

The Acquisition of Language

How do children learn to speak? It seems they do so in a highly methodical way: they break the language down into its simplest parts and develop the rules they need to put the parts together

by Breyne Arlene Moskowitz

An adult who finds herself in a group of people speaking an unfamiliar foreign language may feel quite uncomfortable. The strange language sounds like gibberish: mysterious strings of sound, rising and falling in unpredictable patterns. Each person speaking the language knows when to speak, how to construct the strings and how to interpret other people's strings, but the individual who does not know anything about the language cannot pick out separate words or sounds, let alone discern meanings. She may feel overwhelmed, ignorant and even childlike. It is possible that she is returning to a vague memory from her very early childhood, because the experience of an adult listening to a foreign language comes close to duplicating the experience of an infant listening to the "foreign" language spoken by everyone around her. Like the adult, the child is confronted with the task of learning a language about which she knows nothing.

The task of acquiring language is one for which the adult has lost most of her aptitude but one the child will perform with remarkable skill. Within a short span of time and with almost no direct instruction the child will analyze the language completely. In fact, although many subtle refinements are added between the ages of five and 10, most children have completed the greater part of the basic language-acquisition process by the age of five. By that time a child will have dissected the language into its minimal separable units of sound and meaning; she will have discovered the rules for recombining sounds into words, the meanings of individual words and the rules for recombining words into meaningful sentences, and she will have internalized the intricate patterns of taking turns in dialogue. All in all she will have established herself linguistically as a full-fledged member of a social community, informed about the most subtle details of her native language as it is spoken in a wide variety of situations.

The speed with which children ac-

complish the complex process of language acquisition is particularly impressive. Ten linguists working full time for 10 years to analyze the structure of the English language could not program a computer with the ability for language acquired by an average child in the first 10 or even five years of life. In spite of the scale of the task and even in spite of adverse conditions—emotional instability, physical disability and so on—children learn to speak. How do they go about it? By what process does a child learn language?

What Is Language?

In order to understand how language is learned it is necessary to understand what language is. The issue is confused by two factors. First, language is learned in early childhood, and adults have few memories of the intense effort that went into the learning process, just as they do not remember the process of learning to walk. Second, adults do have conscious memories of being taught the few grammatical rules that are prescribed as "correct" usage, or the norms of "standard" language. It is difficult for adults to dissociate their memories of school lessons from those of true language learning, but the rules learned in school are only the conventions of an educated society. They are arbitrary finishing touches of embroidery on a thick fabric of language that each child weaves for herself before arriving in the English teacher's classroom. The fabric is grammar: the set of rules that describe how to structure language.

The grammar of language includes rules of phonology, which describe how to put sounds together to form words; rules of syntax, which describe how to put words together to form sentences; rules of semantics, which describe how to interpret the meaning of words and sentences, and rules of pragmatics, which describe how to participate in a conversation, how to sequence sentences and how to anticipate the information needed by an interlocutor. The

internal grammar each adult has constructed is identical with that of every other adult in all but a few superficial details. Therefore each adult can create or understand an infinite number of sentences she has never heard before. She knows what is acceptable as a word or a sentence and what is not acceptable, and her judgments on these issues concur with those of other adults. For example, speakers of English generally agree that the sentence "Ideas green sleep colorless furiously" is ungrammatical and that the sentence "Colorless green ideas sleep furiously" is grammatical but makes no sense semantically. There is similar agreement on the grammatical relations represented by word order. For example, it is clear that the sentences "John hit Mary" and "Mary hit John" have different meanings although they consist of the same words, and that the sentence "Flying planes can be dangerous" has two possible meanings. At the level of individual words all adult speakers can agree that "brick" is an English word, that "blick" is not an English word but could be one (that is, there is an accidental gap in the adult lexicon, or internal vocabulary) and that "bnick" is not an English word and could not be one.

How children go about learning the grammar that makes communication possible has always fascinated adults, particularly parents, psychologists and investigators of language. Until recently diary keeping was the primary method of study in this area. For example, in 1877 Charles Darwin published an account of his son's development that includes notes on language learning. Unfortunately most of the diarists used inconsistent or incomplete notations to record what they heard (or what they thought they heard), and most of the diaries were only partial listings of emerging types of sentences with inadequate information on developing word meanings. Although the very best of them, such as W. F. Leopold's classic *Speech Development of a Bilingual Child*, continue to be a rich resource for con-



CHILDREN'S SPEECH IS STUDIED to determine what grammatical rules, which describe how language is structured, they have developed. The author, shown here recording the language output of two young children, works with children in their homes so that their speech is as unconstrained as possible. The search for the regularities in children's language has revealed that in any area of language ac-

quisition they follow the same basic procedure: hypothesizing rules, trying them out and then modifying them. Children formulate the most general rules first and apply them across the board; narrower rules are added later, with exceptions and highly irregular forms. Examples discussed in article concern children learning English, but same process has been observed in children learning other languages.

temporary investigators, advances in audio and video recording equipment have made modern diaries generally much more valuable. In the 1960's, however, new discoveries inspired linguists and psychologists to approach the study of language acquisition in a new, systematic way, oriented less toward long-term diary keeping and more toward a search for the patterns in a child's speech at any given time.

An event that revolutionized linguistics was the publication in 1957 of Noam Chomsky's *Syntactic Structures*. Chomsky's investigation of the structure of grammars revealed that language systems were far deeper and more complex than had been suspected. And of course if linguistics was more complicated, then language learning had to be more complicated. In the 21 years since the publication of *Syntactic Structures* the disciplines of linguistics and child language have come of age. The study of the acquisition of language has benefited not only from the increasingly sophisticated understanding of linguistics but also from the improved understanding of cognitive development as it is related to language. The improvements in recording technology have made experimentation in this area more reliable and more detailed, so that investigators framing new and deeper questions are able to accurately capture both rare occurrences and developing structures.

The picture that is emerging from the more sophisticated investigations reveals the child as an active language learner, continually analyzing what she hears and proceeding in a methodical, predictable way to put together the jigsaw puzzle of language. Different children learn language in similar ways. It is

not known how many processes are involved in language learning, but the few that have been observed appear repeatedly, from child to child and from language to language. All the examples I shall discuss here concern children who are learning English, but identical processes have been observed in children learning French, Russian, Finnish, Chinese, Zulu and many other languages.

Children learn the systems of grammar—phonology, syntax, semantics, lexicon and pragmatics—by breaking each system down into its smallest combinable parts and then developing rules for combining the parts. In the first two years of life a child spends much time working on one part of the task, disassembling the language to find the separate sounds that can be put together to form words and the separate words that can be put together to form sentences. After the age of two the basic process continues to be refined, and many more sounds and words are produced. The other part of language acquisition—developing rules for combining the basic elements of language—is carried out in a very methodical way: the most general rules are hypothesized first, and as time passes they are successively narrowed down by the addition of more precise rules applying to a more restricted set of sentences. The procedure is the same in any area of language learning, whether the child is acquiring syntax or phonology or semantics. For example, at the earliest stage of acquiring negatives a child does not have at her command the same range of negative structures that an adult does. She has constructed only a single very general rule: Attach "no" to the beginning of any sentence constructed by the other rules of grammar.

At this stage all negative sentences will be formed according to that rule.

Throughout the acquisition process a child continually revises and refines the rules of her internal grammar, learning increasingly detailed subrules until she achieves a set of rules that enables her to create the full array of complex, adult sentences. The process of refinement continues at least until the age of 10 and probably considerably longer for most children. By the time a child is six or seven, however, the changes in her grammar may be so subtle and sophisticated that they go unnoticed. In general children approach language learning economically, devoting their energy to broad issues before dealing with specific ones. They cope with clear-cut questions first and sort out the details later, and they may adopt any one of a variety of methods for circumventing details of a language system they have not yet dealt with.

Prerequisites for Language

Although some children verbalize much more than others and some increase the length of their utterances much faster than others, all children overgeneralize a single rule before learning to apply it more narrowly and before constructing other less widely applicable rules, and all children speak in one-word sentences before they speak in two-word sentences. The similarities in language learning for different children and different languages are so great that many linguists have believed at one time or another that the human brain is pre-programmed for language learning. Some linguists continue to believe language is innate and only the surface details of the particular language spoken in a child's environment need to be learned. The speed with which children learn language gives this view much appeal. As more parallels between language and other areas of cognition are revealed, however, there is greater reason to believe any language specialization that exists in the child is only one aspect of more general cognitive abilities of the brain.

Whatever the built-in properties the brain brings to the task of language learning may be, it is now known that a child who hears no language learns no language, and that a child learns only the language spoken in her environment. Most infants coo and babble during the first six months of life, but congenitally deaf children have been observed to cease babbling after six months, whereas normal infants continue to babble. A child does not learn language, however, simply by hearing it spoken. A boy with normal hearing but with deaf parents who communicated by the American Sign Language was exposed to television every day so that he would learn English. Because the child

(1)	BOY	CAT	MAN	HOUSE	FOOT FEET
(2)			MEN		
(3)	BOYS	CATS	MANS	HOUSE	FOOTS FEETS
(4)	BOYS _{aZ}	CATS _{aZ} CAT _{aZ}	MANS _{aZ} MEN _{aZ}	HOUS _{aZ}	FOOTS _{aZ} FEETS _{aZ}
(5)	BOYS	CATS	MANS	HOUSES	FEETS
(6)	BOYS	CATS	MEN	HOUSES	FEET

SORTING OUT OF COMPETING PRONUNCIATIONS that results in the correct plural forms of nouns takes place in the six stages shown in this illustration. Children usually learn the singular forms of nouns first (1), although in some cases an irregular plural form such as "feet" may be learned as a singular or as a free variant of a singular. Other irregular plurals may appear for a brief period (2), but soon they are replaced by plurals made according to the most general rule possible: To make a noun plural add the sound "s" or "z" to it (3). Words such as "house" or "rose," which already end in an "s"- or "z"-like sound, are usually left in their singular forms at this stage. When words of this type do not have irregular plural forms, adults make them plural by adding an "əz" sound. (The vowel "ə" is pronounced like the unstressed word "a.") Some children demonstrate their mastery of this usage by tacking "əz" endings indiscriminately onto nouns (4). That stage is brief and use of the ending is quickly narrowed down (5). At this point only irregular plurals remain to be learned, and since no new rule-making is needed, children may go on to harder problems and leave final stage (6) for later.

