two) have difficulty with the "shifting reference" of these pronouns. A typical error that children make at this age is to refer to themselves as "you," for example, saying "You want to take a walk" when they mean "I want to take a walk."

Children also show a lack of pragmatic awareness in the way they sometimes use articles. Like pronouns, the interpretation of articles depends on context. The definite article *the*, as in "the boy," can be used felicitously only when it is clear to speaker and hearer what boy is being discussed. In a discourse the indefinite article *a/an* must be used for the first mention of a new referent, but the definite article (or pronoun) may be used in subsequent mentions, as illustrated following:

A boy walked into the class.
He was in the wrong room.
The teacher directed the boy to the right classroom.

Children do not always respect the pragmatic rules for articles. In experimental studies, three-year-olds may use the definite article for introducing a new referent. In other words, the child tends to assume that his listener knows who he is talking about without having established this in a linguistically appropriate way.

It may take a child several months or years to master those aspects of pragmatics that involve establishing the reference for function morphemes such as determiners and pronouns. Other aspects of pragmatics are acquired very early. Children in the holophrastic stage use their one-word utterances with different illocutionary force (see page 176). The utterance "up" spoken by J. P. at sixteen months might be a simple statement such as "The teddy is up on the shelf," or a request: "Pick me up."

The Development of Auxiliaries: A Case Study

We have seen in this chapter that language acquisition involves development in various components—the lexicon, phonology, morphology, and syntax, as well as pragmatics. These different modules interact in complex ways to chart an overall course of language development.

As an example, let us take the case of the English auxiliaries. As noted earlier, children in the telegraphic stage do not typically use auxiliaries such as *can*, *will*, or *do*, and they often omit *be* and *have* from their utterances. Several syntactic constructions in English depend on the presence of an auxiliary, the most central of which are questions and negative sentences. To negate a main verb requires an auxiliary verb (or *do* if there isn't one) as in the following examples:

I don't like this book.
I won't read this book.

An adult does not say "I not like this book."

Similarly, as discussed in chapter 2, English yes-no and *wh* questions are formed by moving an auxiliary to precede the subject, as in the following examples:

Can I leave now?
Do you love me?
Where should John put the book?

Although the two-year-old does not have productive control of auxiliaries, she is able to form negative sentences and questions. During the telegraphic stage, the child produces questions of the following sort:

Yes-No Questions
I ride train?
Mommy eggnog?
Have some?

These utterances have a rising intonation pattern typical of yes-no questions in English, but because there are no auxiliaries, there can be no auxiliary movement. In *wh* questions there is also no auxiliary, but there is generally a *wh* phrase that has moved to the beginning of the sentence. English-speaking children do not produce sentences such as "Cowboy doing what?" in which the *wh* phrase remains in its deep structure position.

The two-year-old has an insufficient lexicon. The lack of auxiliaries means that she cannot use a particular syntactic device associated with question formation in English—auxiliary movement. However, she has the pragmatic knowledge to make a request or ask for information, and she has the appropriate prosody, which depends on knowledge of phonology and the syntactic structure of the question. She also knows the grammatical rule that requires *wh* phrases to be in a fronted position. Many components of language must be in place to form an adultlike question.

In languages that do not require auxiliaries to form a question, children appear more adultlike. For example, in Dutch and Italian, the main verb moves. Because many main verbs are acquired before auxiliaries, Dutch and Italian children in the telegraphic stage produce questions that follow the adult rule:

Dutch

En wat doen ze daar?	and what do they there	"And what are they doing there?"
Wordt mama boos?	becomes mama angry	"Is mommy angry?"
Weet je n kerk?	know you a church	"Do you know a church?"

Italian

Cosa fanno questi bambini?	what do these children	"What are these babies doing?"
Chando vene a mama?	when comes the mommy	"When is Mommy coming?"
Vola cici?	flies birdie	"Is the birdie flying?"

The Dutch and Italian children show us there is nothing intrinsically difficult about syntactic movement rules. The delay that English-speaking children show in producing adultlike questions may simply be because auxiliaries are acquired later than main verbs and because English is idiosyncratic in forming questions by moving only auxiliaries.

The lack of auxiliaries during the telegraphic stage also affects the formation of negative sentences. During this stage the English-speaking child's negative sentences look like the following:

He no bite you.
Wayne not eating it.
Kathryn not go over there.
You no bring choo-choo train.
That no fish school.

Because of the absence of auxiliaries, these utterances do not look very adultlike. However, children at this stage understand the pragmatic force of negation. The child who says "No!" when asked to take a nap knows exactly what he means.

As children acquire the auxiliaries, they generally use them correctly; that is, the auxiliary usually appears before the subject in yes-no questions, but not always.

Yes-No Questions
Does the kitty stand up?
Can I have a piece of paper?
Will you help me?
We can go now?
***Wh* Questions**
Which way they should go?
What can we ride in?
What will we eat?

The introduction of auxiliaries into the child's grammar also affects negative sentences. We now find correctly negated auxiliaries, though *be* is still missing in many cases.

Paul can't have one.
Donna won't let go.
I don't want cover on it.
I am not a doctor.
It's not cold.
Paul not tired.
I not crying.

The child always places the negation in the correct position in relation to the auxiliary or *be*. Main verbs follow negation and *be* precedes negation. Children never produce errors such as "Mommy dances not" or "I not am going."

