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the resilience of language

what gesture creation in deaf children can tell us about how all children learn language

SUSAN GOLDIN-MEADOW

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CHAPTER 1

Out of the Mouths of Babes

The fact that children learn language so effortlessly at a time when tying their shoes is a real hurdle makes language-learning appear miraculous. Children are faced with the seemingly difficult task of learning a complex symbolic system, one that varies from culture to culture in seemingly arbitrary ways. We have all had the experience of listening to a foreign language fluently spoken by a native speaker—it feels to us, although not to the speaker, that there are no breaks in the flow. Where are the words? Where do the sentences stop and start? This is the first task that faces young children, discovering the units of the language they are to learn.

In addition, children must learn how the units of their language are combined. When children produce utterances that they have never heard before, and that follow the patterns of the language they are witnessing, we know that they have learned something about the underlying regularities that make English English, Swahili Swahili, or American Sign Language American Sign Language. Children hear particular sentences, yet they acquire rules. Moreover, every child hears a different set of particular sentences, yet they all acquire the same rules and in approximately the same sequence. This is the wonder of language acquisition.

To begin to understand this miraculous process, we will take a brief tour through the steps children follow in acquiring language, beginning with their discovery of the sounds of language.

Discovering the Units of Sound

When we speak, we run words together without reliable pauses between them, which is what gives listeners who don't know the language the feeling

that there are no breaks in the stream. How then do native language-users parse the language they hear into recognizable units? Adult listeners use their knowledge of regularities in the sound structure of the language to predict the boundaries of units like words. Since sound structure differs across language, knowledge of regularities in one language may not be useful in identifying boundaries in another language. Infants thus need to learn the particular features of the sound structure of *their* native language in order to be able to find words in the stream of talk that is addressed to them. When do they accomplish this feat?

Much to everyone's surprise, infants know something about the language they are to learn on the day they are born. Newborn babies born to French-speaking mothers listened to tapes of French and Russian speech and sucked on a wired nipple while doing so. The babies sucked more—and, by inference, were more aroused—when they listened to the French tapes than when they listened to the Russian tapes. Babies who had not heard French during their prenatal months showed no such effect (Mehler, Jusczyk, Lambertz, Halsted, Bertoncini, & Amiel-Tison, 1988). What the babies appear to have learned about French during those months in the womb was its prosodic structure (its intonation contours, or "music"); when the speech samples were filtered so that *only* the prosodic cues remained, the findings were unchanged. Thus, babies are already attuned to the music of their mother's tongue on day 1.

However, babies do not become sensitive to the particular sounds of their native language until the second half of their first year. Babies start out ready to learn any language—an essential characteristic since, in principle, they could be exposed to any of the world's languages, present or future. Babies are able to make essentially all the discriminations in sound contrasts that languages across the globe require. But sometime during the latter part of the first year, the ability to discriminate between contrasts *not* found in the infant's native language fades. (Adults are only able to hear those contrasts used in their particular language and can no longer hear the rest.) For example, Hindi and Salish have consonant contrasts not found in English. Surprising those who believe that adults always know more than children, infants learning English are able to make these Hindi and Salish discriminations, adult English-speakers are not. However, the infants are only able to do so during their first year—by 12 months the ability fades and they begin to listen like adult English-speakers. Importantly, the ability to discriminate these contrasts does *not* fade if the infant is exposed to input that makes use of the contrasts—infants learning Hindi or Salish are still able to make the discriminations in their respective languages at 12 months (Werker & Tees, 1984). Babies start to fail to make discriminations among vowels (as opposed to consonants) that are not found in their language even earlier (perhaps as early as 6 months; Kuhl, Williams, Lacerda, Stevens, & Lindblom, 1992).

By 9 months, infants can recognize words in their language independent of prosodic cues. English and Dutch have very similar prosodic characteristics. They differ, however, in phonetic and phonotactic structure (that is, in which sounds are produced in the language and how those sounds combine). For example, the [r] in English words is very different from the [r] found in Dutch words (a phonetic difference). English allows [d] to occur at the end of a syllable while Dutch doesn't, and Dutch allows [kn] or [zw] to begin syllables while English doesn't (phonotactic differences). When presented with a spoken list of English and Dutch words, 9-month-old English-learners listen longer to the English than the Dutch words. In contrast, 6-month-old English-learners show no preferences (Jusczyk, 1993). By 9 months, babies have learned enough about the sound structure of their language to prefer their own language to others, even those that have the same "music."

While learning to listen to sounds, infants are also learning to produce them. Infants do not produce what we might recognize as words until they are approximately 1 year old. However, long before then they use their voices in changing ways. They begin by using their voices to cry reflexively and to make vegetative sounds; they then coo, laugh, and begin to play with sound. Sometime around 6 to 9 months, infants begin to babble (Oller & Lynch, 1992)—they produce true syllables, often in a reduplicated series of the same consonant-vowel combination, for example, [dada] or [mamama]. Later still, infants begin to produce variegated babbling in which the range of consonants and vowels expands and sounds no longer need to be reduplicated (Stark, 1986). The child is now adding prosody to strings of babbles and, as a result, begins to sound like a native speaker (as long as you're not listening too closely).

Indeed, it is at this point (around 8 months) that native listeners can begin to identify an infant as one who is learning their language. For example, when they heard tapes of 8-month-old babbling, French speakers were able to tell the difference between French babies' babbling and Arabic or Chinese babies' babbling (deBoysson-Bardies, Sagart, & Durand, 1984). When the infants' babbles were closely examined by trained linguists, the French babies were found to display lengthenings and softer modulations than the Arabic and Chinese babies, who exhibited other characteristics that were found in the languages they had been hearing for 8 months (deBoysson-Bardies, 1999). Thus, by the end of the first year, children are beginning to speak, and listen, like native users of their language.

☐ Starting With the Word

All natural languages, spoken or signed, are structured at many levels. Meaningless units (phonemes) combine to create morphemes, the smallest

meaningful units of a language, which in turn combine to form words, phrases, and sentences. Having made significant progress in learning the sound system underlying their language in the first several months of life, children are then free to tackle larger units. Regardless of the language learned, children tend to enter the system of larger units at the level of the word, rather than the morpheme or sentence. Between 10 and 15 months, children produce their first words, typically using each word as an isolated unit. Children then proceed in two directions, learning (1) that the word can be composed of smaller, meaningful parts (morphology), and (2) that the word is a building block for larger, meaningful phrases and sentences (syntax).

What is a word? Consider a child who wants a jar opened and whines while attempting to do the deed herself. This child has conveyed her desires to those around her, but has she produced a word? A word does more than communicate information—it stands for something; it's a symbol. Moreover, the mapping between a word and what it stands for is arbitrary—"dog" is the term we use in English for furry four-legged canines, but the term is "chien" in French and "perro" in Spanish. There is nothing about the form of each of these three words that makes it a good label for a furry creature—the word works to refer to the creature only because speakers of each language act as though they agree that this is what it stands for.

