

This book is about these changes. It is about the *what* and *when* of language development—what changes take place and when they occur in the course of language development. It is also about the *how* and *why*. How do children learn to talk, and why is the development of language a universal feature of human development? In the following chapters, we will delve into these topics in detail. In this chapter, we begin with an overview of the field we are about to study.

## Language and the Scientific Study of Language Development

### A Definition of Language

Language is the systematic and conventional use of sounds (or signs or written symbols) for the purpose of communication or self-expression (Crystal, 1995). This definition is short and simple, and, although true, it is misleading in its simplicity. Language is complex and multifaceted. The child who learns a language achieves the ability to recognize and produce a set of sounds and learns how these sounds can and cannot be combined into possible words. The child who learns English, for example, comes to know approximately 44 different consonants and vowels (Crystal, 1995) and that *pling* is a possible word but *gnilp* is not. By adulthood, the child who learns a language knows a vocabulary of tens of thousands of words. This vocabulary knowledge includes knowledge of each word's meaning and its possibilities for combination with other words. Adult speakers of English know, for example, that *give* and *donate* are synonyms, that *John gave a book to the library* and *John donated a book to the library* are perfectly fine sentences, that *John gave the library a book* is also fine, but that *John donated the library a book* is not. The child who learns a language also comes to know the multiple ways in which pieces of the language can and cannot be systematically combined to form words and sentences. *John kissed Mary* and *Mary kissed John* are both fine sentences, albeit with different meanings; *kissed* is made up of *kiss* + *ed*, and *Mary* + *ed John kiss* just does not work. The child who learns a language also comes to know how to combine sentences into larger units of discourse—to tell a story or have a conversation. As they learn a language, children learn to use that language to communicate in socially appropriate ways. They acquire the means to share their thoughts and feelings with others and the skill to do so differently with their peers and their grandparents. In a literate society, children also learn to use language in its written form. They master both a complex set of correspondences between written symbols and meanings and a literate style of language use. Many children, perhaps most of the world's children, hear and acquire more than one language (e.g., Grosjean, 2010), and there is no reason to think that monolingual development is more basic or natural for children than bilingual or multilingual development. One could argue that a text on language development should treat multilingualism as the norm and have one chapter on the special case of monolingual development. The history of the field, however, is that most of the research on language development has been conducted with children exposed to only one language. Studies of bilingual and multilingual development are fewer, although this is a rapidly growing research area. The organization of this text reflects the scientific literature in taking monolingual development as its focus and presenting research on bilingual development in a single chapter, Chapter 9.

Children develop knowledge in the different domains of language concurrently, and there are many ways in which knowledge in one domain is used in acquiring knowledge in another. It is useful, nonetheless, for researchers and for students of language development to make distinctions among the subcomponents of language. The sounds and sound system of a language constitute a language's **phonology**. The words and associated

## BOX 1.1 Components of Oral Language Development

COMPONENT	DEFINITION	EXAMPLE
Pragmatics	The transmittal of information to others in socially appropriate ways	Being able to make requests, to comment, to be coherent in conversation and narrative
Phonology	The sound system of the language	Being able to distinguish between /vat/ and /bat/, recognizing that /narg/ could be an English word but that /ngar/ could not
Lexicon	Vocabulary and processes of derivational morphology	Knowing the meaning of words and how to form new words (e.g., if <i>narg</i> is a verb, then a <i>narger</i> is someone who nargs)
Morphology and syntax	The systems that govern inflectional morphology and word combination	Knowing the difference in meaning between <i>Man bites dog</i> and <i>Dog bites man</i> , knowing that <i>Man bite dog</i> and <i>Bite man dog</i> are both ungrammatical