In languages such as French and German, which are like Italian and Dutch in having a rule that moves inflected verbs, the verb shows up before the negative marker. French and German children respect this rule, as follows. (In the German examples *nich* is the baby form of *nicht*.)

French

Veux pas lolo.	want not water	"I don't want water."
Marche pas.	walks not	"She doesn't walk."
Ça tourne pas.	that turns not	"That doesn't turn."

German

Macht nich aua.	makes not ouch	"It doesn't hurt."
Brauche nich lala.	need not pacifier	"I don't need a pacifier."
Schmeckt auch nich.	tastes also not	"It doesn't taste good either."

Though the stages of language development are universal, they are shaped by the grammar of the particular adult language the child is acquiring. During the telegraphic stage, German, French, Italian, and English-speaking children omit auxiliaries, but they form negative sentences and questions in different ways because the rules of question and negative formation are different in the respective adult languages. This tells us something essential about language acquisition: Children are sensitive to the rules of the adult language at the earliest stages of development. Just as their phonology is quickly fine-tuned to the ambient language(s), so is their syntactic system.

The ability of children to form complex rules and construct grammars of the languages around them in a relatively short time is phenomenal. That all children go through similar stages regardless of language shows that they are equipped with special abilities to know what generalizations to look for and what to ignore, and how to discover the regularities of language.

Setting Parameters

Children acquire some aspects of syntax very early, even while they are still in the telegraphic stage. Most of these early developments correspond to what we referred to as the parameters of UG in chapter 2. One such parameter determines whether the head of a phrase comes before or after its complements, for

example, whether the order of the VP is verb-object (VO) as in English or OV as in Japanese. Children produce the correct word order of their language in their earliest multiword utterances, and they understand word order even when they are in the one-word stage of production. According to the parameter model of UG, the child does not actually have to formulate a word-order rule. Rather, he must choose between two already specified values: head first or head last. He determines the correct value based on the language he hears around him. The English-speaking child can quickly figure out that the head comes before its complements; a Japanese-speaking child can equally well determine that his language is head final.

Other parameters of UG involve the verb movement rules. In some languages the verb can move out of the VP to higher positions in the phrase structure tree. We saw this in the Dutch and Italian questions discussed in the last section. In other languages, such as English, verbs do not move (only auxiliaries do). The verb movement parameters provide the child with an option: my language does/does not allow verb movement. As we saw, Dutch- and Italian-speaking children quickly set the verb movement parameters to the "does allow" value, and so they form questions by moving the verb. English-speaking children never make the mistake of moving the verb, even when they don't yet have auxiliaries. In both cases, the children have set the parameter at the correct value for their language. Even after English-speaking children acquire the auxiliaries and the Aux movement rule, they never overgeneralize this movement to include verbs. This supports the hypothesis that the parameter is set early in development and cannot be undone. In this case as well, the child does not have to formulate a rule of verb movement; he does not have to learn when the verb moves and where it moves to. This is all given by UG. He simply has to decide whether verb movement is possible in his language.

The parameters of UG limit the grammatical options to a small well-defined set—is my language head first or head last, does my language have verb movement, and so on. Parameters greatly reduce the acquisition burden on the child and contribute to explaining the ease and rapidity of language acquisition.

The Acquisition of Signed Languages

Deaf children who are born to deaf signing parents are naturally exposed to sign language just as hearing children are naturally exposed to spoken language. Given the universal aspects of sign and spoken languages, it is not surprising that language development in these deaf children parallels the stages of spoken language acquisition. Deaf children babble, they then progress to single signs similar to the single words in the holophrastic stage, and finally they begin to combine signs. There is also a telegraphic stage in which the function signs may be omitted. Use of function signs becomes consistent at around the same age for deaf children as function words in spoken languages. The ages at which signing children go through each of these stages are comparable to the ages of children acquiring a spoken language.

Both spoken and signed language acquisition adhere to a set of universal principles, overlaid by language-particular components. We saw earlier that English-speaking children easily acquire *wh* movement, which is governed by universal principles, but they show some delay in their use of Aux movement, which is

specific to English. In *wh* questions in ASL, the *wh* word can move or it can be left in its original position. Both of the following sentences are grammatical:

_____whq
WHO BILL SEE YESTERDAY?

_____ whq
BILL SAW WHO YESTERDAY?

(*Note*: We follow the convention of writing the glosses for signs in uppercase letters.)

There is no Aux movement in ASL, but a question is accompanied by a facial expression with furrowed brows and the head tilted back. This is represented by the "whq" above the ASL glosses. This *non-manual marker* is part of the grammar of ASL. It is like the rising intonation we use when we ask questions in English and other spoken languages.

In the acquisition of *wh* questions in ASL, signing children easily learned the rules associated with the *wh* phrase. The children sometimes move the *wh* phrase and sometimes leave it in place, as adult signers do. But they often omit the non-manual marker, an omission that is not grammatical in the adult language.