0044-4

(1)	WALK	PLAY	NEED	COME	GO
(2)				CAME	WENT
(3)	WALKED	PLAYED	NEED	COMED	GOED
(4)	WALKEDəD	PLAYEDəD	NEEDəD	CAMEDəD COMEDəD	GOED WENTəD
(5)	WALKED	PLAYED	NEEDED	COMED	GOED
(6)	WALKED	PLAYED	NEEDED	CAME	WENT

DEVELOPMENT OF PAST-TENSE FORMS OF VERBS also takes place in six stages. After the present-tense forms are learned (1) irregular past-tense forms may appear briefly (2). The first and most general rule that is postulated is: To put a verb into the past tense add a "t" or "d" sound (3). In adult speech verbs such as "want" or "need," which already end in a "t" or "d" sound, are put into the past tense by adding "əd" sound. Many children go through brief stage in which they add "əd" endings to any existing verb forms (4). Once the use of "əd" ending has been narrowed down (5), only irregular past-tense forms remain to be learned (6).

was asthmatic and was confined to his home he interacted only with people at home, where his family and all their visitors communicated in sign language. By the age of three he was fluent in sign language but neither understood nor spoke English. It appears that in order to learn a language a child must also be able to interact with real people in that language. A television set does not suffice as the sole medium for language learning because, even though it can ask questions, it cannot respond to a child's answers. A child, then, can develop language only if there is language in her environment and if she can employ that language to communicate with other people in her immediate environment.

Caretaker Speech

In constructing a grammar children have only a limited amount of information available to them, namely the language they hear spoken around them. (Until about the age of three a child models her language on that of her parents; afterward the language of her peer group tends to become more important.) There is no question, however, that the language environments children inhabit are restructured, usually unintentionally, by the adults who take care of them. Recent studies show that there are several ways caretakers systematically modify the child's environment, making the task of language acquisition simpler.

Caretaker speech is a distinct speech register that differs from others in its simplified vocabulary, the systematic phonological simplification of some words, higher pitch, exaggerated intonation, short, simple sentences and a high proportion of questions (among mothers) or imperatives (among fathers). Speech with the first two characteristics is formally designated Baby Talk. Baby Talk is a subsystem of caretaker speech

that has been studied over a wide range of languages and cultures. Its characteristics appear to be universal: in languages as diverse as English, Arabic, Comanche and Gilyak (a Paleo-Siberian language) there are simplified vocabulary items for terms relating to food, toys, animals and body functions. Some words are phonologically simplified, frequently by the duplication of syllables, as in "wawa" for "water" and "choo-choo" for "train," or by the reduction of consonant clusters, as in "tummy" for "stomach" and "scambled eggs" for "scrambled eggs." (Many types of phonological simplification seem to mimic the phonological structure of an infant's own early vocabulary.)

Perhaps the most pervasive characteristic of caretaker speech is its syntactic simplification. While a child is still babbling, adults may address long, complex sentences to her, but as soon as she begins to utter meaningful, identifiable words they almost invariably speak to her in very simple sentences. Over the next few years of the child's language development the speech addressed to her by her caretakers may well be describable by a grammar only six months in advance of her own.

The functions of the various language modifications in caretaker speech are not equally apparent. It is possible that higher pitch and exaggerated intonation serve to alert a child to pay attention to what she is hearing. As for Baby Talk, there is no reason to believe the use of phonologically simplified words in any way affects a child's learning of pronunciation. Baby Talk may have only a psychological function, marking speech as being affectionate. On the other hand, syntactic simplification has a clear function. Consider the speech adults address to other adults; it is full of false starts and long, rambling, highly complex sentences. It is not surprising that elaborate theories of innate language ability arose

during the years when linguists examined the speech adults addressed to adults and assumed that the speech addressed to children was similar. Indeed, it is hard to imagine how a child could derive the rules of language from such input. The wide study of caretaker speech conducted over the past eight years has shown that children do not face this problem. Rather it appears they construct their initial grammars on the basis of the short, simple, grammatical sentences that are addressed to them in the first year or two they speak.

Correcting Language

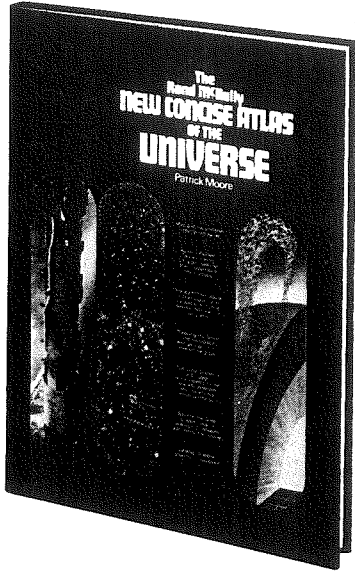
Caretakers simplify children's language-analysis task in other ways. For example, adults talk with other adults about complex ideas, but they talk with children about the here and now, minimizing discussion of feelings, displaced events and so on. Adults accept children's syntactic and phonological "errors," which are a normal part of the acquisition process. It is important to understand that when children make such errors, they are not producing flawed or incomplete replicas of adult sentences; they are producing sentences that are correct and grammatical with respect to their own current internalized grammar. Indeed, children's errors are essential data for students of child language because it is the consistent departures from the adult model that indicate the nature of a child's current hypotheses about the grammar of language. There are a number of memorized, unanalyzed sentences in any child's output of language. If a child says, "Nobody likes me," there is no way of knowing whether she has memorized the sentence intact or has figured out the rules for constructing the sentence. On the other hand, a sentence such as "Nobody don't like me" is clearly not a memorized form but one that reflects an intermediate stage of a developing grammar.

Since each child's utterances at a particular stage are from her own point of view grammatically correct, it is not surprising that children are fairly impervious to the correction of their language by adults, indeed to any attempts to teach them language. Consider the boy who lamented to his mother, "Nobody don't like me." His mother seized the opportunity to correct him, replying, "Nobody likes me." The child repeated his original version and the mother her modified one a total of eight times until in desperation the mother said, "Now listen carefully! Nobody likes me." Finally her son got the idea and dutifully replied, "Oh! Nobody don't likes me." As the example demonstrates, children do not always understand exactly what it is the adult is correcting. The information the adult is trying to impart may be at odds with the information in the child's head, namely the rules the child

940

0049-5

Vital Update for Buffs, Students, Professionals



The Rand McNally NEW CONCISE ATLAS OF THE UNIVERSE

by Patrick Moore

10¾" x 14½", 192 pages
0-528-83031-7 \$29.95
Nearly 1,000 illustrations,
400 in full color

On matters of universal importance, count on "the atlas people" and astronomer Patrick Moore to keep you current. This usable, essentially definitive reference makes the most up-to-date, accurate information instantly available. For fact-finding convenience, maps and scientific data are arranged into four "atlases": The Earth from Space; The Moon; The Solar System; and The Stars. Superbly executed illustrations are based on information relayed from the latest satellite photographs, with charts and diagrams for added clarification. A book that invites hours of pleasurable browsing, and an invaluable current resource for student, space enthusiast, or professional.

Wherever books are sold.

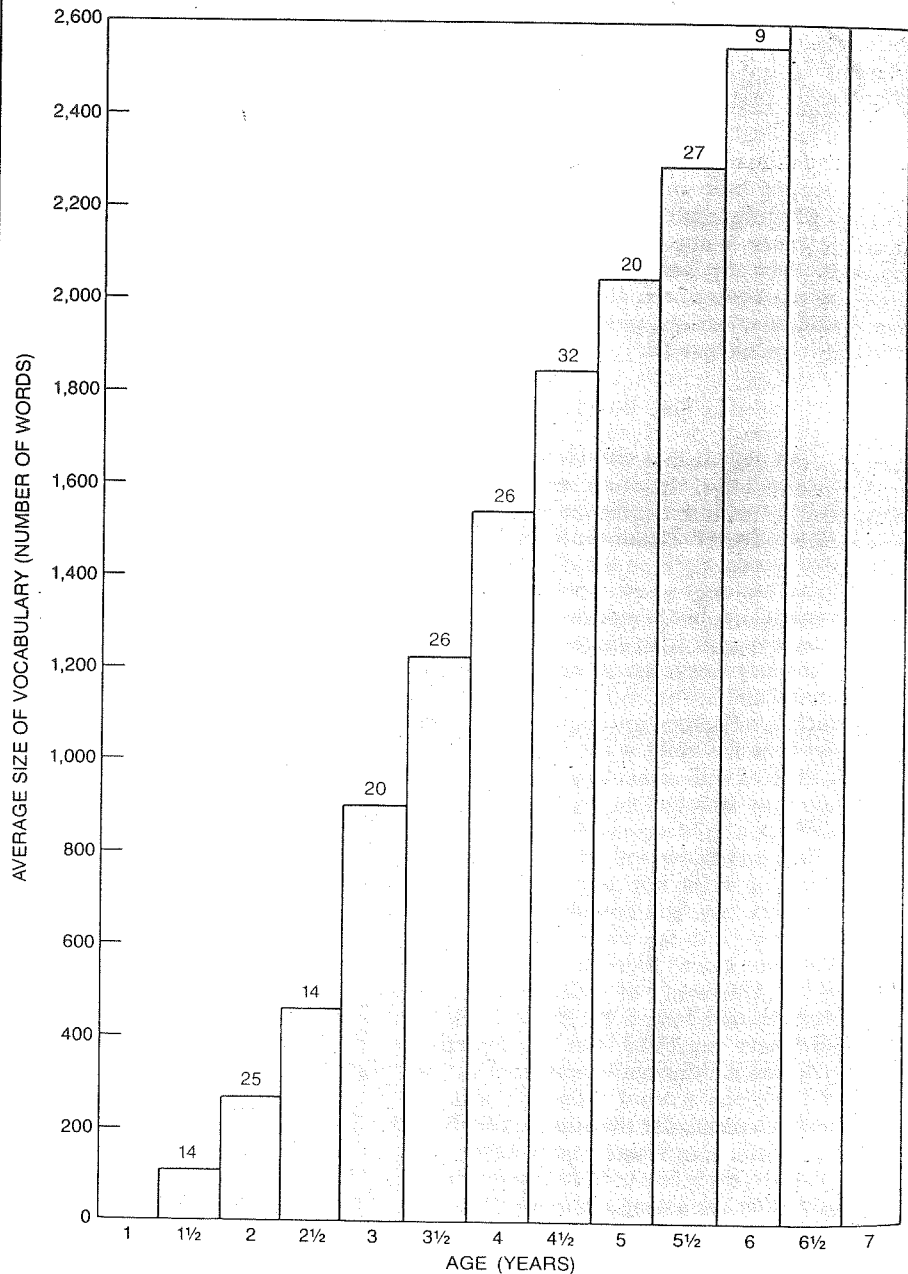
Rand McNally
Box 7600 • Chicago, Illinois 60680