At the earliest stages of development, children may use a sequence of sounds consistently for a particular meaning, but the sequence bears no resemblance to the sound of any word in their language. These "proto-words" (Bates, 1976) are transitional forms that are often tied to particular contexts. For example, a child uses the sound sequence "brmm-brmm" every time he plays with or sees his toy truck. In fact, a child's proto-word need not be verbal at all—gesture works quite well. For example, a child smacks her lips every time she feeds her fish, or flaps her arms when she sees a picture of a butterfly (Acredolo & Goodwyn, 1985, 1988; Iverson, Capirci, & Caselli, 1994). Indeed, some children rely heavily on gestural "words" to communicate with others at the early stages.

Sometime around 18 months, children's vocabularies reach 50 words (Nelson, 1973), and they continue to add an average of nine words a day throughout the preschool years (Carey, 1978). Children's most common words are names for people and pets ("mama," "Metro"), objects ("bottle"), and substances ("milk"). These nominal terms are among the earliest terms children learn, along with social words ("want," "no," "bye-bye"). Adjectives ("hot") and verbs ("go," "up") are part of a young child's repertoire, but tend to be rare relative to nouns (Gentner, 1982; Goldin-Meadow, Seligman, & Gelman, 1976; although children learning languages other than English may show the noun bias less than English-learners, e.g., Korean; Gopnik & Choi, 1995; Mandarin; Tardif, 1996).

It is, of course, not trivial for the child to figure out exactly what adults mean when they use a word like "dog" or "run" (let alone abstract terms like "liberty" and "conjecture"). "Dog" could refer to the furry creature in its entirety, its paws, its tail, its fur, and so forth. "Run" could refer to the trajectory of the motion, the manner in which it is carried out, its direction, and so on. An infinite number of hypotheses are logically possible for the meaning of a word in a given adult utterance (Quine, 1960). Yet children are able to zero in on adult meanings of the words they hear. How? It would certainly be easier for children to settle on the meaning of a word if they were constrained to consider only a subset of the possibilities as candidate word meanings—if, for example, they were biased to assume that labels refer to wholes instead of parts (the creature, not the tail) and to classes instead of particular items (all dogs, not one dog). Constraints of this sort have, in fact, been proposed as part of the equipment that children bring to the language-learning situation (Markman, 1991, 1994), although others are equally convinced that inherent constraints are not needed to explain how children learn the meanings of words (Bloom, 2000).

Constraints on what a word means can also come from the discourse context in which the word is used. An adult may, for example, label an object when the child is directing full attention to that object, effectively making a set of meanings particularly salient to the child. More constraining still, the linguistic frame in which a word appears narrows down the meanings that the word can have (Gleitman, 1990). For example, English sentence structure conveys who does what to whom and, in this way, provides clues as to the meaning of the verb in the sentence. A 2-year-old child who hears "the rabbit is gorping the duck," will look longer at a scene in which the rabbit is acting on the duck than at a scene in which both the rabbit and the duck are circling their arms. The child correctly assumes that "gorp" must refer to an action on an object, in this case, the duck (Naigles, 1990). This is an impressive inference, particularly since the same child when hearing "the rabbit and the duck are gorping" will look longer at the scene in which the rabbit and the duck are each circling their arms. Now the child correctly assumes that "gorp" refers to the arm-circling action. Thus, the clues that children exploit to determine the meaning of a word come not only from how that word is used in relation to the world of objects and actions, but also from how it is used in sentences—children use language itself to bootstrap their way into word meanings (Fisher, Hall, Rakowitz, & Gleitman, 1994; Landau & Gleitman, 1985).

☐ Learning That Words Are Made of Parts

Words in English, and in all languages, can be broken down into parts. For example, the word "dogs" refers to more than one furry creature, but it does so quite systematically—"dog" stands for the animal, while "s" stands for many-ness. We know this because we know that words like "cats," "shoes,"

and "books" all refer to more than one cat, shoe, or book. We have extracted (albeit not consciously) what the words have in common—the "-s" ending in their forms and "plural" in their meanings—to form what is called a morpheme, a consistent pairing between a form and a meaning.

At the earliest stages, children learn morphologically complex words as unanalyzed wholes, "amalgams" (MacWhinney, 1978). For example, "shoes" may not, in the child's mind, be composed of the stem "shoe" plus the plural "-s," particularly if the child never produces the form "shoe" and uses "shoes" to refer to footwear in singles and in pairs. At some point, English-learning children discover that "shoes" is composed of parts ("shoe", "-s") and that each part has a meaning (footwear, plural). It is often not easy to tell when this analysis has taken place, particularly since it is not likely to have been done consciously.

One key piece of evidence, possible only when the pattern in the language the child is learning is not completely regular, comes from children's overregularizations—errors in which children make exceptions to the adult pattern (e.g., feet) conform to the regular pattern (e.g., foots). Children who produce the incorrect form "foots" must have extracted the plural morpheme "-s" from a variety of other regular forms in their system, and added it to the noun "foot." Similarly, children who produce "eated" must have extracted the past tense morpheme "-ed" from verbs like "walked" and "stopped" and added it to the verb "eat" (Marcus, 1995). Creative errors of this sort also indicate that children know the differences between nouns and verbs; children add the "-ed" ending to verbs like "eat" or "walk" but rarely to nouns like "foot" or "shoe." In addition to waiting for creative errors to occur, experimenters can give older children nonsense words and ask them to generate novel forms for different sentence frames, as Jean Berko (1958) did in her well-known "wug" test. Berko showed children a picture of two unknown creatures and said, "This is a wug. Now there are two of them. There are two _____". The child who knows about plural endings should supply the word "wugs."

The "wug" test gives children the sentence frame ("There are two _____") and a referent (a picture with two items) and asks them to supply the *form* of the appropriate grammatical morpheme ("-s"). In a clever study, Brown (1957) turned the question around and gave children the form of the grammatical morpheme and asked them to supply the *meaning*. For example, Brown showed children a picture of hands acting on a confetti-like substance in a pail and told them that this was "sibbing." They were then asked to identify sibbing in a set of three pictures showing just the acting hands, just the substance, or just the pail. They correctly pointed to the acting hands, indicating that they knew the grammatical morpheme "-ing" attaches to words for actions, not objects. Importantly, when they were told that the original picture contained "some sib," they pointed to the substance picture, and when they heard it contained "the sib," they pointed to the pail picture.

Thus, at a young age, children know that forms and meanings are *paired* in a grammatical morpheme and can approach the morpheme from either direction; if given the meaning of the morpheme (as in the "wug" test), they can provide the form, and if given the form of the morpheme (as in Brown's test), they can provide the meaning.

English does not have a very rich morphological system—words in English typically contain relatively few morphemes, unlike languages like Hebrew whose words tend to contain many morphemes. It turns out that children learning languages rich in morphology (like Hebrew) learn the parts of words earlier in the course of language development than do children acquiring morphologically impoverished languages (like English; Berman, 1985). Moreover, a morphological system that is regular is particularly easy to master. For example, children acquiring Turkish, which has a rich, predictable and perceptually salient inflectional system, produce words with grammatical morphemes even before they combine words (Aksu-Koc & Slobin, 1985). In contrast, children acquiring English generally do not begin to learn the morphemes of their language until after they begin to combine words into sentences.