Sometimes the parallels between the acquisition of signed and spoken languages are striking. For example, some of the grammatical morphemes in ASL are semantically transparent or **iconic**, that is, they look like what they mean; for example, the sign for the pronoun "I" involves the speaker pointing to his chest. The sign for the pronoun "you" is a point to the chest of the addressee. As noted earlier, at around age two, children acquiring spoken languages often reverse the pronouns "I" and "you." Interestingly, at this same age signing children make this same error. They will point to themselves when they mean "you" and point to the addressee when they mean "I." Children acquiring ASL make this error despite the transparency or iconicity of these particular signs, because signing children (like signing adults) treat these pronouns as linguistic symbols and not simply as pointing gestures. As part of the language, the shifting reference of these pronouns presents the same problem for signing children that it does for speaking children.

Hearing children of deaf parents acquire both sign language and spoken language when exposed to both. Studies show that Canadian bilingual children who acquire Langues des Signes Quebecoise (LSQ), or Quebec Sign Language, develop the two languages exactly as bilingual children acquiring two spoken languages. The LSQ–French bilinguals reached linguistic milestones in each of their languages in parallel with Canadian children acquiring French and English. They produced their first words, as well as their first word combinations, at the same time in each language. In reaching these milestones, neither group showed any delay compared to monolingual children.

Deaf children of hearing parents who are not exposed to sign language from birth suffer a great handicap in acquiring language. It may be many years before these children are able to use a spoken language or before they encounter a conventional sign language. Yet the instinct to acquire language is so strong in humans that these deaf children begin to develop their own manual gestures to

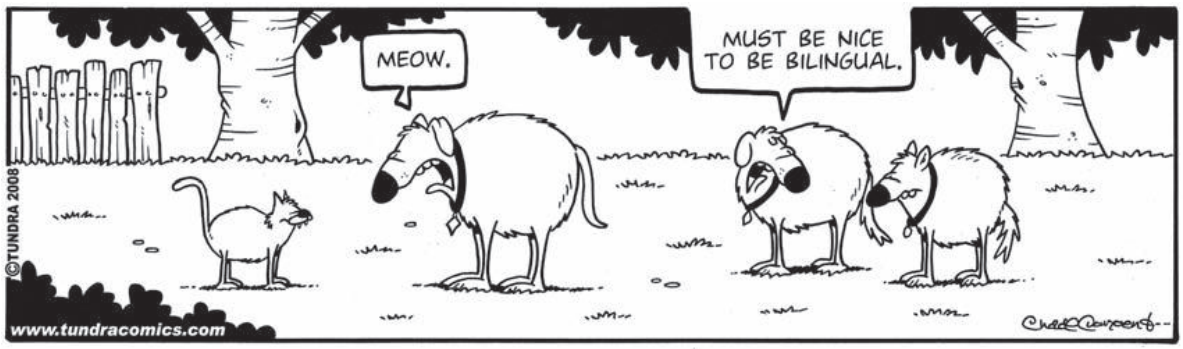
express their thoughts and desires. A study of six such children revealed that they not only developed individual signs but joined pairs and formed sentences with definite syntactic order and systematic constraints. Although these "home signs," as they are called, are not fully developed languages like ASL or LSQ, they have a linguistic complexity and systematicity that could not have come from the input, because there was no input. Cases such as these demonstrate not only the strong drive that humans have to communicate through language, but also the innate basis of language structure.

Knowing More Than One Language

> He that understands grammar in one language, understands it in another as far as the essential properties of Grammar are concerned. The fact that he can't speak, nor comprehend, another language is due to the diversity of words and their various forms, but these are the accidental properties of grammar.
>
> **ROGER BACON** (1214–1294)

People can acquire a second language under many different circumstances. You may have learned a second language when you began middle school, or high school, or college. Moving to a new country often means acquiring a new language. Other people live in communities or homes in which more than one language is spoken and may acquire two (or more) languages simultaneously. The term **second language acquisition**, or **L2 acquisition**, generally refers to the acquisition of a second language by someone (adult or child) who has already acquired a first language. This is also referred to as **sequential bilingualism**. **Bilingual language acquisition** refers to the (more or less) simultaneous acquisition of two languages beginning in infancy (or before the age of three years), also referred to as **simultaneous bilingualism**.

Childhood Bilingualism



Approximately half of the people in the world are native speakers of more than one language. This means that as children they had regular and continued

exposure to those languages. In many parts of the world, especially in Africa and Asia, bilingualism (even multilingualism) is the norm. In contrast, many Western countries (though by no means all of them) view themselves as monolingual, even though they may be home to speakers of many languages. In the United States and many European countries, bilingualism is often viewed as a transitory phenomenon associated with immigration.

Bilingualism is an intriguing topic. People wonder how it's possible for a child to acquire two (or more) languages at the same time. There are many questions, such as: Doesn't the child confuse the two languages? Does bilingual language development take longer than monolingual development? Are bilingual children brighter, or does acquiring two languages negatively affect the child's cognitive development in some way? How much exposure to each language is necessary for a child to become bilingual?

Much of the early research into bilingualism focused on the fact that bilingual children sometimes mix the two languages in the same sentences, as the following examples from French-English bilingual children illustrate. In the first example, a French word appears in an otherwise English sentence. In the other two examples, all of the words are English but the syntax is French.

His nose is perdu.	"His nose is lost."
A house pink	"A pink house"
That's to me.	"That's mine."