is postulating for producing language. The surface correction of a sentence does not give the child a clue about how to revise the rule that produced the sentence.

It seems to be virtually impossible to speed up the language-learning process. Experiments conducted by Russian investigators show that it is extremely difficult to teach children a detail of language more than a few days before they would learn it themselves. Adults sometimes do, of course, attempt to teach children rules of language, expecting them to learn by imitation, but Courtney B. Cazden of Harvard University found that children benefit less from frequent adult correction of their errors than from true conversational interaction. Indeed, correcting errors can inter-

rupt that interaction, which is, after all, the function of language. (One way children may try to secure such interaction is by asking "Why?" Children go through a stage of asking a question repeatedly. It serves to keep the conversation going, which may be the child's real aim. For example, a two-and-a-half-year-old named Stanford asked "Why?" and was given the nonsense answer: "Because the moon is made of green cheese." Although the response was not at all germane to the conversation, Stanford was happy with it and again asked "Why?" Many silly answers later the adult had tired of the conversation but Stanford had not. He was clearly not seeking information. What he needed was to practice the form of social conversation before dealing with its func-



CHILDREN'S AVERAGE VOCABULARY SIZE increases rapidly between the ages of one and a half and six and a half. The number of children tested in each sample age group is shown in color. Data are based on work done by Madorah E. Smith of University of Hawaii.

tion. Asking "Why?" served that purpose well.)

In point of fact adults rarely correct children's ungrammatical sentences. For example, one mother, on hearing "Tommy fall my truck down," turned to Tommy with "Did you fall Stevie's truck down?" Since imitation seems to have little role in the language-acquisition process, however, it is probably just as well that most adults are either too charmed by children's errors or too busy to correct them.

Practice does appear to have an important function in the child's language-learning process. Many children have been observed purposefully practicing language when they are alone, for example in a crib or a playpen. Ruth H. Weir of Stanford University hid a tape recorder in her son's bedroom and recorded his talk after he was put to bed. She found that he played with words and phrases, stringing together sequences of similar sounds and of variations on a phrase or on the use of a word: "What color... what color blanket... what color mop... what color glass... what color TV... red ant... fire... like lipstick... blanket... now the blue blanket... what color TV... what color horse... then what color table... then what color fire... here yellow spoon." Children who do not have much opportunity to be alone may use dialogue in a similar fashion. When Weir tried to record the bedtime monologues of her second child, whose room adjoined that of the first, she obtained through-the-wall conversations instead.

The One-Word Stage

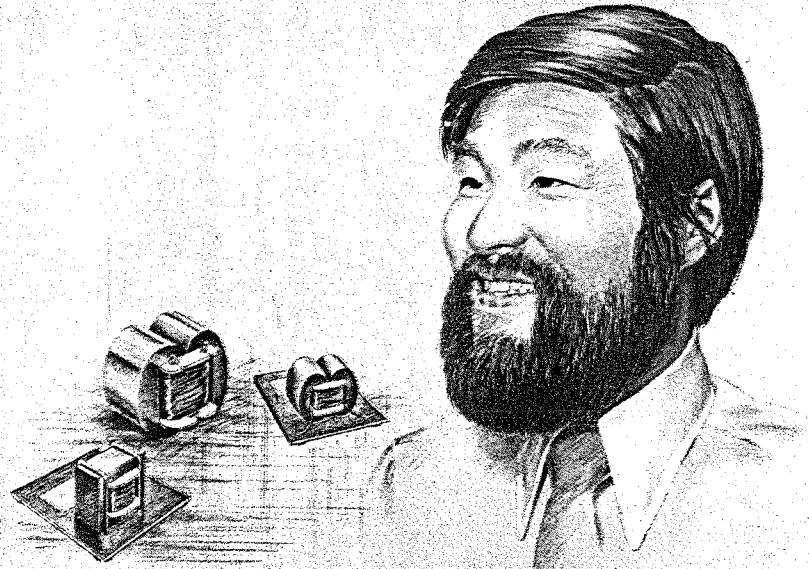
The first stage of child language is one in which the maximum sentence length is one word; it is followed by a stage in which the maximum sentence length is two words. Early in the one-word stage there are only a few words in a child's vocabulary, but as months go by her lexicon expands with increasing rapidity. The early words are primarily concrete nouns and verbs; more abstract words such as adjectives are acquired later. By the time the child is uttering two-word sentences with some regularity, her lexicon may include hundreds of words.

When a child can say only one word at a time and knows only five words in all, choosing which one to say may not be a complex task. But how does she decide which word to say when she knows 100 words or more? Patricia M. Greenfield of the University of California at Los Angeles and Joshua H. Smith of Stanford have suggested that an important criterion is informativeness, that is, the child selects a word reflecting what is new in a particular situation. Greenfield and Smith also found that a newly acquired word is first used for naming and only later for asking for something.

Superficially the one-word stage

CORPORATE DEVELOPMENT CENTER REPORTS . . .

On Metallic Glasses in Power Transformers for Saving Energy



A group under Dr. R. Hasegawa has developed a ternary metallic glass, METGLAS® 2605S, of nominal composition $\text{Fe}_{82}\text{B}_{12}\text{Si}_6$, that combines excellent soft magnetic properties with improved thermal stability and magnetic strength.

For sine flux conditions, power transformers (60 Hz) using heat-treated METGLAS 2605S exhibit a core loss of only 0.19 watts/Kg. This is nearly four times lower than the core loss of the widely-used Si/Fe power transformer material, grade M-4 (1.3 watts/Kg); and is even well below that for Fe-B metallic glasses.

METGLAS 2605S exhibits excellent DC properties which include a coercivity of 0.03 Oe, saturation induction of 16.1 Kgauss, and remanence of 12 Kgauss. Permeability at 20 gauss induction reaches 8000.

Relative to Fe-B metallic glasses, the new material is comparatively inexpensive and more easily fabricated. It anneals at temperatures about one-third those of conventional silicon-iron materials (400°C vs 800-1300°C). The new material is available in the form of continuous ribbons 50 μm thick and up to 5 cm wide (0.002 x 2 in.).

METGLAS 2605S is one of a series of iron-rich Fe-B-Si glassy alloys developed at the Corporate Development Center. Those interested in additional information are invited to write: Allied Chemical Corporation/Corporate Development Center, Attention: Dr. L. A. Davis, P. O. Box 1021R, Morristown, New Jersey 07960.

*Registered trademark of Allied Chemical Corporation



0049-6

95

STAGE 1	No . . . wipe finger. No a boy bed. No singing song. No the sun shining. No money. No sit there. No play that. No fall! Not . . . fit. Not a teddy bear. More . . . no. Wear mitten no.
STAGE 2	I can't catch you. I can't see you. We can't talk. You can't dance. I don't want it. I don't like him. I don't know his name. No pinch me. Book say no. Touch the snow no. This a radiator no. No square . . . is clown. Don't bite me yet. Don't leave me. Don't wake me up . . . again. He not little, he big. That no fish school. That no Mommy. There no squirrels. He no bite you. I no want envelope. I no taste them.
STAGE 3	We can't make another broom. I don't want cover on it. I gave him some so he won't cry. No, I don't have a book. I am not a doctor. It's not cold. Don't put the two wings on. I didn't did it. You didn't caught me. I not hurt him. Ask me if I not made mistake. Because I don't want somebody to wake me up. I didn't see something. I isn't . . . I not sad. This not ice cream. This no good. I not crying. That not turning. He not taking the walls down.