☐ Combining Words Into Sentences

At about age 18 months, children begin to produce two-word strings. The two-word combinations children produce are highly similar in two respects (Bloom, 1970; Bowerman, 1973a; Brown, 1973). First, the content is the same. Children note the appearance and disappearance of objects, their properties, locations, and owners, and comment on the actions done to and by objects and people. Second, the words in these short sentences are consistently ordered (Braine, 1976). The particular orders that children use mirror the orders provided by the language models they experience. Even when the language children are learning has relatively free word order, children tend to follow a consistent pattern (based on a frequently occurring adult order; Slobin, 1966).

Young children produce words in consistent orders as soon as they combine them and, in this sense, adhere to a syntax (Bloom, 1970). But is it the syntax of adults? Adult regularities are formulated in terms of syntactic categories—subject, object, noun phrase, verb phrase, and so on—rather than semantic categories, categories that focus on the role that the object is playing in an action, for example, the role of doer (agent) or the role of done-to (patient). Is there evidence for syntactic categories in the young child's language?

In fact, the earliest orders that children produce can all be described at a semantic level and thus do not *require* a syntactic analysis (although they do not violate one either). For example, the sentence "baby drink" can be

described as agent-action, as opposed to subject-verb. Indeed, the fact that young children often interpret sentences like "babies are pushed by dogs" to mean the babies are the *pushers* (not the *pushees*) suggests that, for these children, the first word is an agent, not a subject (i.e., it's defined in terms of its role in the action rather than its role in the syntactic structure of the sentence). A subject-verb description is needed when the words that fill the first position are no longer restricted to a single semantic category (Bowerman, 1973b; e.g., "bottle falls"—bottle is not affecting an object and thus is not an agent) and when other aspects of the sentence depend on this nonsemantic category (e.g., subject-verb agreement—one says "bottle falls" about a single bottle but "bottles fall" about several). It is not until children begin to fill in their telegraphic utterances with grammatical morphemes (e.g., tense endings on verbs that must agree in number with the subject—bottle falls vs. bottles fall) that clear evidence for syntactic categories can be found. However, the fact that children use their grammatical morphemes appropriately *as soon as* they appear in their repertoires suggests that the groundwork for syntactic categories may have been laid quite early, perhaps from the start (cf. Valian, 1986).

Word order is an important device used by languages to convey who did what to whom. Importantly, even before children produce two-word combinations, they have some knowledge of this device. Children who produce single words only, when shown two scenes (Big Bird washing Cookie Monster vs. Cookie Monster washing Big Bird), will look reliably longer at the scene that matches the sentence they are listening to—the first scene for the sentence "Big Bird is washing Cookie Monster" and the second for "Cookie Monster is washing Big Bird" (Hirsh-Pasek & Golinkoff, 1991). The order of words must be conveying information to the child about who is the doer (agent) and who is the done-to (patient) of the action.

Moreover, children who are limited to two words per sentence in their talk appear to know something about the larger predicate frames underlying their short sentences. They produce, at times, all of the appropriate arguments that a given predicate allows (essentially all of the slots that nouns fill, e.g., they produce "*baby* drink" and "drink *juice*" when talking about drinking the juice, or "*mommy* give," "give *juice*," and "give *me*" when talking about giving the juice). Indeed, for children at the two-word stage, the rate at which a semantic element (like juice) is put into words depends on the predicate frame underlying the sentence (Bloom, Miller, & Hood, 1975). If a predicate frame underlying a two-word sentence is small, an element in that structure will be more likely to be produced as one of the two words in the sentence than will an element that is part of a larger predicate frame: There's less competition for one of the two word slots in a sentence with a smaller versus a larger predicate frame. Thus, for example, children are more likely to produce "juice" in a two-word sentence with a two-argument predicate frame (x drinks y, where x and y are the two arguments) than in a two-word sentence with a three-argument predicate frame (x gives y to z); that is, "juice" is more likely to appear with "drink" than with "give" simply because there is less competition for one of the two word slots in a sentence with two versus three underlying arguments (Goldin-Meadow, 1985; Goldin-Meadow & Mylander, 1984). The fact that the child's rate of production of a given element in a sentence varies systematically according to the size of the predicate frame underlying that sentence is evidence for the existence of the predicate frame itself.

At some implicit level, the child seems to know how many arguments there ought to be in each frame. Moreover, when provided with sentences that differ in their argument structures, children can make the appropriate inferences about the type of action described. For example, children will look longer at a scene in which Cookie Monster is making Big Bird turn (as opposed to one in which each is turning independently) when they hear the two-argument sentence, "*Cookie Monster* is turning *Big Bird*," than when they hear the one-argument sentence "*Cookie Monster* is turning with Big Bird" (Hirsh-Pasek, Golinkoff, & Naigles, 1996).

☐ Elaborating Sentences

Although from the outset, children are able to say "no," ask questions, and make demands (they do so gesturally or through simple lexical devices), with the advent of grammatical morphemes, they can begin to accomplish these goals using sentential forms expressing these various functions. Negatives and questions are not, however, completely adultlike even after grammatical morphemes appear. For example, they deviate from the adult form in that children often omit subjects and auxiliary verbs (do, is, have). From the few within-child analyses that have been done, subjects and auxiliaries appear to be introduced into both negatives and questions at about the same time (Klima & Bellugi, 1966). Negative markers are placed between the auxiliary and the verb ("baby is *not* drinking"); however, some period of time is needed before children consistently invert the subject and the auxiliary in questions ("is *baby* drinking?).

Children also build their sentences by elaborating one element of a single proposition ("baby drinking big bottle"), and by combining sentences to express complex or compound propositions (Bowerman, 1979; Limber, 1973). For example, English-learning children produce object complements ("I hope I don't hurt it"), embedded clauses ("that a box that they put it in"), coordinate clauses ("maybe you can carry that and I can carry this"), and subordinate clauses ("I gave him some so he won't cry").

The advent of two-proposition constructions brings with it the problem of appropriately relating the propositions, not only in production but also in comprehension. Children can show some remarkably subtle behaviors in

this regard. For example, consider a child who is told that a little girl fell and ripped her dress in the afternoon and reported the event to her mother later that night. When 3-year-olds are asked "when did the girl say she ripped her dress?" they will provide one of two possible answers (in the afternoon, or at night), but when asked "when did the girl say how she ripped her dress?" they will correctly provide only one (at night) (deVilliers, Roeper, & Vainikka, 1990). The reason for this interpretive pattern has to do with how the two propositions ("say," and "rip") are linked in the probe question (that is, their constituent structure). The important point is that, at the young age of 3, children appreciate this subtlety that would, in fact, be difficult to teach.