In early studies of bilingualism, this kind of language mixing was viewed negatively. It was taken as an indication that the child was confused or having difficulty with the two languages. In fact, many parents, sometimes on the advice of educators or psychologists, would stop raising their children bilingually when faced with this issue. However, it now seems clear that some amount of language mixing is a normal part of the early bilingual acquisition process and not necessarily an indication of any language problem.

Theories of Bilingual Development

These mixed utterances raise an interesting question about the grammars of bilingual children. Does the bilingual child start out with only one grammar that is eventually differentiated, or does she construct a separate grammar for each language right from the start? The **unitary system hypothesis** says that the child initially constructs only one lexicon and one grammar. The presence of mixed utterances such as the ones just given is often taken as support for this hypothesis. In addition, at the early stages, bilingual children often have words for particular objects in only one language. For example, a Spanish-English bilingual child may know the Spanish word for milk, *leche*, but not the English word, or she may have the word *water* but not *agua*. This kind of complementarity has also been taken as support for the idea that the child has only one lexicon.

However, careful examination of the vocabularies of bilingual children reveals that although they may not have exactly the same words in both languages, there is enough overlap to make the single lexicon idea implausible. The reason children may not have the same set of words in both languages is that they use their two languages in different circumstances and acquire the vocabulary

appropriate to each situation. For example, the bilingual English-Spanish child may hear only Spanish during mealtime, and so he will first learn the Spanish words for foods. Also, bilingual children have smaller vocabularies in each of their languages than the monolingual child has in her one language. This makes sense because a child can only learn so many words a day, and the bilingual child has two lexicons to build. For these reasons the bilingual child may have more lexical gaps than the monolingual child at a comparable stage of development, and those gaps may be different for each language.

The **separate systems hypothesis** says that the bilingual child builds a distinct lexicon and grammar for each language. To test the separate systems hypothesis, it is necessary to look at how the child acquires those pieces of grammar that are different in his two languages. For example, if both languages have SVO word order, this would not be a good place to test this hypothesis. Several studies have shown that where the two languages diverge, children acquire the different rules of each language. Spanish-English and French-German bilingual children have been shown to use the word orders appropriate to each language, as well as the correct agreement morphemes for each language. Other studies have found that children set up two distinct sets of phonemes and phonological rules for their languages.

The separate systems hypothesis also receives support from the study of the LSQ-French bilinguals discussed earlier. These children have semantically equivalent words in the two languages, just as bilinguals acquiring two spoken languages do. In addition, these children, like all bilingual children, were able to adjust their language choice to the language of their addressees, showing that they differentiated the two languages. Like most bilingual children, the LSQ-French bilinguals produced mixed utterances that had words from both languages. What is especially interesting is that these children showed simultaneous language mixing. They would produce an LSQ sign and a French word at the same time, something that is only possible if one language is spoken and the other signed. However, this finding has implications for bilingual language acquisition in general. It shows that the language mixing of bilingual children is not caused by confusion, but is rather the result of two grammars operating simultaneously.

If bilingual children have two grammars and two lexicons, what explains the mixed utterances? Various explanations have been offered. One suggestion is that children mix because they have lexical gaps; if the French-English bilingual child does not know the English word *lost*, she will use the word she does know, *perdu*—the "any port in a storm" strategy. Another possibility is that the mixing in child language is similar to **codeswitching** used by many adult bilinguals (discussed in chapter 9). In specific social situations, bilingual adults may switch back and forth between their two languages in the same sentence, for example, "I put the forks en las mesas" (I put the forks on the tables). Codeswitching reflects the grammars of both languages working simultaneously; it is not "bad grammar" or "broken English." Adult bilinguals codeswitch only when speaking to other bilingual speakers. It has been suggested that the mixed utterances of bilingual children are a form of codeswitching. In support of this proposal, various studies have shown that bilingual children as young as two make contextually appropriate language choices: In speaking to monolinguals the children use one language, and in speaking to bilinguals they mix the two languages.

Two Monolinguals in One Head

Although we must study many bilingual children to reach any firm conclusions, the evidence accumulated so far seems to support the idea that children construct multiple grammars from the outset. Moreover, it seems that bilingual children develop their grammars along the same lines as monolingual children. They go through a babbling stage, a holophrastic stage, a telegraphic stage, and so on. During the telegraphic stage they show the same characteristics in each of their languages as the monolingual children. For example, monolingual English-speaking children omit verb endings in sentences such as "Eve play there" and "Andrew want that," and German-speaking children use infinitives as in "S[ch]okolade holen" (chocolate get-infinitive). Spanish- and Italian-speaking monolinguals never omit verbal inflection or use infinitives in this way. Remarkably, two-year-old German-Italian bilinguals use infinitives when speaking German but not when they speak Italian. Young Spanish-English bilingual children drop the English verb endings but not the Spanish ones, and German-English bilinguals omit verbal inflection in English and use the infinitive in German. Results such as these have led some researchers to suggest that from a grammar-making point of view, the bilingual child is like "two monolinguals in one head."