THREE STAGES in the acquisition of negative sentences were studied by Ursula Bellugi of the Salk Institute for Biological Studies and Edward S. Klima of the University of California at San Diego. They observed that in the first stage almost all negative sentences appear to be formulated according to the rule: Attach "no" or "not" to the beginning of a sentence to make it negative. In the second stage additional rules are postulated that allow the formation of sentences in which "no," "not," "can't" and "don't" appear after the subject and before the verb. In the third stage several issues remain to be worked out, in particular the agreement of pronouns in negative sentences (*dark color*), the inclusion of the forms of the verb "to be" (*gray*) and the correct use of the auxiliary "do" (*white*). In adult speech the auxiliary "do" often carries tense and other functional markings such as the negative; children in third stage may replace it by "not" or use it redundantly to mark tense that is already marked on the main verb.

seems easy to understand: a child says one word at a time, and so each word is a complete sentence with its own sentence intonation. Ten years ago a child in the one-word stage was thought to be learning word meanings but not syntax. Recently, however, students of child language have seen less of a distinction between the one-word stage as a period of word learning and the subsequent period, beginning with the two-word stage, as one of syntax acquisition. It now seems clear that the infant is engaged in an enormous amount of syntactic analysis in the one-word stage, and indeed that her syntactic abilities are reflected in her utterances and in her accurate perception of multiword sentences addressed to her.

Ronald Scollon of the University of Hawaii and Lois Bloom of Columbia University have pointed out independently that important patterns in word choice in the one-word stage can be found by examining larger segments of children's speech. Scollon observed that a 19-month-old named Brenda was able to use a vertical construction (a series of one-word sentences) to express what an adult might say with a horizontal construction (a multiword sentence). Brenda's pronunciation, which is represented phonetically below, was imperfect and Scollon did not understand her words at the time. Later, when he transcribed the tape of their conversation, he heard the sound of a passing car immediately preceding the conversation and was able to identify Brenda's words as follows:

Brenda: "Car [pronounced 'ka']. Car. Car. Car."
 Scollon: "What?"
 Brenda: "Go. Go."
 Scollon: [Undecipherable.]
 Brenda: "Bus [pronounced 'baish']. Bus. Bus. Bus. Bus. Bus. Bus. Bus. Bus."
 Scollon: "What? Oh, bicycle? Is that what you said?"
 Brenda: "Not ['na']."
 Scollon: "No?"
 Brenda: "Not."
 Scollon: "No. I got it wrong."

Brenda was not yet able to combine two words syntactically to express "Hearing that car reminds me that we went on the bus yesterday. No, not on a bicycle." She could express that concept, however, by combining words sequentially. Thus the one-word stage is not just a time for learning the meaning of words. In that period a child is developing hypotheses about putting words together in sentences, and she is already putting sentences together in meaningful groups. The next step will be to put two words together to form a single sentence.

The Two-Word Stage

The two-word stage is a time for experimenting with many binary semantic-syntactic relations such as possessor-

possessed ("Mommy sock"), actor-action ("Cat sleeping") and action-object ("Drink soup"). When two-word sentences first began to appear in Brenda's speech, they were primarily of the following forms: subject noun and verb (as in "Monster go"), verb and object (as in "Read it") and verb or noun and location (as in "Bring home" and "Tree down"). She also continued to use vertical constructions in the two-word stage, providing herself with a means of expressing ideas that were still too advanced for her syntax. Therefore once again a description of Brenda's isolated sentences does not show her full abilities at this point in her linguistic development. Consider a later conversation Scollon had with Brenda:

Brenda: "Tape corder. Use it. Use it."
 Scollon: "Use it for what?"
 Brenda: "Talk. Corder talk. Brenda talk."

Brenda's use of vertical constructions to express concepts she is still unable to encode syntactically is just one example of a strategy employed by children in all areas of cognitive development. As Jean Piaget of the University of Geneva and Dan I. Slobin of the University of California at Berkeley put it, new forms are used for old functions and new functions are expressed by old forms. Long before Brenda acquired the complex syntactic form "Use the tape recorder to record me talking" she was able to use her old forms—two-word sentences and vertical construction—to express the new function. Later, when that function was old, she would develop new forms to express it. The controlled dovetailing of form and function can be observed in all areas of language acquisition. For example, before children acquire the past tense they may employ adverbs of time such as "yesterday" with present-tense verbs to express past time, saying "I do it yesterday" before "I dood it."

Bloom has provided a rare view of an intermediate stage between the one-word and the two-word stages in which the two-word construction—a new form—served only an old function. For several weeks Bloom's daughter Alison uttered two-word sentences all of which included the word "wida." Bloom tried hard to find the meaning of "wida" before realizing that it had no meaning. It was, she concluded, simply a placeholder. This case is the clearest ever reported of a new form preceding new functions. The two-word stage is an important time for practicing functions that will later have expanded forms and practicing forms that will later expand their functions.

Telegraphic Speech

There is no three-word stage in child language. For a few years after the end of the two-word stage children do produce rather short sentences, but the al-

0049-8

most inviolable length constraints that characterized the first two stages have disappeared. The absence of a three-word stage has not been satisfactorily explained as yet; the answer may have to do with the fact that many basic semantic relations are binary and few are ternary. In any case a great deal is known about the sequential development in the language of the period following the

two-word stage. Roger Brown of Harvard has named that language telegraphic speech. (It should be noted that there is no specific age at which a child enters any of these stages of language acquisition and further that there is no particular correlation between intelligence and speed of acquisition.)

Early telegraphic speech is characterized by short, simple sentences made up

primarily of content words: words that are rich in semantic content, usually nouns and verbs. The speech is called telegraphic because the sentences lack function "words": tense endings on verbs and plural endings on nouns, prepositions, conjunctions, articles and so on. As the telegraphic-speech stage progresses, function words are gradually added to sentences. This process has possibly been studied more thoroughly than any other in language acquisition, and a fairly predictable order in the addition of function words has been observed. The same principles that govern the order of acquisition of function words in English have been shown to operate in many other languages, including some, such as Finnish and Russian, that express the same grammatical relations with particularly rich systems of noun and verb suffixes.

In English many grammatical relations are represented by a fixed word order. For example, in the sentence "The dog followed Jamie to school" it is clear it is the dog that did the following. Normal word order in English requires that the subject come before the verb, and so people who speak English recognize "the dog" as the subject of the sentence. In other languages a noun may be marked as a subject not by its position with respect to the other words in the sentence but by a noun suffix, so that in adult sentences word order may be quite flexible. Until children begin to acquire suffixes and other function words, however, they employ fixed word order to express grammatical relations no matter how flexible adult word order may be. In English the strong propensity to follow word order rigidly shows up in children's interpretations of passive sentences such as "Jamie was followed by the dog." At an early age children may interpret some passive sentences correctly, but by age three they begin to ignore the function words such as "was" and "by" in passive sentences and adopt the fixed word-order interpretation. In other words, since "Jamie" appears before the verb, Jamie is assumed to be the actor, or the noun doing the following.

Function Words

In spite of its grammatical dependence on word order, the English language makes use of enough function words to illustrate the basic principles that determine the order in which such words are acquired. The progressive tense ending "-ing," as in "He going," is acquired first, long before the present-tense third-person singular ending "-s," as in "He goes." The "-s" itself is acquired long before the past tense endings, as in "He goed." Once again the child proves to be a sensible linguist, learning first the tense that exhibits the least variation in form. The "-ing" ending is pronounced only one way, regard-

CHILD'S LEXICAL ITEM	FIRST REFERENTS	OTHER REFERENTS IN ORDER OF OCCURRENCE	GENERAL AREA OF SEMANTIC EXTENSION
MOOI	MOON	CAKE ROUND MARKS ON WINDOWS WRITING ON WINDOWS AND IN BOOKS ROUND SHAPES IN BOOKS TOOLING ON LEATHER BOOK COVERS ROUND POSTMARKS LETTER "O"	SHAPE
BOW-WOW	DOG	FUR PIECE WITH GLASS EYES FATHER'S CUFFLINKS PEARL BUTTONS ON DRESS BATH THERMOMETER	SHAPE
KOTIBAIZ	BARS OF COT	LARGE TOY ABACUS TOAST RACK WITH PARALLEL BARS PICTURE OF BUILDING WITH COLUMNS	SHAPE
BÉBÉ	REFLECTION OF CHILD (SELF) IN MIRROR	PHOTOGRAPH OF SELF ALL PHOTOGRAPHS ALL PICTURES ALL BOOKS WITH PICTURES ALL BOOKS	SHAPE
VOV-VOV	DOG	KITTENS HENS ALL ANIMALS AT A ZOO PICTURE OF PIGS DANCING	SHAPE
ASS	GOAT WITH ROUGH HIDE ON WHEELS	THINGS THAT MOVE: ANIMALS, SISTER, WAGON... ALL MOVING THINGS ALL THINGS WITH A ROUGH SURFACE	MOVEMENT TEXTURE
TUTU	TRAIN	ENGINE MOVING TRAIN JOURNEY	MOVEMENT
FLY	FLY	SPECKS OF DIRT DUST ALL SMALL INSECTS CHILD'S OWN TOES CRUMBS OF BREAD A TOAD	SIZE
QUACK	DUCK ON WATER	ALL BIRDS AND INSECTS ALL COINS (AFTER SEEING AN EAGLE ON THE FACE OF A COIN)	SIZE
KOKO	COCKEREL'S CROWING	TUNES PLAYED ON A VIOLIN TUNES PLAYED ON A PIANO TUNES PLAYED ON AN ACCORDION TUNES PLAYED ON A PHONOGRAPH ALL MUSIC MERRY-GO-ROUND	SOUND
DANY	SOUND OF A BELL	CLOCK TELEPHONE DOORBELLS	SOUND

CHILDREN OVERGENERALIZE WORD MEANINGS, using words they acquire early in place of words they have not yet acquired. Eve V. Clark of Stanford University has observed that when a word first appears in a child's lexicon, it refers to a specific object but the child quickly extends semantic domain of word, using it to refer to many other things. Eventually meaning of the word is narrowed down until it coincides with adult usage. Clark found that children most frequently base the semantic extension of a word on shape of its first referent.

goes to 103

less of the pronunciation of the verb to which it is attached. The verb endings "-s" and "-ed," however, vary in their pronunciation: compare "cuts (s)," "cuddles (z)," "crushes (əz)," "walked (t)," "played (d)" and "halted (əd)." (The vowel "ə," called "shwa," is pronounced like the unstressed word "a.") Furthermore, present progressive ("-ing") forms are used with greater frequency than any other tense in the speech children hear. Finally, no verb has an irregular "-ing" form, but some verbs do have irregular third-person present-tense singular forms and many have irregular past-tense forms. (The same pattern of learning earliest those forms that exhibit the least variation shows up much more dramatically in languages such as Finnish and Russian, where the paradigms of inflection are much richer.)