However, children do make errors in interpreting complex sentences that adults find easy. When asked to act out the sentence, "the lion tells the bear to climb up the ladder," they appropriately make the bear do the climbing. But when asked to act out the sentence, "the lion pushes the bear after climbing up the ladder," many children incorrectly make the bear climb rather than the lion (Hsu, Cairns, Eisenberg, & Schlisselberg, 1989). The reason the climber differs in the two sentences again has to do the with the structural relations between the constituents in each sentence. Here, however, children have not yet achieved an adult performance level (although even this complexity will be mastered by age 8 and typically by 6½).

☐ In Sum

We have looked at the steps children take when learning language, but our brief tour has not really made the process appear any less miraculous. There is a great deal for children to learn, and they do it in a remarkably short period of time. Some have even suggested that the task is so great, and the constraints imposed by the input so few, that children must be coming to the language-learning situation with preconceptions about what language is—good guesses as to what the right units in a natural language are, and how those units are allowed to combine with one another. In the next chapter, we review the kinds of explanations that have been offered for how children learn language, and consider how this question can best be studied.

CHAPTER 2

How Do Children Learn Language?

To study the process of language-learning, the most common technique is to do nothing more than watch and listen as children talk. In the earliest studies, researcher-parents made diaries of their own child's utterances (Stern & Stern, 1907; Leopold, 1939–49). The diarist's goal was to write down all of the new utterances that the child produced. Diary studies were later replaced by audio and video samples of talk from a number of children, usually over a period of years. The most famous of these "modern" studies is Roger Brown's longitudinal recordings of Adam, Eve, and Sarah (Brown, 1973).

Because transcribing and analyzing child talk is so labor-intensive, each individual language acquisition study typically focuses on a small number of children, often interacting with their primary caregiver at home. However, advances in computer technology have made it possible for researchers to share their transcripts of child talk via the computerized Child Language Data Exchange System (CHILDES; MacWhinney, 1995). A single researcher can now call upon data collected from spontaneous interactions in naturally occurring situations across a wide range of languages, and thus test the robustness of descriptions based on a small sample. In addition, naturalistic observations of children's talk can always be, and often are, supplemented with experimental probes that are used with a larger number of subjects (e.g., Berko's "wug" test, 1958).

Thus, although time-consuming, it is possible to describe what children do when they acquire language. The harder task is to figure out *how* they do it. This is the question that drives this book.

Many theories have been offered to explain how children go about the process of language-learning. I begin by briefly reviewing the major accounts. We will find that, although there is disagreement among the theories in the details, all modern day accounts accept the fact that children come to the language-learning situation prepared to learn. The disagreement lies in what

each theory assumes the child is prepared with—a general outline of what language is? a set of processes which will lead to the acquisition of language (and language alone)? a set of processes which will lead to the acquisition of any skill, including language?

In the final section of this chapter, I describe an agenda for an empirical program of research that is designed to discover what children are prepared with when they come to language-learning. Children learn language in a variety of different environments. If, despite these differences in environmental input, the outcome of the language-learning process is the same, it begins to look like the children themselves are prepared to learn language in a particular way. In the remaining chapters of this section (Chapters 3 through 5), we discover what we can learn about a child's preparation for language-learning from the variations in language-learning environments that occur routinely—learning language in different cultures, in different modalities, with varying amounts of input. The rest of the book focuses on language development in an environment that is an extreme variation from the typical—developing language without any linguistic input at all.

Children are typically exposed to language and, in response, learn language. But what if a child were able to develop the same linguistic properties when not exposed to a language model? These properties of language would be *resilient* in the sense that they do not require a language model to be developed. Conversely, properties of language that a child is unable to develop without a language model would be *fragile*, requiring a language model to be developed. The goal of this book is to discover the resilient properties of language.

Theoretical Accounts of Language-Learning

Behaviorist Accounts

Consistent with the psychological theories of the day, prior to the late 1950s language was considered just another behavior, governed not by its own rules and constraints but by the general laws of learning. Mechanisms of imitation and reinforcement were considered adequate to produce the grammatical habits that made up language. This behaviorist account of language was dealt a devastating blow with the publication of Noam Chomsky's review (1959) of B.F. Skinner's *Verbal Behavior*. Chomsky argued that adult language use cannot be adequately described in terms of sequences of behaviors or responses. A system of abstract rules underlies each individual's knowledge and use of language, and it is these rules that children acquire when they learn language. When viewed in this way, the language acquisition problem requires an entirely different sort of solution.

Nativist Accounts

The premise of the Chomskian perspective is that children are learning a linguistic system governed by subtle and abstract principles without explicit instruction and, indeed, without enough information from the input to support induction of these particular principles (as opposed to other principles)—"Plato's problem" or the poverty of the stimulus argument (Chomsky, 1999). If there is not enough information in the input to explain how children learn language, the process must be supported by innate syntactic knowledge and language-specific learning procedures. The theory of *Universal Grammar* (UG) formulates this *a priori* knowledge in terms of principles and parameters that determine the set of possible human languages. UG is assumed to be part of the innately endowed knowledge of humans. The principles of UG provide a framework for properties of language, often leaving several (constrained) options open to be decided by the data the child comes in contact with. For example, word order freedom is a parameter of variation. Some languages (English) mandate strict word orders; others (Russian, Japanese) list a small set of admissible orders; still others (Walpiri, an Australian aboriginal language) allow almost total scrambling of word order within a clause. Input from a given language is needed for learners to "set" the parameters of that language.

One important aspect of this theory is that setting a single parameter can cause a cluster of superficially unrelated grammatical properties to appear in the language. For example, the "null-subject" parameter involves a number of properties (Hyams, 1986): whether overt subjects are required in all declarative sentences (*yes* in English, *no* in Italian); whether expletive elements such as "it" in "it seems" or "there" in "there is" are exhibited (*yes* in English, *no* in Italian); whether free inversion of subjects is allowed in simple sentences (*no* in English, *yes* in Italian), and so forth. The prediction is that the input necessary to set the "null-subject" parameter results in the simultaneous alignment of all of these aspects within a child's grammar. There is, at present, controversy over whether predictions of this sort are supported by the child language data (e.g., Valian, 1991).

Innate knowledge of the principles underlying language is, however, not sufficient to account for how children acquire language. How are children to know what a noun or a subject is in the specific language they are learning? They need to identify subjects and verbs in their language before they can determine whether the two are strictly ordered in that language, and before they can engage whatever innate knowledge they might have about how language is structured. Thus, in addition to innate syntactic knowledge, children also need learning procedures, which may themselves be language-specific. One example is a set of rules *linking* semantic and syntactic categories (Pinker, 1984, 1989). Children are assumed to know innately that agents

are likely to be subjects, objects affected by action are likely to be direct objects, and so on. All they need do is identify (using context) the agent in a scene; the linking rules allow them to infer that the term used to refer to that agent is the subject of the sentence. Their innate knowledge about how these elements are allowed to be structured can then take over. Again, controversies exist over whether child language data support these assumptions (e.g., "ergative" languages do not straightforwardly link agents with subjects and yet are easily acquired by young children; Ochs, 1982; see Chapter 3).