The Role of Input

One issue that concerns researchers studying bilingualism, as well as parents of bilingual children, is the relationship between language input and proficiency. What role does input play in helping the child to separate the two languages? One input condition that is thought to promote bilingual development is *une personne–une langue* (one person, one language)—as in, Mom speaks only language A to the child and Dad speaks only language B. The idea is that keeping the two languages separate in the input will make it easier for the child to acquire each without influence from the other. Whether this method influences bilingual development in some important way has not been established. In practice this "ideal" input situation may be difficult to attain. It may also be unnecessary. We saw earlier that babies are attuned to various phonological properties of the input language such as prosody and phonotactics. Various studies suggest that this sensitivity provides a sufficient basis for the bilingual child to keep the two languages separate.

Another question is, how much input does a child need in each language to become "native" in both? The answer is not straightforward. It seems intuitively clear that if a child hears twelve hours of English a day and only two hours of Spanish, he will probably develop English much more quickly and completely than Spanish. In fact, under these conditions he may never achieve the kind of grammatical competence in Spanish that we associate with the normal monolingual Spanish speaker. In reality, bilingual children are raised in a variety of circumstances. Some may have more or less equal exposure to the two languages; some may hear one language more than the other but still have sufficient input in the two languages to become "native" in both; some may ultimately have one language that is dominant to a lesser or greater degree. Researchers simply do not know how much language exposure is necessary in the two languages to produce a balanced bilingual. For practical purposes, the rule of thumb is that

the child should receive roughly equal amounts of input in the two languages to achieve native proficiency in both.

Cognitive Effects of Bilingualism

Bilingual Hebrew-English-speaking child: "I speak Hebrew and English."
Monolingual English-speaking child: "What's English?"

SOURCE UNKNOWN

Another issue is the effect of bilingualism on intellectual or cognitive development. Does being bilingual make you more or less intelligent, more or less creative, and so on? Historically, research into this question has been fraught with methodological problems and has often been heavily influenced by the prevailing political and social climate. Many early studies (before the 1960s) showed that bilingual children did worse than monolingual children on IQ and other cognitive and educational tests. The results of more recent research indicate that bilingual children outperform monolinguals in certain kinds of problem solving. Also, bilingual children seem to have better **metalinguistic awareness**, which refers to a speaker's conscious awareness *about* language rather than *of* language. This is illustrated in the epigraph to this section. Moreover, bilingual children have an earlier understanding of the arbitrary relationship between an object and its name. Finally, they have sufficient metalinguistic awareness to speak the contextually appropriate language, as noted earlier.

Whether children enjoy some cognitive or educational benefit from being bilingual seems to depend in part on extralinguistic factors such as the social and economic position of the child's group or community, the educational situation, and the relative "prestige" of the two languages. Studies that show the most positive effects (e.g., better school performance) generally involve children reared in societies where both languages are valued and whose parents were interested and supportive of their bilingual development.

Second Language Acquisition

In contrast to the bilinguals just discussed, many people are introduced to a second language (L2) after they have achieved native competence in a first language (L1). If you have had the experience of trying to master a second language as an adult, no doubt you found it to be a challenge quite unlike your first language experience.

Is L2 Acquisition the Same as L1 Acquisition?

With some exceptions, adults do not simply pick up a second language. It usually requires conscious attention, if not intense study and memorization, to become proficient in a second language. Again, with the exception of some remarkable individuals, adult second-language learners (L2ers) do not often achieve native-like grammatical competence in the L2, especially with respect to pronunciation. They generally have an accent, and they may make syntactic or morphological errors that are unlike the errors of children acquiring their first language

(L1ers). For example, L2ers often make word order errors, especially early in their development, as well as morphological errors in grammatical gender and case. L2 errors may **fossilize** so that no amount of teaching or correction can undo them.

Unlike L1 acquisition, which is uniformly successful across children and languages, adults vary considerably in their ability to acquire an L2 completely. Some people are very talented language learners. Others are hopeless. Most people fall somewhere in the middle. Success may depend on a range of factors, including age, talent, motivation, and whether you are in the country where the language is spoken or sitting in a classroom five mornings a week with no further contact with native speakers. For all these reasons, many people, including many linguists who study L2 acquisition, believe that second language acquisition is something different from first language acquisition. This hypothesis is referred to as the **fundamental difference hypothesis** of L2 acquisition.

In certain important respects, however, L2 acquisition is like L1 acquisition. Like L1ers, L2ers do not acquire their second language overnight; they go through stages. Like L1ers, L2ers construct grammars. These grammars reflect their competence in the L2 at each stage, and so their language at any particular point, though not native-like, is rule-governed and not haphazard. The intermediate grammars that L2ers create on their way to the target have been called **interlanguage grammars**.

Consider word order in the interlanguage grammars of Romance (e.g., Italian, Spanish, and Portuguese) speakers acquiring German as a second language. The word order of the Romance languages is Subject-(Auxiliary)-Verb-Object (like English). German has two basic word orders depending on the presence of an auxiliary. Sentences with auxiliaries have Subject-Auxiliary-Object-Verb, as in (1). Sentences without auxiliaries have Subject-Verb-Object, as in (2). (Note that as with the child data above, these L2 sentences may contain various "errors" in addition to the word order facts we are considering.)

1. Hans hat ein Buch gekauft. "Hans has a book bought."
2. Hans kauft ein Buch. "Hans is buying a book."

Studies show that Romance speakers acquire German word order in pieces. During the first stage they use German words but the S-Aux-V-O word order of their native language, as follows:

Stage 1: Mein Vater hat gekauft ein Buch.
"My father has bought a book."