The past tense is acquired after the progressive and present tenses, because the relative time it represents is conceptually more difficult. The future tense ("will" and a verb) is formed regularly in English and is as predictable as the progressive tense, but it is a much more abstract concept than the past tense. Therefore it is acquired much later. In the same way the prepositions "in" and "on" appear earlier than any others, at about the same time as "-ing," but prepositions such as "behind" and "in front of," whose correct usage depends on the speaker's frame of reference, are acquired much later.

It is particularly interesting to note that there are three English morphemes that are pronounced identically but are acquired at different times. They are the plural "-s," the possessive "-s" and the third-person singular tense ending "-s," and they are acquired in the order of

listing. Roman Jakobson of Harvard has suggested that the explanation of this phenomenon has to do with the complexity of the different relations the morphemes signal: the singular-plural distinction is at the word level, the possessive relates two nouns at the phrase level and the tense ending relates a noun and a verb at the clause level.

The forms of the verb "to be"—"is," "are" and so on—are among the last of the function words to be acquired, particularly in their present-tense forms. Past- and future-tense forms of "to be" carry tense information, of course, but present-tense forms are essentially meaningless, and omitting them is a very sensible strategy for a child who must maximize the information content of a sentence and place priorities on linguistic structures still to be tackled.

Plurals

When there are competing pronunciations available, as in the case of the plural and past tenses, the process of sorting them out also follows a predictable pattern. Consider the acquisition of the English plural, in which six distinct stages can be observed. In English, as in many other (but not all) languages, nouns have both singular and plural forms. Children usually use the singular forms first, both in situations where the singular form would be appropriate and in situations where the plural form would be appropriate. In instances where the plural form is irregular in the adult model, however, a child may not recognize it as such and may use it in place of the singular or as a free variant of the singular. Thus in the first stage of acquisition, before either the concept of a plu-

ral or the linguistic devices for expressing a plural are acquired, a child may say "two cat" or point to "one feet."

When plurals begin to appear regularly, the child forms them according to the most general rule of English plural formation. At this point it is the child's overgeneralization of the rule, resulting in words such as "mans," "foots" or "feets," that shows she has hypothesized the rule: Add the sound /s/ or /z/ to the end of a word to make it plural. (The slashes indicate pronounced sounds, which are not to be confused with the letters used in spelling.)

For many children the overgeneralized forms of the irregular nouns are actually the earliest /s/ and /z/ plurals to appear, preceding "boys," "cats" and other regular forms by hours or days. The period of overgeneralization is considered to be the third stage in the acquisition of plurals because for many children there is an intermediate second stage in which irregular plurals such as "men" actually do appear. Concerned parents may regard the change from the second-stage "men" to the third-stage "mans" as a regression, but in reality it demonstrates progress from an individual memorized item to the application of a general rule.

In the third stage the small number of words that already end in a sound resembling /s/ or /z/, such as "house," "rose" and "bush," are used without any plural ending. Adults normally make such words plural by adding the suffix /əz/. Children usually relegate this detail to the remainder pile, to be dealt with at a later time. When they return to the problem, there is often a short fourth stage of perhaps a day, in which the child delightedly demonstrates her

<p>(1) Laura (2:2): Her want some more. Her want some more candy.</p>	<p>(4) Andrew (2:0): Put that on. Andrew put that on.</p>	<p>(7) Jamie (6:0): Jamie: Why are you doing that? Mother: What? Jamie: Why are you writing what I say down? Mother: What? Jamie: Why are you writing down what I say?</p>
<p>(2) Laura (2:2): Where my tiger? Where my tiger book?</p>	<p>(5) Andrew (2:1): All wet. This shoe all wet.</p>	<p>(8) Jamie (6:3): Jamie: Who do you think is the importantest kid in the world except me? Mother: What did you say, Jamie? Jamie: Who do you think is the specialest kid in the world not counting me?</p>
<p>(3) Laura (2:2): Let's dooz this. Let's do this. Let's do this puzzle.</p>	<p>(6) Benjy (2:3): Broke it. Broke it. Broke it I did.</p>	<p>(9) Jamie (6:6): Jamie: Who are you versing? Adult: What? Jamie: I wanted to know who he was playing against.</p> <p>(10) Jamie (6:10): Jamie: I figured something you might like out. Mother: What did you say? Jamie: I figured out something you might like.</p>

CHILDREN CORRECT THEIR SPEECH in ways that reflect the improvements they are currently making on their internal grammar. For example, Laura (1-3) is increasing the length of her sentences, encoding more information by embellishing a noun phrase. Andrew (4, 5) and Benjy (6) appear to be adding subjects to familiar verb-

phrase sentences. Jamie (7-10) seems to be working on much more subtle refinements such as the placement of verb particles, for example the "down" of "writing down." (Each child's age at time of correction is given in years and months.) Corrections shown here were recorded by Judy S. Reilly of University of California at Los Angeles.

0049-10

FACULTY POSITIONS
AT
**KUWAIT
UNIVERSITY**

FOR THE
79/80 ACADEMIC YEAR

Applications now being accepted for teaching posts at Kuwait University for the coming academic year. Contracts to begin September 1979 for a two year period, renewable if agreeable to both parties.

Candidates are being sought in the following field(s) of specialization:

DEPARTMENT OF BOTANY & MICROBIOLOGY:

Paleobotany, Medical Microbiology, Plant Taxonomy.

REQUIREMENTS:

1. Applicant must hold Ph.D. in specialized area.
2. Applicant must currently hold an academic post in an accredited University or research center.

Language of Instruction:
English

If you meet the qualifications, and wish to obtain an application form, please send a self-addressed envelope to the Cultural Division at the following address:

**EMBASSY OF
THE STATE OF
KUWAIT**

Cultural Division
4340 Connecticut Avenue,
N.W.
Suite 500
Washington, D.C. 20008

You will receive an instruction sheet indicating what materials to send to Kuwait along with your application. Please do not inquire by phone.

solution by tacking /əz/ endings indiscriminately onto nouns no matter what sound they end in and no matter how many other plural markings they may already have. A child may wake up one morning and throw herself into this stage with all the zeal of a kitten playing with its first ball of string.

Within a few days the novelty wears off and the child enters a less flamboyant fifth stage, in which only irregular plurals still deviate from the model forms. The rapid progression through the fourth stage does not mean that she suddenly focused her attention on the problem of /əz/ plurals. It is more likely that she had the problem at the back of her mind throughout the third stage. She was probably silently formulating hypotheses about the occurrence of /əz/ and testing them against the plurals she was hearing. Finding the right rule required discovering the phonological specification of the class of nouns that take /əz/ plurals.

Arriving at the sixth and final stage in the acquisition of plurals does not require the formulation of any new rules. All that is needed is the simple memorizing of irregular forms. Being rational, the child relegates such minor details to the lowest-priority remainder pile and turns her attention to more interesting linguistic questions. Hence a five-year-old may still not have entered the last stage. In fact, a child in the penultimate stage may not be at all receptive to being taught irregular plurals. For example, a child named Erica pointed to a picture of some "mouses," and her mother corrected her by saying "mice." Erica and her mother each repeated their own version two more times, and then Erica resolved the standoff by turning to a picture of "ducks." She avoided the picture of the mice for several days. Two years later, of course, Erica was perfectly able to say "mice."

Negative Sentences

One of the pioneering language-acquisition studies of the 1960's was undertaken at Harvard by a research group headed by Brown. The group studied the development in the language of three children over a period of several years. Two members of the group, Ursula Bellugi and Edward S. Klima, looked specifically at the changes in the children's negative sentences over the course of the project. They found that negative structures, like other subsystems of the syntactic component of grammar, are acquired in an orderly, rule-governed way.

When the project began, the forms of negative sentences the children employed were quite simple. It appeared that they had incorporated the following rule into their grammar: To make a sentence negative attach "no" or "not" to the beginning of it. On rare occasions,

possibly when a child had forgotten to anticipate the negative, "no" could be attached to the end of a sentence, but negative words could not appear inside a sentence.

In the next stage the children continued to follow this rule, but they had also hypothesized and incorporated into their grammars more complex rules that allowed them to generate sentences in which the negatives "no," "not," "can't" and "don't" appeared after the subject and before the verb. These rules constituted quite an advance over attaching a negative word externally to a sentence. Furthermore, some of the primitive imperative sentences constructed at this stage began with "don't" rather than "no." On the other hand, "can't" never appeared at the beginning of a sentence, and neither "can" nor "do" appeared as an auxiliary, as they do in adult speech: "I can do it." These facts suggest that at this point "can't" and "don't" were unanalyzed negative forms rather than contractions of "cannot" and "do not," but that although "can't" and "don't" each seemed to be interchangeable with "no," they were no longer interchangeable with each other.

In the third stage of acquiring negatives many more details of the negative system had appeared in the children's speech. The main feature of the system that still remained to be worked out was the use of pronouns in negative sentences. At this stage the children said "I didn't see something" and "I don't want somebody to wake me up." The pronouns "somebody" and "something" were later replaced with "nobody" and "nothing" and ultimately with the properly concorded forms "anybody" and "anything."