Social/Cognitive Accounts

The nativist position entails two claims: (1) at least some of the principles of organization underlying language are language-specific and not shared with other cognitive systems, and (2) the procedures that guide the implementation of these principles are themselves innate. Note that, while these two claims often go hand-in-hand, they need not. One can imagine that the principles underlying linguistic knowledge might be specific to language and, at the same time, implemented through general, all-purpose learning mechanisms (although such mechanisms must be more complex than the mechanisms behaviorist accounts have offered). This constitutes the position that has come to be known as a social or cognitive account of language-learning.

Children do not sound like adults when they begin to speak; there clearly is developmental work that needs to be done. The question is what type of work is required? One possibility, favored by some nativists, is that children have in place all of the grammatical categories and syntactic principles they need; they just lack the "operating systems" that will allow those principles to run. The developmental work to be done does not, under this view, involve a changing grammatical system.

In contrast, the child's language may change dramatically during development, transforming from a system based on semantic categories to one based on syntactic categories. This transformation could be maturationally determined (Wexler, 1999) or guided by innate linking rules, preserving a nativist account. However, the transformation could also result from an inductive leap children make on the basis of the linguistic data available to them, in conjunction with the cognitive and/or social skills they bring to the task—this inductive leap is at the heart of all social or cognitive accounts.

Cognitive underpinnings may be necessary but they are rarely sufficient for the onset of linguistic skills. For example, the onset of gesture-speech combinations that convey two elements of a proposition ("open" + point at box) precedes the onset of two-word combinations ("open box") by several months, suggesting that the cognitive ability to express two semantic elements is not the final stumbling block (Butcher & Goldin-Meadow, 2000; Goldin-Meadow & Butcher, 2003). More than likely, it is extracting linguistic patterns from the input that presents the largest problem.

Social and cognitive accounts claim that there is, in fact, enough information in the linguistic input children hear, particularly in the context of the supportive social environments in which they live, to induce a grammatical system. Ample research indicates that adults alter the speech they direct to their children. Speech to children (often called *motherese;* Newport, Gleitman, & Gleitman, 1977) is slower, shorter, higher pitched, more exaggerated in intonation, more grammatically well formed, and more directed in content to the present situation than speech addressed to adults (Snow, 1972). And children pay particular attention to this fine-tuned input, interpreting it in terms of their own biases or "operating principles" (e.g., paying attention to the ends of words, Slobin, 1985b). One problem that arises with postulating motherese as an engine of child language-learning, however, is that child-directed speech may not be universal. In many cultures, children participate in communicative interactions as overhearers (rather than as addressees) and the speech they hear is not likely to be simplified in the same ways (Ochs & Schieffelin, 1984; see Chapter 14). Nevertheless, children in these cultures become competent users of their grammatical systems in roughly comparable time frames, suggesting that there may be many developmental routes to the same end, a reasonable conjecture given the robustness of language.

One very interesting possibility that skirts the problem of children not universally getting simplified input is that the children themselves may do their own simplifying. For example, young children's memory limitations may make them less able to recall entire strings of words or morphemes. They would, as a result, be doing the analytic work required to abstract linguistic regularities on a smaller, filtered data base ("less is more"; Newport, 1991). This filtering may be just what children require to arrive at their linguistic systems. Moreover, it is a general process that children across the globe presumably bring, in equal measure, to the language-learning situation.

Connectionist Accounts

In a sense, connectionism is more of a technique for exploring language-learning than an explanatory account. But connectionism does come with some theoretical baggage. For example, most connectionist models are based on the assumption that language (like all other cognitive skills) can be explained without recourse to rules. And, of course, you have to buy the assumptions of the theory in order to find the technique useful.

In a connectionist account, behavior is produced by a network of interconnected units. Language development is a process of continuously adjusting the relative strengths of the connections in the network until they produce an output that resembles the input. As a result, connectionism can offer a tool for examining the trade-off between the three components central to all theories of language learning (Plunkett, 1995)—input, structures the child

brings to the learning situation (architectures of the artificial system), and learning mechanisms (learning algorithms). The latter two are considered innate on the nativist account and specific to language. Connectionism provides a technique for determining the innate structures and learning processes that must be present, given the input children typically receive, to achieve learning. As an example, networks have been shown to arrive at appropriate generalizations from strings of sentences *only if* the memory span of the network for previously processed words begins small and gradually increases (reminiscent of Newport's "less is more" hypothesis described above, 1991; Elman, 1993).

Studying Language-Learning by Manipulating Environments

All theoretical accounts agree that human children are prepared to learn language. The question is—what are they prepared with? Do children come to the learning situation with specific hypotheses about how language ought to be structured? Or do they come with general biases to process information in a particular way? Under this second view, the strong inclination that children have to structure communication in language-like patterns falls out of their general processing biases coming into contact with a natural language.

One obvious way to explore the nature of the biases children bring to the learning situation is to observe language-learning in varying circumstances, circumstances that vary in how much linguistic structure the child is bathed in. The assumption is that children bring the same processing biases to whatever circumstances they encounter. To the extent that child outcome remains the same across these various input situations, we have strong evidence that the child's processing biases are themselves important in determining the language the child develops—that the child's developmental trajectory is buffered from vagaries in the input. However, to the extent that each varying input situation results in a different child outcome, we not only have evidence that input matters, but we can begin to explore the patterns between input and child outcome to make inferences about the child's biases and processing strategies.

In other scientific domains, when we are interested in understanding the mechanisms that underlie developmental change, we attempt to experimentally manipulate the situation, altering circumstances of acquisition and observing the effects of those alterations on child outcome. But for obvious ethical reasons, we cannot tamper with the circumstances under which children learn language. The alternative is to take advantage of the varied circumstances that children find themselves in when they attempt to learn language. In the next three chapters (Chapters 3 through 5), I consider different input conditions that could, in principle, alter the language-learning task for the child.

Children who grow up in Taipei face the task of learning Mandarin. The task for children who grow up in Philadelphia is to learn English. Children across the globe are thus exposed to very different models of language, each of which could dramatically alter the acquisition task. As a result, we have a naturalistic "experiment" in which we can observe how child output is affected by the input they receive. The "results" of this experiment will be described in Chapter 3, with a focus on the commonalities in acquisition patterns found across languages.

Children born to deaf parents who use sign language to communicate with them are exposed to a language system that differs dramatically from the typical. It is language by hand and eye, rather than by mouth and ear. We could ask whether language-learning takes a different course when it is conducted in a different modality. The answer, which will be described in Chapter 4, is that for the most part it does not—children learn language in the manual modality as easily and on the same time table as children learning language in the oral modality.

Across linguistic communities, children are exposed to very different kinds of input. Within a community, however, children also experience variations in input, since some parents talk often to their children and use a wide variety of constructions, and others talk less. Does this variability in amount of input affect child acquisition? There have been many studies of the effect of natural variation in linguistic input on child language-learning. Moreover, there have been attempts to extend the range of variation children experience within ethical limits—that is, to increase the amount of input a child receives and determine whether that increase affects child output. I describe the results of these studies in Chapter 5.