At the second stage, they acquired the VP word order Object-Verb.

Stage 2: Vor Personalrat auch meine helfen.
in the personnel office [a colleague] me helped
"A colleague in the personnel office helped me."

At the third stage they acquired the rule that places the verb or (auxiliary) in second position.

Stage 3: Jetzt kann sie mir eine Frage machen.
now can she me a question ask
"Now she can ask me a question."
I kenne nich die Welt.
I know not the world.
"I don't know the world."

These stages differ from those of children acquiring German as a first language. For example, German children know early on that the language has SOV word order.

Like L1ers, L2ers also attempt to uncover the grammar of the target language, but with varying success, and they often do not reach the target. Proponents of the *fundamental difference hypothesis* believe that L2ers construct grammars according to different principles than those used in L1 acquisition, principles that are not specifically designed for language acquisition, but for the problem-solving skills used for tasks like playing chess or learning math. According to this view, L2ers lack access to the specifically linguistic principles of UG that L1ers have to help them.

Opposing this view, others have argued that adults are superior to children in solving all sorts of nonlinguistic problems. If they were using these problem-solving skills to learn their L2, shouldn't they be uniformly more successful than they are? Also, linguistic savants such as Christopher, discussed in the introduction, argue against the view that L2 acquisition involves only nonlinguistic cognitive abilities. Christopher's IQ and problem-solving skills are minimal at best, yet he has become proficient in several languages.

Many L2 acquisition researchers do not believe that L2 acquisition is fundamentally different from L1 acquisition. They point to various studies that show that interlanguage grammars do not generally violate principles of UG, which makes the process seem more similar to L1 acquisition. In the German L2 examples above, the interlanguage rules may be wrong for German, or wrong for Romance, but they are not impossible rules. These researchers also note that although L2ers may fall short of L1ers in terms of their final grammar, they appear to acquire rules in the same way as L1ers.

Native Language Influence in L2 Acquisition

One respect in which L1 acquisition and L2 acquisition are clearly different is that adult L2ers already have a fully developed grammar of their first language. As discussed in chapter 6, linguistic competence is unconscious knowledge. We cannot suppress our ability to use the rules of our language. We cannot decide not to understand English. Similarly, L2ers—especially at the beginning stages of acquiring their L2—seem to rely on their L1 grammar to some extent. This is shown by the kinds of errors L2ers make, which often involve the **transfer** of grammatical rules from their L1. This is most obvious in phonology. L2ers generally speak with an accent because they may transfer the phonemes, phonological rules, or syllable structures of their first language to their second language. We see this in the Japanese speaker, who does not distinguish between *write* [raɪt] and *light* [laɪt] because the r/l distinction is not phonemic in Japanese; in the French speaker, who says "ze cat in ze hat" because French does not have [ð];

in the German speaker, who devoices final consonants, saying [hæf] for *have*; and in the Spanish speaker, who inserts a schwa before initial consonant clusters, as in [əskul] for *school* and [əsnab] for *snob*.

Similarly, English speakers may have difficulty with unfamiliar sounds in other languages. For example, in Italian long (or double) consonants are phonemic. Italian has minimal pairs such as the following:

ano	"anus"	anno	"year"
pala	"shovel"	palla	"ball"
dita	"fingers"	ditta	"company"

English-speaking L2 learners of Italian have difficulty in hearing and producing the contrast between long and short consonants. This can lead to very embarrassing situations, for example on New Year's Eve, when instead of wishing people *buon anno* (good year), you wish them *buon ano*.

Native language influence is also found in the syntax and morphology. Sometimes this influence shows up as a wholesale transfer of a particular piece of grammar. For example, a Spanish speaker acquiring English might drop subjects in nonimperative sentences because this is possible in Spanish, as illustrated by the following examples:

Hey, is not funny.
In here have the mouth.
Live in Colombia.

Or speakers may begin with the word order of their native language, as we saw in the Romance-German interlanguage examples.

Native language influence may show up in more subtle ways. For example, people whose L1 is German acquire English yes-no questions faster than Japanese speakers do. This is because German has a verb movement rule for forming yes-no questions that is very close to the English Aux movement rule, while in Japanese there is no syntactic movement in question formation.

The Creative Component of L2 Acquisition

It would be an oversimplification to think that L2 acquisition involves only the transfer of L1 properties to the L2 interlanguage. There is a strong creative component to L2 acquisition. Many language-particular parts of the L1 grammar do not transfer. Items that a speaker considers irregular, infrequent, or semantically difficult are not likely to transfer to the L2. For example, speakers will not typically transfer L1 idioms such as *He hit the roof* meaning "He got angry." They are more likely to transfer structures in which the semantic relations are transparent. For example, a structure such as (1) will transfer more readily than (2).

1. It is awkward to carry this suitcase.
2. This suitcase is awkward to carry.

In (1) the NP "this suitcase" is in its logical direct object position, while in (2) it has been moved to the subject position away from the verb that selects it.

Many of the "errors" that L2ers do make are not derived from their L1. For example, in one study Turkish speakers at a particular stage in their development of German used S-V-Adv (Subject-Verb-Adverb) word order in embedded clauses (the *wenn* clause in the following example) in their German interlanguage, even though both their native language and the target language have S-Adv-V order:

Wenn	ich	geh	zuruck	ich	arbeit elektriker	in der Türkei.
if	I	go	back,	I	work (as an) electrician	in Turkey

(Cf. *Wenn ich **zuruck geh** ich arbeit elektriker*, which is grammatically correct German.)