Many features of telegraphic speech were still evident in the third stage. The form "is" of the verb "to be" was frequently omitted, as in "This no good." In adult speech the auxiliary "do" often functions as a dummy verb to carry tense and other markings; for example, in "I didn't see it," "do" carries the tense and the negative. In the children's speech at this stage "do" appeared occasionally, but the children had not yet figured out its entire function. Therefore in some sentences the auxiliary "do" was omitted and the negative "not" appeared alone, as in "I not hurt him." In other sentences, such as "I didn't did it," the negative auxiliary form of "do" appears to be correct but is actually an unanalyzed, memorized item; at this stage the tense is regularly marked on the main verb, which in this example happens also to be "do."

Many children acquire negatives in the same way that the children in the Harvard study did, but subsequent investigations have shown that there is more than one way to learn a language. Carol B. Lord of U.C.L.A. identified a quite different strategy employed by a

two-year-old named Jennifer. From 24 to 28 months Jennifer used "no" only as a single-word utterance. In order to produce a negative sentence she simply spoke an ordinary sentence with a higher pitch. For example, "I want put it on" spoken with a high pitch meant "I don't want to put it on." Lord noticed that many of the negative sentences adults addressed to Jennifer were spoken with an elevated pitch. Children tend to pay more attention to the beginning and ending of sentences, and in adult speech negative words usually appear in the middle of sentences. With good reason, then, Jennifer seemed to have hypothesized that one makes a sentence negative by uttering it with a higher pitch. Other children have been found to follow the same strategy. There are clearly variations in the hypotheses children make in the process of constructing grammar.

Semantics

Up to this point I have mainly discussed the acquisition of syntactic rules, in part because in the years following the publication of Chomsky's *Syntactic Structures* child-language research in this area flourished. Syntactic rules, which govern the ordering of words in a sentence, are not all a child needs to know about language, however, and after the first flush of excitement over Chomsky's work investigators began to ask questions about other areas of language acquisition. Consider the development of the rules of semantics, which govern the way words are interpreted. Eve V. Clark of Stanford reexamined old diary studies and noticed that the development in the meaning of words during the first several months of the one-word stage seemed to follow a basic pattern.

The first time children in the studies used a word, Clark noted, it seemed to be as a proper noun, as the name of a specific object. Almost immediately, however, the children generalized the word based on some feature of the original object and used it to refer to many other objects. For example, a child named Hildegard first used "tick-tock" as the name for her father's watch, but she quickly broadened the meaning of the word, first to include all clocks, then all watches, then a gas meter, then a fire-hose wound on a spool and then a bathroom scale with a round dial. Her generalizations appear to be based on her observation of common features of shape: roundness, dials and so on. In general the children in the diary studies overextended meanings based on similarities of movement, texture, size and, most frequently, shape.

As the children progressed, the meanings of words were narrowed down until eventually they more or less coincided with the meanings accepted by adult speakers of the language. The narrow-

ing-down process has not been studied intensively, but it seems likely that the process has no fixed end point. Rather it appears that the meanings of words continue to expand and contract through adulthood, long after other types of language acquisition have ceased.

One of the problems encountered in trying to understand the acquisition of semantics is that it is often difficult to determine the precise meaning a child has constructed for a word. Some interesting observations have been made, however, concerning the development of the meanings of the pairs of words that function as opposites in adult language. Margaret Donaldson and George Balfour of the University of Edinburgh asked children from three to five years old which one of two cardboard trees had "more" apples on it. They asked other children of the same age which tree had "less" apples. (Each child was interviewed individually.) Almost all the children in both groups responded by pointing to the tree with more apples on it. Moreover, the children who had been asked to point to the tree with "less" apples showed no hesitation in choosing the tree with more apples. They did not act as though they did not know the meaning of "less"; rather they acted as if they did know the meaning and "less" meant "more."

Subsequent studies have revealed similar systematic error making in the acquisition of other pairs of opposites such as "same" and "different," "big" and "little," "wide" and "narrow" and "tall" and "short." In every case the pattern of learning is the same: one word of the pair is learned first and its meaning is overextended to apply to the other word in the pair. The first word learned is always the unmarked word of the pair, that is, the word adults use when they do not want to indicate either one of the opposites. (For example, in the case of "wide" and "narrow," "wide" is the unmarked word: asking "How wide is the road?" does not suggest that the road is wide, but asking "How narrow is the road?" does suggest that the road is narrow.)

Clark observed a more intricate pattern of error production in the acquisition of the words "before" and "after." Consider the four different types of sentence represented by (1) "He jumped the gate before he patted the dog," (2) "Before he patted the dog he jumped the gate," (3) "He patted the dog after he jumped the gate" and (4) "After he jumped the gate he patted the dog." Clark found that the way the children she observed interpreted sentences such as these could be divided into four stages.

In the first stage the children disregarded the words "before" and "after" in all four of these sentence types and assumed that the event of the first clause took place before the event of the sec-

ond clause. With this order-of-mention strategy the first and fourth sentence types were interpreted correctly but the second and third sentence types were not. In the second stage sentences using "before" were interpreted correctly but an order-of-mention strategy was still adopted for sentences that used "after." Hence sentences of the fourth type were interpreted correctly but sentences of the third type were not. In the next stage both the third and the fourth sentence types were interpreted incorrectly, suggesting that the children had adopted the strategy that "after" actually meant "before." Finally, in the fourth stage both "before" and "after" were interpreted appropriately.

It appears, then, that in learning the meaning of a pair of words such as "more" and "less" or "before" and "after" children acquire first the part of the meaning that is common to both words and only later the part of the meaning that distinguishes the two. Linguists have not yet developed satisfactory ways of separating the components of meaning that make up a single word, but it seems clear that when such components can be identified, it will be established that, for example, "more" and "less" have a large number of components in common and differ only in a single component specifying the pole of the dimension. Beyond the studies of opposites there has been little investigation of the period of semantic acquisition that follows the early period of rampant overgeneralization. How children past the early stage learn the meanings of other kinds of words is still not well understood.

Phonology

Just as children overgeneralize word meanings and sentence structures, so do they overgeneralize sounds, using sounds they have learned in place of sounds they have not yet acquired. Just as a child may use the word "not" correctly in one sentence but instead of another negative word in a second sentence, so may she correctly contrast /p/ and /b/ at the beginnings of words but employ /p/ at the ends of words, regardless of whether the adult models end with /p/ or /b/. Children also acquire the details of the phonological system in very regular ways. The ways in which they acquire individual sounds, however, are highly idiosyncratic, and so for many years the patterns eluded diarists, who tended to look only at the order in which sounds were acquired. Jakobson made a major advance in this area by suggesting that it was not individual sounds children acquire in an orderly way but the distinctive features of sound, that is, the minimal differences, or contrasts, between sounds. In other words, when a child begins to contrast /p/ and /b/, she also begins to contrast

0049-12

all the other pairs of sounds that, like /p/ and /b/, differ only in the absence or presence of vocal-cord vibration. In English these pairs include /t/ and /d/, and /k/ and the hard /g/. It is the acquisition of this contrast and not of the six individual sounds that is predictable. Jakobson's extensive examination of the diary data for a wide variety of languages supported his theory. Almost all current work in phonological theory rests on the theory of distinctive features that grew out of his work.

My own recent work suggests that phonological units even more basic than the distinctive features play an important part in the early acquisition process. At an early stage, when there are relatively few words in a child's repertory, unanalyzed syllables appear to be the basic unit of the sound system. By designating these syllables as unanalyzed I mean that the child is not able to separate them into their component consonants and vowels. Only later in the acquisition process does such division into smaller units become possible. The gradual discovery of successively smaller units that can form the basis of the phonological system is an important part of the process.

At an even earlier stage, before a child has uttered any words, she is accomplishing a great deal of linguistic learning, working with a unit of phonological organization even more primitive than the syllable. That unit can be defined in terms of pitch contours. By the late babbling period children already control the intonation, or pitch modulation, contours of the language they are learning. At that stage the child sounds as if she is uttering reasonably long sentences, and adult listeners may have the impression they are not quite catching the child's words. There are no words to catch, only random strings of babbled sounds with recognizable, correctly produced question or statement intonation contours. The sounds may accidentally be similar to some of those found in adult English. These sentence-length utterances are called sentence units, and in the phonological system of the child at this stage they are comparable to the consonant-and-vowel segments, syllables and distinctive features that appear in the phonological systems of later stages. The syllables and segments that appear when the period of word learning begins are in no way related to the vast repertory of babbling sounds. Only the intonation contours are carried over from the babbling stage into the later period.

No matter what language environment a child grows up in, the intonation contours characteristic of adult speech in that environment are the linguistic information learned earliest. Some recent studies suggest that it is possible to identify the language environment of a child from her babbling intonation during the



WE DON'T HAVE MEETING ROOMS in Jack Daniel's Hollow. But there are plenty of nearby places to hold discussions.

You see, making good whiskey doesn't call for meetings. What you need is clear water and choice grain; experienced Tennesseans to distill your whiskey; and a rickyard for making charcoal to mellow its taste. Happily, we don't have to leave our distillery for any of these good things. And with Cashion's Service Station down the road, we can even hold a meeting now and then.