The Resilient and Fragile Properties of Language

What I am proposing is a research program for studying language-learning and, more importantly, a way to think about the findings of such a program. Any particular manipulation of the environmental conditions under which language-learning takes place has the potential to alter the language-learning outcome. To the extent that a property of language is *unaffected* by a given manipulation, it can be said to be developmentally *resilient*—its developmental course is impervious to the change in input conditions. Of course, the more radical the manipulation is—that is, the more different the conditions are from the conditions that surround the typical language-learning situation—the more impressive it is that a given property of language continues to crop up.

My goal in the next three chapters is to identify the properties of language

that are resilient when children learn different languages, when children learn language in a different modality, and when children get different amounts of input in their language. I also explore whether there is convergence across these manipulations in the properties identified as resilient. It is an empirical question as to whether the same property of language will survive a variety of input manipulations—that is, whether it will be resilient across a range of learning conditions. If so, we can be that much more certain that this particular property of language is fundamental to human communication, one whose development is not beholden to the vagaries of environmental input but is, instead, robustly overdetermined.

Finally, it is likely that some properties of language will *not* survive a particular manipulation and may, in fact, not survive a variety of manipulations. I call such properties of language *fragile* for it is these properties whose development is sensitive to changes in input conditions. Note that when we use the manipulation strategy to identify a resilient property of language, we look for the *presence* of the property under changed conditions. In contrast, when seeking a fragile property of language, we are, in effect, looking for the property's *absence* under the changed conditions—that is, we are seeking negative evidence. Relying on negative evidence is always a relatively shaky enterprise. As a result, we are on firmer ground when we use the manipulations described in the next three chapters, and in the second section of the book, to identify the resilient properties of language than to identify the fragile properties of language.

CHAPTER 3

Language-Learning Across the Globe

Languages vary across the globe. The question we ask in this chapter is whether the differences across languages make a difference to the language-learning child. Is it easier to learn a language in which verbs are positioned in the middle of the sentence? What about a language in which nouns are placed before adjectives? Or a language that has both properties?

Conveniently, the world has supplied us with just the right "experiments" to answer questions of this sort. Some languages, like English, Polish, Hebrew, and Sesotho, tend to order verbs in the middle of simple declarative sentences, between subjects and objects. Others, like Japanese, Georgian, Walpiri, and Greenlandic, place verbs at the end of sentences. And others still, Samoan and K'iche' Mayan, place verbs at the beginning of sentences. Moreover, some languages of each ordering type place nouns before adjectives (verb-medial English and Polish; verb-final Japanese and Georgian; verb-initial K'iche' Mayan) while others place nouns after adjectives (verb-medial Hebrew and Sesotho; verb-final Walpiri and Greenlandic; verb-initial Samoan; Slobin, 1992).

These different types of languages pose different types of acquisition problems for learners. By observing children who are exposed to languages that vary systematically along one or more dimensions, we can get some sense of which types of languages, if any, present stumbling blocks to the language-learner. For example, children might find it difficult to learn sentences that begin with verbs, and might find ways of avoiding the troublesome construction. To the extent that we see children *change* the input they receive, we get a sense of the role children themselves play in shaping the language they learn—the child as "language-maker" (Slobin, 1985b).

Children Learn the Particulars of Their Language

In 1985, Dan Slobin encouraged the field of language acquisition to take advantage of the "experiments of nature" offered by the world's languages. He did so by pointing out the kinds of questions that could only be addressed by cross-linguistic studies (Slobin, 1985a), and by publishing the first two volumes of *The cross-linguistic study of language acquisition*.

The encouragement was wildly successful. Language acquisition researchers, who up until this point had been narrowly focused on English, began expanding their horizons and their languages. As an example, during the 1970s, 80% of the data-oriented articles in the *Journal of Child Language* examined language-learning exclusively in English. But by 1990, the number had dropped to 57% (Slobin, 1992). Moreover, completely new languages were being added to the list every year, so that by 1990, some aspect of acquisition had been explored in 36 different languages. And as of 1997, there were five volumes in Slobin's cross-linguistic series exploring acquisition in 28 different languages.

What have we learned from these studies? When we look carefully at children learning vastly different languages, we find that, overall, children accept the differences graciously. They learn the particular properties that their language presents, and they do so from the earliest stages.

For example, English and Korean languages present children with very different ways of talking about joining objects. In English, placing a videocassette in its case or an apple in a bowl would both be described as putting one object "in" another. However, in Korean, a distinction is made according to the fit of the objects—a videocassette placed in a tight-fitting case would be described by the verb "kkita," whereas an apple placed in a loose-fitting bowl would be described by the verb "nehta." Indeed, in Korean, the notion of fit seems more important than the notion of containment. Unlike English-speakers who say that the ring is placed "on" the finger and that the finger is placed "in" the ring, Korean-speakers use "kkita" to describe both situations since both involve a tight-fitting relation between the objects. As it turns out, children have no trouble learning to talk about joining objects in terms of containment in English, or in terms of fit in Korean (Choi & Bowerman, 1991), as early as 17 to 20 months. Not only do distinctions made in each language draw children's attention to different facets of spatial relationships, but children appear to be perfectly comfortable being drawn to either set of distinctions.

The way in which a distinction is expressed in a language might also affect the speed with which a child expresses that distinction. In other words, the form of expression that a language uses for a meaning can either facilitate, or hinder, early expression of that meaning. For example, Slobin (1985b) has argued that children pay particular attention to the ends of words, a strategy which makes postpositions and suffixes more salient than prepositions and prefixes. And indeed, children acquire simple locatives like "in" and "on" earlier in postpositional languages like Hungarian and Turkish (where they occur at the end of a word) than in prepositional languages like English and Serbo-Croatian (where they occur before the word; Slobin, 1973). As Slobin points out, comparisons of this sort can only be carried out cross-linguistically since it is essential to hold meaning (and, if possible, frequency of use) constant while "contrasting" how the meaning is expressed.

In general, languages offer children different patterns for structuring communication (i.e., different typologies, cf. Slobin, 1997a), and those patterns can have widespread effects throughout the child's language. For example, English is principally a right-branching language, whereas Japanese is left-branching. The principal branching direction of a language refers to the direction in which major recursive devices, such as relative clauses and other forms of sentence complementation, are positioned (Lust, 1981; 1983). The generation of recursive terms in English tends to occur to the *right* of the term that is elaborated (e.g., "the friend *who came from Tokyo*"); in Japanese the generation of recursive terms tends to occur to the *left* of the elaborated term (e.g., "*Tokyo kara kita* tomodachi" [= *Tokyo from came* the friend]; see Smith, 1978).

Early in development, children notice this fact about their language, which affects not only their initial sentence complements, but also how they deal with redundancy—in particular, whether they prefer sentences in which the reduced or null element (θ) is to the *right* of the expressed element (e.g., "*frogs* jump and θ catch flies," where θ follows "frogs") or to the *left* of the expressed element (e.g., "frogs θ and kangaroos *jump*," where θ precedes "jump"). English-learning children produce and imitate complex sentences in which redundancy is reduced in a rightward direction (in keeping with their right-branching language; Lust, 1977; Lust & Mervis, 1980), whereas Japanese-learning children prefer complex sentences in which redundancy is reduced in a leftward direction (in keeping with their left-branching language, Lust & Wakayama, 1979). Thus, languages differ in the global patterns they present to children, and children pay attention to those patterns.