The embedded S-V-Adv order is most likely an overgeneralization of the verb-second requirement in German main clauses. As we noted earlier, overgeneralization is a clear indication that a rule has been acquired.

Why certain L1 rules transfer to the interlanguage grammar and others don't is not well understood. It is clear, however, that although construction of the L2 grammar is influenced by the L1 grammar, developmental principles—possibly universal—also operate in L2 acquisition. This is best illustrated by the fact that speakers with different L1s go through similar L2 stages. For example, Turkish, Serbo-Croatian, Italian, Greek, and Spanish speakers acquiring German as an L2 all drop articles to some extent. Because some of these L1s have articles, this cannot be caused by transfer but must involve some more general property of language acquisition.

Is There a Critical Period for L2 Acquisition?

> I don't know how you manage, Sir, amongst all the foreigners; you never know what they are saying. When the poor things first come here they gabble away like geese, although the children can soon speak well enough.
>
> **MARGARET ATWOOD,** *Alias Grace*, 1996

Age is a significant factor in L2 acquisition. The younger a person is when exposed to a second language, the more likely she is to achieve native-like competence.

In an important study of the effects of age on ultimate attainment in L2 acquisition, Jacqueline Johnson and Elissa Newport tested several groups of Chinese and Korean speakers who had acquired English as a second language. The subjects, all of whom had been in the United States for at least five years, were tested on their knowledge of specific aspects of English morphology and syntax. They were asked to judge the grammaticality of sentences such as:

The little boy is speak to a policeman.
The farmer bought two pig.
A bat flewed into our attic last night.

Johnson and Newport found that the test results depended heavily on the age at which the person had arrived in the United States. The people who arrived as children (between the age of three and eight) did as well on the test as American

native speakers. Those who arrived between the ages of eight and fifteen did not perform like native speakers. Moreover, every year seemed to make a difference for this group. The person who arrived at age nine did better than the one who arrived at age ten; those who arrived at age eleven did better than those who arrived at age twelve, and so on. The group that arrived between the ages of seventeen and thirty-one had the lowest scores.

Does this mean that there is a critical period for L2 acquisition, an age beyond which it is *impossible* to acquire the grammar of a new language? Most researchers would hesitate to make such a strong claim. Although age is an important factor in achieving native-like L2 competence, it is certainly possible to acquire a second language as an adult. Many teenage and adult L2 learners become proficient, and a few highly talented ones even manage to pass for native speakers. Also, the Newport and Johnson studies looked at the end state of L2 acquisition, after their subjects had been in an English-speaking environment for many years. It is possible that the ultimate attainment of adult L2ers falls short of native competence, but that the process of L2 acquisition is not fundamentally different from L1 acquisition.

It is more appropriate to say that L2 acquisition abilities gradually decline with age and that there are "sensitive periods" for the native-like mastery of certain aspects of the L2. The sensitive period for phonology is the shortest. To achieve native-like pronunciation of an L2 generally requires exposure during childhood. Other aspects of language, such as syntax, may have a larger window.

Recent research with learners of their "heritage language" (the ancestral language not learned as a child, such as Gaelic in Ireland) provides additional support for the notion of sensitive periods in L2 acquisition. This finding is based on studies into the acquisition of Spanish by college students who had overheard the language as children (and sometimes knew a few words), but who did not otherwise speak or understand Spanish. The *overhearers* were compared to people who had no exposure to Spanish before the age of fourteen. All of the students were native speakers of English studying their heritage language as a second language. These results showed that the overhearers acquired a more native-like accent than the other students did. However, the overhearers did not show any advantage in acquiring the grammatical morphemes of Spanish. Early exposure may leave an imprint that facilitates the late acquisition of certain aspects of language.

Recent research on the neurological effects of acquiring a second language shows that left hemisphere cortical density is increased in bilinguals relative to monolinguals and that this increase is more pronounced in early versus late second-language learners. The study also shows a positive relationship between brain density and second-language proficiency. The researchers conclude that the structure of the human brain is altered by the experience of acquiring a second language.

Summary

When children acquire a language, they acquire the grammar of that language—the phonological, morphological, syntactic, and semantic rules. They also acquire the pragmatic rules of the language as well as a lexicon. Children

are not taught language. Rather, they extract the rules (and much of the lexicon) from the language around them.

Several learning mechanisms have been suggested to explain the acquisition process. Imitations of adult speech, reinforcement, and analogy have all been proposed. None of these possible learning mechanisms account for the fact that children creatively form new sentences according to the rules of their language, or for the fact that children make certain kinds of errors but not others. Empirical studies of the motherese hypothesis show that grammar development does not depend on structured input. **Connectionist models** of acquisition also depend on the child having specially structured input.

The ease and rapidity of children's language acquisition and the uniformity of the stages of development for all children and all languages, despite the **poverty of the stimulus** they receive, suggest that the language faculty is innate and that the infant comes to the complex task already endowed with a Universal Grammar. UG is not a grammar like the grammar of English or Arabic, but represents the principles to which all human languages conform. Language acquisition is a creative process. Children create grammars based on the linguistic input and are guided by UG.