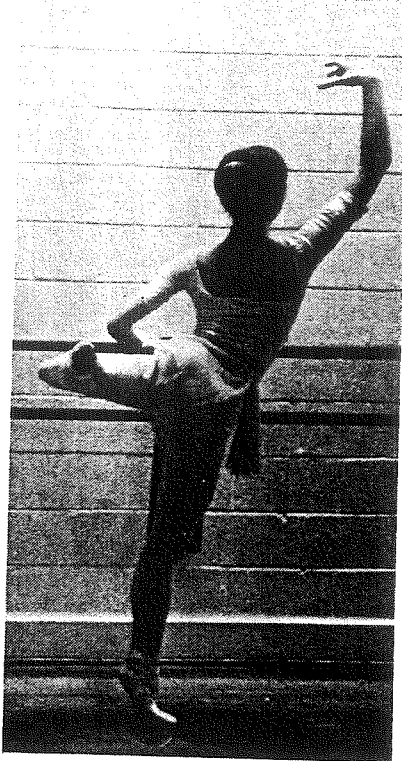
CHARCOAL
MELLOWED
DROPS
BY DROP

Tennessee Whiskey • 90 Proof • Distilled and Bottled by Jack Daniel Distillery
Lem Motlow, Prop., Inc., Lynchburg (Pop. 361), Tennessee 37352

Placed in the National Register of Historic Places by the United States Government

0049-13

America's most demanding sport.



In a study conducted by the Institute of Sports Medicine and Trauma at Lenox Hill Hospital, ballet ranked as the most demanding physical activity ... ahead of basketball, soccer, football and baseball. That's part of why "dance" has become an important part of physical education in our schools. Learn more. Write for our pamphlet, "What Every Parent Should Know About the New Physical Education."



Physical Education Public Information
American Alliance for Health,
Physical Education & Recreation
1201 16th Street, N.W., Washington, D.C. 20036

second year of life. Other studies suggest that children can be distinguished at an even earlier age on the basis of whether or not their language environment is a tone language, that is, a language in which words spoken with different pitches are identifiable as different words, even though they may have the same sequence of consonants and vowels. To put it another way, "ma" spoken with a high pitch and "ma" spoken with a low pitch can be as different to someone speaking a tone language as "ma" and "pa" are to someone speaking English. (Many African and Asian languages are tone languages.) Tones are learned very early, and entire tone systems are mastered long before other areas of phonology. The extremely early acquisition of pitch patterns may help to explain the difficulty adults have in learning the intonation of a second language.

Phonetics

There is one significant way in which the acquisition of phonology differs from the acquisition of other language systems. As a child is acquiring the phonological system she must also learn the phonetic realization of the system: the actual details of physiological and acoustic phonetics, which call for the coordination of a complex set of muscle movements. Some children complete the process of learning how to pronounce things earlier than others, but differences of this kind are usually not related to the learning of the phonological system. Brown had what has become a classic conversation with a child who referred to a "fis." Brown repeated "fis," and the child indignantly corrected him, saying "fis." After several such exchanges Brown tried "fish," and the child, finally satisfied, replied, "Yes, fis." It is clear that although the child was still not able to pronounce the distinction between the sounds "s" and "sh," he knew such a systematic phonological distinction existed. Such phonetic muddying of the phonological waters complicates the study of this area of acquisition. Since the child's knowledge of the phonological system may not show up in her speech, it is not easy to determine what a child knows about the system without engaging in complex experimentation and creative hypothesizing.

Children whose phonological system produces only simple words such as "mama" and "papa" actually have a greater phonetic repertory than their utterances suggest. Evidence of that repertory is found in the late babbling stage, when children are working with sentence units and are making a large array of sounds. They do not lose their phonetic ability overnight, but they must constrain it systematically. Going on to the next-higher stage of language learning, the phonological system, is more



LEAR SIEGLER TERMINALS

- ADM3A, Kit \$745.00
- ADM3A, assembled 835.00
- ADM1A 1,445.00

Call for other models pricing, complete microprocessors line, peripherals & terminals.

Texas Instruments

- TI-57 \$48.50
- TI-58 87.50
- TI-59 in stock 208.50
- SR-60A 1995.00
- TI-Programmer 48.00
- PC-100A 145.50
- SR-40 \$19.95
- MBA 52.95
- TI-55 43.50
- TI-1750 LCD 16.50
- TI-25 LCD 26.50
- TI-745 Terminal 1625.00

HEWLETT PACKARD

- HP-31E New 49.50
- HP-32E New 65.50
- HP-33E New 82.50
- HP-37E New 61.50
- HP-38E Financial 98.50
- HP-67 352.00
- HP-97 584.50
- HP-29C 149.00

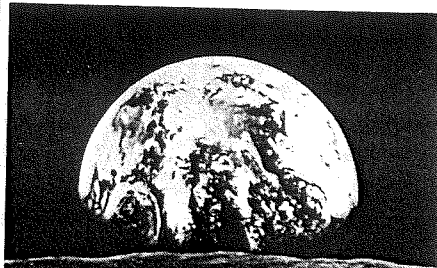
SCM TYPEWRITER SPECIAL

- SCM-2200 \$249.00
- SCM-1200 219.00
- CLASSIC 12 144.00

All units shipped in original cartons with accessories according to manufacturer's specifications. Send money order, personal check (2 weeks to clear). In Illinois add 5% sales tax. Add \$4.50 min. shipping charges per unit. WE SHIP UPS. Subject to availability. Above prices are for mail order and prepaid only. Send mail orders. We also carry microprocessors and terminals.

Nabich's Inc.

519 DAVIS ST EVANSTON, ILL. 60201
TEL: 312-869-6140



COSMOS, EARTH, AND MAN

A Short History of the Universe

Preston Cloud

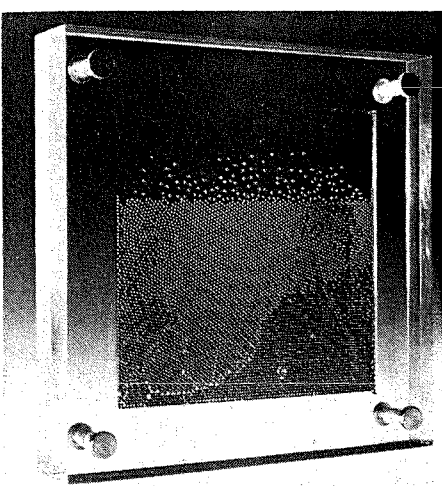
"This book ranges from an account of the nature of matter to a consideration of modern ideas on the evolution and destiny of man. I know of nothing covering the ground that is anything as good."

—G. Evelyn Hutchinson
Illus. \$14.95

Yale University Press
New Haven and London

Photo: NASA

0049-14



1/3 ACTUAL SIZE
ATOMIX
by Francois Dalleget

6000 steel balls in free motion
Tilt it! Rotate it!
Create for yourself the
crystalline geometry of nature!

"Marvellous to look at... simulates the process of atomic surface diffusion." *New Scientist*
"This season's most sensual plaything!" *New York Magazine*
"Making instant art... Atomix is hypnotic!" *The New York Times*
"Atomix" is in the Museum of Modern Art design collection.

\$95.00 postpaid - Mail your check or money order to: ARTORIUM, 330 East 59th Street, New York, N.Y. 10022

SPEAKER INFORMATION KIT.



Get 70 pages of speaker facts in three fact-packed publications.

Speakerlab's Speaker Operating Manual covers everything you need to know to get the best performance out of any loudspeaker, including placement, wire gauges and allowable lengths, amp overloads, room acoustics, L-pad adjustments and impedances.

Our 54-page color catalog covers enclosures, designing your own speakers and driver principles as well as our line of nine easy-to-build speaker kits ranging from a miniature two-way system only ten inches high to a massive all-horn corner system.

"How To Hook Up Your System" spends twelve pages of text and diagrams really explaining system hookup. From where to place your electronics for maximum cooling to the intricacies of installing a cartridge, from eliminating hum to proper record care.

Get all three for just a dollar from the folks who take speaker information seriously...



Here's a buck! I can really use 70 pages of speaker information from the world's largest manufacturer of speaker kits.

SA-E

name _____

address _____

city _____ state _____ zip _____



Journal of Field Archaeology

Taxonomists

in all branches of botany, zoology, and medicine are needed to identify archaeological finds. The *Journal of Field Archaeology* is preparing a list of taxonomic specialists who are able to classify plant (seeds, pollen, fibers, wood, etc.), animal (insects, shells, bones, hair, teeth, leather, etc.), and human remains from current archaeological excavations. If you are willing to participate in such inter-disciplinary work, please send your name, address and the materials you are competent to identify to:

Curt W. Beck
Vassar College, Box 92
Poughkeepsie, N. Y. 12601

important to the child than the details of facile pronunciation. Much later, after the phonological system has been acquired, the details of pronunciation receive more attention.

In the period following the babbling period the persisting phonetic facility gets less and less exercise. The vast majority of a child's utterances fail to reflect her real ability to pronounce things accurately; they do, however, reflect her growing ability to pronounce things systematically. (For a child who grows up learning only one language the movements of the muscles of the vocal tract ultimately become so overpracticed that it is difficult to learn new pronunciations during adulthood. On the other hand, people who learn at least two languages in early childhood appear to retain a greater flexibility of the vocal musculature and are more likely to learn to speak an additional language in their adult years without the "accent" of their native language.)

In learning to pronounce, then, a child must acquire a sound system that includes the divergent systems of phonology and phonetics. The acquisition of phonology differs from that of phonetics in requiring the creation of a representation of language in the mind of the child. This representation is necessary because of the abstract nature of the units of phonological structure. From only the acoustic signal of adult language the child must derive successively more abstract phonological units: first intonations, then syllables, then distinctive features and finally consonant-and-vowel segments. There are, for example, few clear segment boundaries in the acoustic signal the child receives, and so the consonant-and-vowel units could hardly be derived if the child had no internal representation of language.

At the same time that a child is building a phonological representation of language she is learning to manipulate all the phonetic variations of language, learning to produce each one precisely and automatically. The dual process of phonetics and phonology acquisition is one of the most difficult in all of language learning. Indeed, although a great deal of syntactic and semantic acquisition has yet to take place, it is usually at the completion of the process of learning to pronounce that adults consider a child to be a full-fledged language speaker and stop using any form of caretaker speech.