When Children Change the Input They Receive

We have just seen that children are able to learn the particulars of the language to which they are exposed. However, there are times when children seem to ignore or perhaps override the linguistic input they receive. It is these instances that are of particular interest in our search for the biases that children themselves bring to language-learning.

One of the most obvious ways in which children alter the input they receive is that their utterances are short even though all of the adults around them produce long sentences. Adults (and older children) in many cultures

do shorten their utterances when they talk to young children; however, these utterances are never as short as the ones young learners themselves produce. Moreover, not only are children's first utterances short, but they are also simple and lack the grammatical morphemes required in adult talk. There may well be processing constraints operating in all cross-linguistic situations that limit the child's earliest productions to single words.

Over time, children across the globe gradually enlarge their productions to two-word or, in some cases (e.g., Greenlandic; Fortescue & Olsen, 1992), two-morpheme constructions. Do children's initial grammatical encodings of meanings in these early two-unit constructions have anything in common? We might expect that they would *not*, simply because, as we have seen, languages use different forms to express the same meaning. Surprisingly, however, there are cases where children across the globe all express a common meaning apparently without regard for the varied forms it takes across the world's languages. Whenever this happens, we begin to suspect that the meaning is part of the baggage children themselves bring to language-learning—a meaning that children might attempt to express even if they received no linguistic input whatsoever. We begin by examining these privileged meanings, which could serve as the conceptual starting point for all children learning language (cf. Slobin, 1985a).

Privileged Meanings

At times, children across the globe begin to express a set of meanings in precisely the same order despite wide variations in the forms their individual languages use for those meanings. In these cases, we are inclined to believe that the children themselves had a hand in guiding their own developmental trajectory (although, of course, the frequency with which meanings are used across cultures, if universal, could also have a hand in creating uniform developmental patterns). For example, when children begin to talk about locations, there is a common order of emergence across languages. Children learning English, Italian, Serbo-Croatian, and Turkish all follow the same pattern—"in" and "on" precede "under" and "beside," which precede "between," "back," and "front" for objects that have an inherent front-back orientation (e.g., cars, houses), which precede "back" and "front" for objects that don't have an inherent orientation (e.g., plates, blocks; Johnston & Slobin, 1979). Importantly, the forms used to express these meanings differ across the languages—prepositions (English, Italian), prepositions and case inflections (Serbo-Croatian), and postpositions and case inflections (Turkish). In addition, the absolute ages for these developments differ across children learning each language. However, the order remains the same, perhaps reflecting the child's growing ability to deal first with two-dimensional topological relations and only later with more complex projective relations that add the third dimension of depth.

There are two other ways in which children can convince us that they play an active role in constructing their language. The range of meanings children express with a given form may be *narrower* than the adult range—children are thus using the form for a subset of the meanings expressed with the adult form. Or, the range of meanings children express with a given form may be *broader* than the adult range—here, children are using the form for a wider group of meanings than are expressed with the adult form. We find instances of both types.

Children across the globe begin by grammatically marking agent-patient (that is, doer-done to) relations in basic causal events. These are events in which an agent carries out a physical and perceptible change of state in a patient, either by means of direct body contact or an instrument—for example, mother pours milk (Slobin, 1985a)—what Hopper and Thompson (1980) call "highly transitive" events. As an example, in Russian, a particular linguistic marker called an accusative inflection must be placed on all words that fill the syntactic slot *direct object*, regardless of the type of event conveyed. However, children acquiring Russian first use the accusative inflection *only* for direct objects in sentences describing manipulative physical actions (giving, putting, throwing). In sentences describing actions that are less obviously operating on an object (e.g., seeing), young children use a noun without any inflection at all (Gvozdev, 1949, as described in Slobin, 1985a).

We find a similar pattern of *underextension* in ergative languages, languages in which the inflection is placed on the agent (as opposed to the patient) of a transitive event (e.g., Kaluli). This ergative inflection is first used by Kaluli-learning children to mark agents in sentences describing concrete, manipulative actions—giving, grabbing, taking, hitting. It is *not* used to mark agents of less physical actions (e.g., saying, seeing; Schieffelin, 1985). Interestingly, Kaluli-learning children correctly use the ergative marker for doers of transitive events and not for doers of intransitive actions (actions that do not involve objects, e.g., running). Intuitively, we might think it reasonable to treat all doers alike, as we do in English—"he runs" vs. "he hits her"—the boy is doing the running and the hitting, and is referred to with the same term ("he") placed in the same position (before the verb). However, this is not what Kaluli-learning children do—they follow the ergative pattern set forth in their language, that is, they use the ergative marker on *he* in "he hits her" but not on *he* in "he runs." But, Kaluli learners, like Russian learners, first grammaticize the participants of highly transitive manipulative activities like hitting, pouring, or eating. Slobin (1985a, 7) suggests that such highly transitive activities constitute a "central semantic organizing point for grammatical marking", a starting point for the language-learning child.

Children's initial use of tense reflects the same focus on events that bring about visible change of state. Children first use past-tense, perfect, or perfective verb inflections to comment on an event that was just completed and

that results in a visible change of state or location of an object—that is, on verbs like "drop," "break," and "spill" (Bloom, Lifter, & Hafitz, 1980; Slobin, 1985a). Only later do children develop a more general past tense. Moreover, the focus on results may bring with it a tendency to concentrate on marking patients at the expense of agents. For example, Italian-learning children will make the past participle of transitive verbs agree in number and gender with the direct object-patient, not the subject-agent—despite the fact that, in the input language, the participle agrees with *neither* object nor subject of a transitive verb, and agrees with the *subject* (actor) of an intransitive verb (Antinucci & Miller, 1976). The close relation between objects and *results* in the real world may encourage the child to create grammatical structure where there is none.

These are all examples of children *narrowing* the meaning of a particular grammatical marking to focus on, what we assume are, for the child, conceptually salient events. There are, however, also examples of how children *broaden* the meaning of an adult grammatical form. For example, children often use the same grammatical form for both animate and inanimate reference points in a locative relation, despite the fact that a distinction is made in adult talk. German-learning children incorrectly generalize "zu," the preposition used to express location (a relation involving an inanimate recipient), to express possession (a relation involving an animate recipient and conveyed by the preposition "von" in adult talk; Mills, 1985). As another example, English-learning children at times confuse "give," which adults use to refer to moving objects toward a person, and "put," which adults use to refer to moving objects to a place (e.g., "give some ice in here, mommy," and "can I go put it to her?"; Bowerman, 1982a). The children are effectively *ignoring animacy* distinctions that are present in the adult language to which they are exposed.

In addition to *meanings* that appear to be privileged in the early stages of child language, there are *forms* that children apparently find easy to incorporate into their language. We turn next to those forms.