Language development proceeds in stages, which are universal. During the first year of life, children develop the sounds of their language. They begin by producing and perceiving many sounds that do not exist in their language input, the **babbling stage**. Gradually, their productions and perceptions are fine-tuned to the environment. Children's late babbling has all the phonological characteristics of the input language. Deaf children who are exposed at birth to sign languages also produce manual babbling, showing that babbling is a universal first stage in language acquisition that is dependent on the linguistic input received.

At the end of the first year, children utter their first words. During the second year, they learn many more words and they develop much of the phonological system of the language. Children's first utterances are one-word "sentences" (the **holophrastic** stage).

Many experimental studies show that children are sensitive to various linguistic properties such as stress and phonotactic constraints, and to statistical regularities of the input that enable them to segment the fluent speech that they hear into words. One method of segmenting speech is **prosodic bootstrapping**. Other bootstrapping methods can help the child to learn verb meaning based on syntactic context (**syntactic bootstrapping**), or syntactic categories based on word meaning (**semantic bootstrapping**) and distributional evidence such as word frames.

After a few months, the child puts two or more words together. These early sentences are not random combinations of words—the words have definite patterns and express both syntactic and semantic relationships. During the telegraphic stage, the child produces longer sentences that often lack function or grammatical morphemes. The child's early grammar still lacks many of the rules of the adult grammar, but is not qualitatively different from it. Children at this stage have correct word order and rules for agreement and case, which show their knowledge of structure.

Children make specific kinds of errors while acquiring their language. For example, they will **overgeneralize** morphology by saying *bringed* or *mans*. This

shows that they are acquiring rules of their particular language. Children never make errors that violate principles of Universal Grammar.

In acquiring the lexicon of the language children may **overextend** word meaning by using *dog* to mean any four-legged creature. As well, they may **underextend** word meaning and use dog only to denote the family pet and no other dogs, as if it were a proper noun. Despite these categorization "errors," children's word learning, like their grammatical development, is guided by general principles.

Deaf children exposed to **sign language** show the same stages of language acquisition as hearing children exposed to spoken languages. That all children go through similar stages regardless of language shows that they are equipped with special abilities to know what generalizations to look for and what to ignore, and how to discover the regularities of language, irrespective of the modality in which their language is expressed.

Children may acquire more than one language at a time. **Bilingual** children seem to go through the same stages as monolingual children except that they develop two grammars and two lexicons simultaneously. This is true for children acquiring two spoken languages as well as for children acquiring a spoken language and a sign language. Whether the child will be equally proficient in the two languages depends on the input he or she receives and the social conditions under which the languages are acquired.

In **second language acquisition, L2** learners construct grammars of the target language—called **interlanguage grammars**—that go through stages, like the grammars of first-language learners. Influence from the speaker's first language makes L2 acquisition appear different from L1 acquisition. Adults often do not achieve native-like competence in their L2, especially in pronunciation. The difficulties encountered in attempting to learn languages after puberty may be because there are sensitive periods for L2 acquisition. Some theories of second language acquisition suggest that the same principles operate that account for first language acquisition. A second view suggests that the acquisition of a second language in adulthood involves general learning mechanisms rather than the specifically linguistic principles used by the child.

The universality of the language acquisition process, the stages of development, and the relatively short period in which the child constructs a complex grammatical system without overt teaching suggest that the human species is innately endowed with special language acquisition abilities and that language is biologically and genetically part of the human neurological system.

All normal children learn whatever language or languages they are exposed to, from Afrikaans to Zuni. This ability is not dependent on race, social class, geography, or even intelligence (within a normal range). This ability is uniquely human.

References for Further Reading

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Exercises

1. *Baby talk* is a term used to label the word forms that many adults use when speaking to children. Examples in English are *choo-choo* for "train" and *bow-wow* for "dog." Baby talk seems to exist in every language and culture. At least two things seem to be universal about baby talk: The words that have baby-talk forms fall into certain semantic categories (e.g., food and animals), and the words are phonetically simpler than the adult forms (e.g., "tummy" /tʌmi/ for "stomach" /stʌmɪk/). List all the baby-talk words you can think of in your native language; then (1) separate them into semantic categories, and (2) try to state general rules for the kinds of phonological reductions or simplifications that occur.

2. In this chapter we discussed the way children acquire rules of question formation. The following examples of children's early questions are from a stage that is later than those discussed in the chapter. Formulate a generalization to describe this stage.

Can I go?	Can I can't go?
Why do you have one tooth?	Why you don't have a tongue?
What do frogs eat?	What do you don't like?
Do you like chips?	Do you don't like bananas?

3. Find a child between two and four years old and play with the child for about thirty minutes. Keep a list of all words and/or "sentences" that are used inappropriately. Describe what the child's meanings for these words probably are. Describe the syntactic or morphological errors (including omissions). If the child is producing multiword sentences, write a grammar that could account for the data you have collected.

4. Roger Brown and his coworkers at Harvard University studied the language development of three children, referred to in the literature as Adam, Eve, and Sarah. The following are samples of their utterances during the "two-word stage."

see boy	push it
see sock	move it
pretty boat	mommy sleep