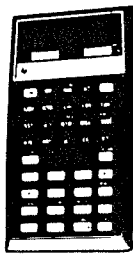
Abnormal Language Development

There seems to be little question that the human brain is best suited to language learning before puberty. Foreign languages are certainly learned most easily at that time. Furthermore, it has been observed that people who learn more than one language in childhood have an easier time learning additional

Save on Calculators

TEXAS INSTRUMENTS

Model	Your Cost	Model	Your Cost
TI 25	\$ 29.95	TI 1680	27.95
SR 40	19.96	TI 1750	19.95
TI50	29.98	TI 1790 Datachron	39.95
TI 55	43.95	TI 2010 Alarm Clock	28.95
TI 57	48.95	TI 5015	57.95
TI 58	87.95	TI 5025	78.95
TI 59	209.95	TI 5040	89.95
TI 30 SP	17.95	TI 5050M	76.95
PC 100A	146.95	TI 5100	39.95
TI 1030	15.95	Speak & Spell	48.95
Programmer	48.95	Spelling Bee	27.95
MBA	57.95	Data Man	18.95
TI 58/59 Libraries	29.95	Data Clip	27.95
Money Manager	17.95	Little Professor	12.59
Bus. Analyst	27.95		



TI Accessories at discount prices

TI watches—all models—men's and women's—\$9.95 up.

One free TI 503-1 digital watch with single purchase of \$650 from this ad.

All TI units come complete, fully guaranteed by Texas Instruments.

HEWLETT-PACKARD

NEW MODELS

Model	Your Cost	Model	Your Cost
HP 10	139.95	HP 80	235.95
HP 19C	227.95	HP 91	259.95
HP 29C	144.95	HP 92	409.95
HP 67	352.95	HP 97	584.95

- *HP31E Scientific 49.95
- *HP32E Adv Scientific 65.95
- *HP33E Prog Scientific 82.95
- *HP37E Bus Management 61.95
- *HP38E Finan Program 98.95
- *Subject to availability.

HP accessories at discount prices. One year guarantee by H-P. All units come complete. We will beat any deal. Try us at any time.

SPECIALS

Philips-Norelco # 185	109.95	Fantorder Dict.	from 129.95
Philips-Norelco #95	149.95	RCA Selectavision VBT200	749.95
Philips-Norelco NTI	189.00	Sony Betamax 8600	Call us
Philips-Norelco 88	265.00	GE 45" TV screen, great	Call us
Philips-Norelco 100-302	419.95	Sony 1979 TVs, all models	Call us
Philips-Norelco 101-303	459.95	Alarm Prog. Video game	169.95
Philips-Norelco 101-304	429.95	Printing calculators	from 59.95
Craig Dict. All Models	Call us	Selko & Citizen watches	Call us
Sanyo Dict. All Models	Call us	RCA & Zenith TVs	from 99.95

FREE one \$14.95 Prescalator coffee maker with purchase of one case of Coffee Plus (24 1-lb cans) at \$1.79 per lb. Free delivery within continental U.S.

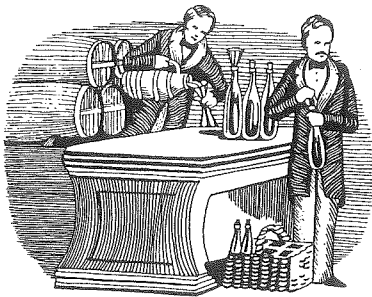
No one can beat Olympic Sales Co. prices and fast service. Try us. Ask for our famous catalog. Prices are f.a.b. Add \$4.95 for shipping hand-held calculators. Calif. residents add 5% sales tax. Goods subject to availability. We will beat any price if competition has goods on hand.

Outside Calif. call toll-free (800) 421-8045 or (800) 421-8071. In Calif. call (213) 381-3911.

VISA and MASTERCHARGE cards accepted.

OLYMPIC SALES COMPANY, INC.
216 South Oxford Ave. • P.O. Box 74545
Los Angeles, CA 90004 • (213) 381-3911 • Telex 67-3477

ONCE, YOU COULDN'T BUY CALIFORNIA WINE IN A BOTTLE. UNLESS IT WAS INGLENOOK.



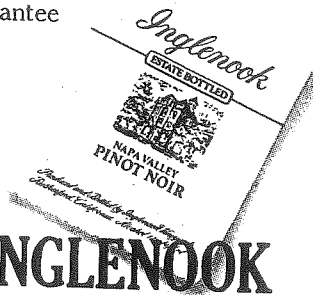
Before Inglenook, when you bought wine you had to bring your own bottle.

of consistent quality. That's why Inglenook became the first California wine to be sold "exclusively in bottles."

Captain Niebaum understood that fine wine required more than just superior grapes. And after 100 years of making fine wine, we still understand.

THE YEAR WAS 1879 and there was no such thing as a premium California wine. Because California wine wasn't even sold in bottles. You had to bring your own.

Our founder, Gustave Niebaum, realized that no matter how much pampering the grapes received, without bottling there could be no guarantee



INGLENOOK

Celebrating 100 years of Superior Winemaking. 1879-1979

Inglenook Vineyards, Rutherford, Napa Valley, California



SLIDES from the Kitt Peak National Observatory and the Cerro Tololo Inter-American Observatory

PRINTS

POSTERS

These "sister" observatories, Kitt Peak in Arizona and Cerro Tololo in Chile, operate twin 4-meter (158-inch) telescopes and other instrumentation capable of exploring the entire celestial sphere.

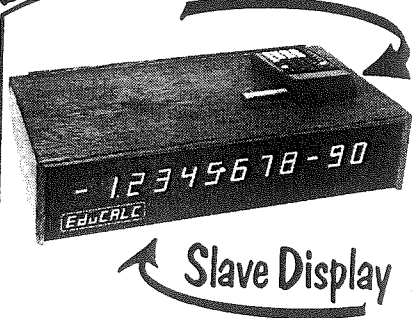
Now you can purchase 35mm (2" x 2") slides and black and white prints of celestial objects photographed with these telescopes. Over 100 subjects are available: nebulae, galaxies and star clusters, as well as telescopes and observatory scenes.

Selected subjects are also available as larger color transparencies, color prints and posters. For an illustrated 44-page catalog containing a complete listing and prices, send \$1.00 to:

Catalog-
Public Information Office
Kitt Peak National Observatory
P.O. Box 26625-SA
Tucson, Arizona 85726

M104 (NGC 4594) Sombrero Galaxy, KPNO 4-M Photo

LOOK MASTER Power



INSTRUCTORS' CALCULATORS

EACH MODEL has the usual small red numerical readout on its built-in "master" calculator; it faces you as you operate it. It also has a BIG "slave" display with a wide viewing angle (130°) and spectacular legibility at 60 FEET! When AC power is supplied, this "slave" display lights up toward your audience and shows the same number as does the "master" calculator. It rivets attention - CLEAR TO THE BACK ROW!

- The COMPACT EduCALCS™ 40 GD incorporating Texas Instrument's SR 40 scientific calculator with algebraic logic. \$295
- BA GD incorporating Texas Instrument's Business Analyst financial statistical calculator with algebraic logic. \$295
- PG GD with the Programmer HEXADECIMAL-OCTAL-DECIMAL Calculator/Converter. \$345
- The FULL-SIZED EduCALCS including NEW CARD PROGRAMMABLES, your choice of "master" calculator determines the EduCALC price:
 - Texas Instrument Programmables, order model 59 GD. \$ 920
 - Hewlett Packard master calculators, order model 29 C GD. \$ 815
 - 67 GD with 12-digit SMART DISPLAY™. \$1395

ORDER YOURS TODAY! ONE-YEAR FULL WARRANTY DELIVERY INCLUDED U.S. OR CANADA

©1978 EDUCATIONAL CALCULATOR DEVICES, INC.
 Post Office Box 974, Dept. SA1, Laguna Beach, CA 92652
 Telephone: 714 497-3600

CALL OR WRITE FOR INFORMATION ON OUR NEW HP SERIES E OR MODELS FOR THE VISUALLY IMPAIRED.

Patent Pending

6049-15

languages in later years. It seems to be extremely important for a child to exercise the language-learning faculty. Children who are not exposed to any learnable language during the crucial years, for example children who are deaf before they can speak, generally grow up with the handicap of having little or no language. The handicap is unnecessary: deaf children of deaf parents who communicate by means of the American Sign Language do not grow up without language. They live in an environment where they can make full use of their language-learning abilities, and they are reasonably fluent in sign language by age three, right on the developmental schedule. Deaf children who grow up communicating by means of sign language have a much easier time learning English as a second language than deaf children in oral-speech programs learning English as a first language.

The study of child language acquisition has made important contributions to the study of abnormal speech development. Some investigators of child language have looked at children whose language development is abnormal in the hope of finding the conditions that are necessary and sufficient for normal development; others have looked at the development of language in normal children in the hope of helping children whose language development is abnormal. It now appears that many of the severe language abnormalities found in children can in some way be traced to interruptions of the normal acquisition process. The improved understanding of the normal process is being exploited to create treatment programs for children with such problems. In the past therapeutic methods for children with language problems have emphasized the memorizing of language routines, but methods now being developed would allow a child to work with her own language-learning abilities. For example, the American Sign Language has been taught successfully to several autistic children. Many of these nonverbal and antisocial children have learned in this way to communicate with therapists, in some cases becoming more socially responsive. (Why sign language should be so successful with some autistic children is unclear; it may have to do with the fact that a sign lasts longer than an auditory signal.)

There are still many questions to be answered in the various areas I have discussed, but in general a great deal of progress has been made in understanding child language over the past 20 years. The study of the acquisition of language has come of age. It is now a genuinely interdisciplinary field where psychologists, neurosurgeons and linguists work together to penetrate the mechanisms of perception and cognition as well as the mechanisms of language.