Privileged Forms

Across the globe, children combine words into strings. Even the earliest strings that children produce are characterized by two properties: (1) Words in a string are not combined in haphazard order, but rather follow particular ordering patterns. (2) A string is characterized by a frame which dictates how the words in that string are interpreted (Gleitman & Newport, 1995).

Turning first to *word order* within sentence strings, we find that when a language uses word order consistently, children learning that language also use word order consistently, even in two-word strings. As we might expect, the ordering patterns that children produce in their two-word strings reflect the ordering patterns in the input language. For example, an English-learning child will produce the sentence "baby milk" when the baby is drinking the milk, but the sentence "milk baby" when putting the milk on top of the baby's head—thus closely following the typical patterns English-speaking adults would use in these two situations (Bloom, 1970).

Even more impressive is the fact that children use consistent word order when the language they are learning has relatively free word order. Some languages, like Russian, are much more forgiving than English with respect to word order: a word can be placed in a variety of positions within the sentence, as long as it carries the appropriate marking. Children learning these languages choose among the many sentence orders in their input, and produce a much narrower range of orders than they hear (Bates, 1976; MacWhinney, 1977; Slobin, 1966).

What about *predicate frames* underlying sentence strings? We saw in Chapter 1 that very young English-learning children are able to use the predicate frame of a sentence to figure out what the verb in that sentence means (e.g., the fact that "x gorps y" has two slots for nouns tells the child that "gorp" refers to an action on an object). In their own talk, children put verbs in unusual sentence frames (unusual from an adult's point of view), as though expecting the verb to take on the meaning appropriate to that frame. For example, an English-learning child said "Kendall fall that toy" to mean that she dropped the toy (Bowerman, 1982a). She had, up until this point, always used "fall" appropriately to indicate the downward descent of an object on its own (i.e., she used it in an x ____ frame). By placing "fall" in an "y ____ x" frame rather than the correct "x ____" frame, Kendall is giving the word a transitive meaning (action on an object) rather than an intransitive meaning (action with no object). Comparable examples have been reported in children learning French, Portuguese, Polish, Hebrew, Hungarian, and Turkish—and even in languages where the input does not model this possibility (Slobin, 1985a).

Children are not only sensitive to regularities of form within sentences but also across sentences. They detect regularities across word sets called *paradigms*. As an example of a paradigm, the various forms that verbs can take (*walk—walks—walked*) constitute a verb paradigm. We saw in Chapter 1 that English-learning children detect regularities within paradigms, and often attempt to "regularize" any ill-fitting forms they find; for example, children alter the past tense form for "eat" so that it conforms to the paradigm constructed on the basis of the regular verbs in their language (*eat—eats—eated* rather than *eat—eats—ate*).

Verb paradigms in English are rather simple compared to paradigms in other languages (e.g., Romance languages like French or Spanish, or Latin which is said to have at least 100 inflectional forms; Akmajian, Demers, Farmer, & Harnish, 1995). Children are capable of learning, and indeed improving upon, rather complex systems. For example, in Spanish, nouns that are masculine take the indefinite article *un* and the definite article *el* and

generally end in *–o*; in contrast, nouns that are feminine take the articles *una* and *la* and generally end in *–a*. Spanish-learning children acquire these regularities early, as is evident from the fact that they will attempt to "clean up" any nouns that happen to violate this paradigm, e.g., they produce "una mana" rather than the irregular, but correct, form, "una mano" (= hand, feminine), and "un papelo" rather than irregular correct form, "un papel" (= paper, masculine; Montes Giraldo, 1976, as described in Clark, 1985).

Thus, children do not learn words as isolated units, but as elements in sets. The child's focus, then, is not only on how a word maps onto the world (i.e., word-world relations), but also how that word relates to other words in the system (word-word relations; Karmiloff-Smith, 1979; Newport, 1981).

Children are learning ordering patterns for words within a sentence at the same time as they are learning the markings appropriate to each word's paradigm. Under certain circumstances, the two processes can exhibit a trade-off. Children learn inflectional markings early in development if the inflectional system of their language is completely regular and exceptionless, as in Turkish (Slobin, 1982). However, in the absence of a clear and fully reliable inflectional system, as in Serbo-Croatian, children begin by relying heavily on word order (Slobin, 1982). Moreover, if the inflectional system (although regular) is not adequately represented in the speech children actually hear, children will again resort to word order. For example, when Samoan-speaking adults talk to other adults, they use an ergative inflection to mark the agent in a transitive sentence. The marker serves to distinguish agents from patients in transitive sentences (e.g., the eater from the eaten) and also from actors in intransitive sentences (e.g., the eater from the runner). However, adults rarely produce this ergative inflection when they talk to young children. As we might expect given their input, young Samoan-learning children rarely express this marker in their own speech. But the children do exhibit an ergative pattern in their early language—through word order. They produce words for both patients (the eaten) and intransitive actors (the runner) after the verb, and don't produce words for transitive agents (the eater) in this postverbal position—an ergative alignment of the cases, one which is *not* found in adult speech to Samoan-learning children (Ochs, 1982).

☐ Taking Cross-Linguistic Universals to Another Level

We find that children do exhibit some commonalities in the early steps they take in the language-learning process despite wide differences in the languages to which they are exposed. These commonalities could well constitute "conceptual starting points for grammaticized notions" (Slobin, 1997b).

Starting points are just that—a place to begin. In the longer term, children are clearly able to cope with the wide diversity across languages, learning whatever system is put before them. And, indeed, the job of any theory of language acquisition is to account for the developmental progression that takes children from their starting point to such very different endpoints.

If the endpoint language matches the child's starting point in a particular domain, that domain is likely to be relatively easy to learn. If, however, the endpoint language uses categories that are wider, or narrower, than the categories with which the child starts the language-learning process in a domain, that domain is likely to be more difficult to learn. Where the rough and easy spots are in the developmental process may thus depend on how the particular language a child is learning overlaps with the child's starting point.

But what would happen if a child were exposed to no language whatsoever? Under such unusual circumstances, we might expect nothing at all—after all, a language model might be *essential* to catalyze children into applying their starting points to the task of communication.

On the other hand, it is possible that a language model is *not* essential for a child to engage in communication. Under this scenario, we would expect that children who are not exposed to a learnable language model might well display just those commonalities that we find in cross-linguistic learning situations—that is, the conceptual starting points for grammaticized notions.

Thus, for example, we might expect model-less children, not only to communicate about highly transitive events, but also to begin to construct a grammatical system around these events. Similarly, we might look for burgeoning grammatical systems in representations of the results of events, with perhaps little focus on animacy. Moreover, we would expect such children to construct grammatical systems that have structure within sentences (e.g., ordering patterns, underlying predicate frames), as well as structure across sentences (e.g., word sets or paradigms).

The cross-linguistic universals described in this chapter, in effect, constitute a set of hypotheses as to how children might be expected to communicate in the absence of usable linguistic input. We will put these "hypotheses" to the test in the second section of this book. But before doing so, we explore a completely different set of input conditions that might, in principle, be expected to alter the language-learning task for the child.