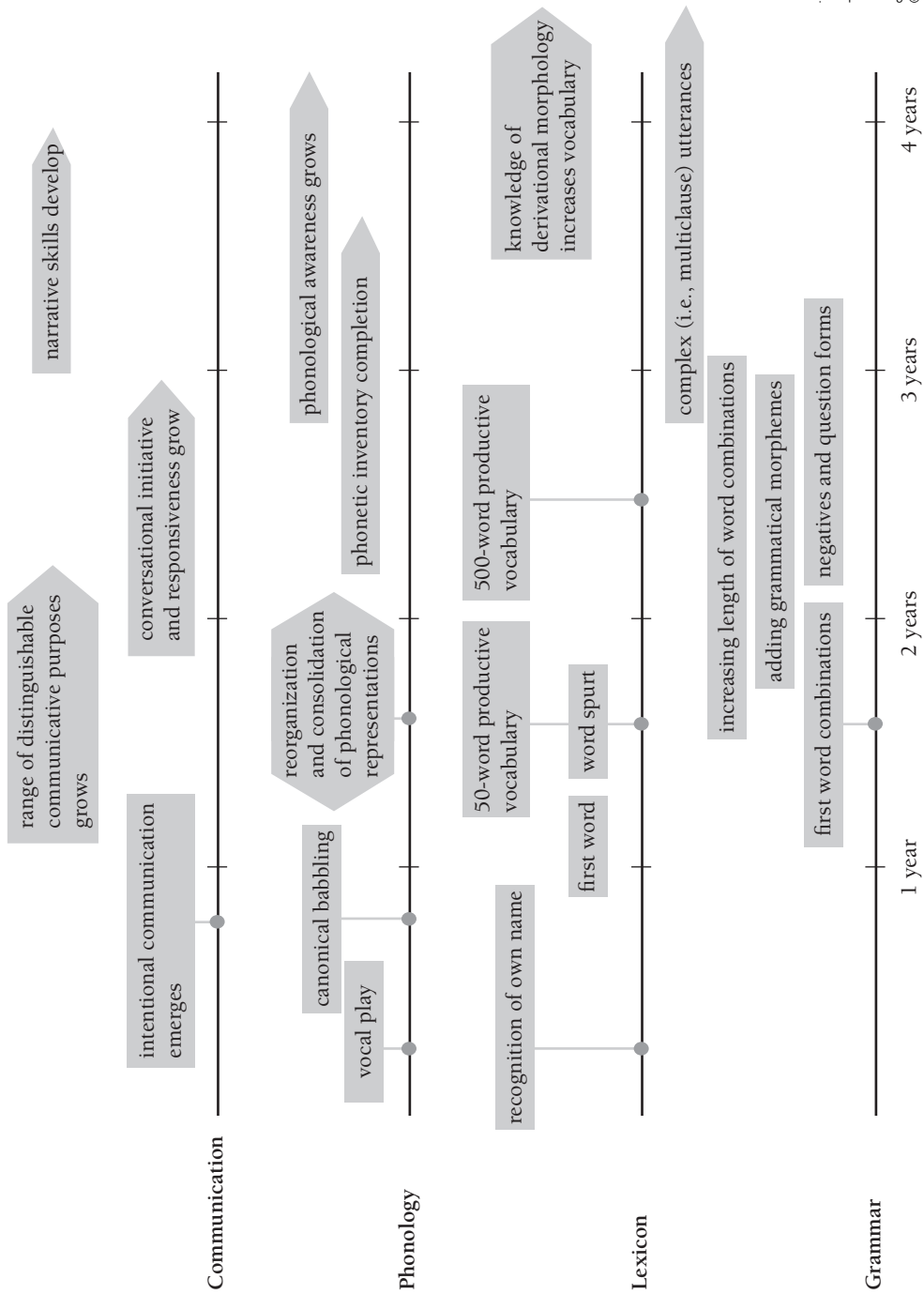
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knowledge are the **lexicon**. The system for combining units of meaning (words and parts of words such as *-ed*) is **morphology**; the system for combining words into sentences is **syntax**. The knowledge that underlies the use of language to serve communicative functions is knowledge of **pragmatics**, and the knowledge that allows the socially appropriate use of language is knowledge of **sociolinguistics**. Knowledge of reading and writing is referred to as **literacy**. We will define these components of linguistic knowledge further in later chapters; definitions of the components of oral language are presented in Box 1.1. Readers with some background in language development or linguistics may be surprised not to find semantic development listed here. Semantics is the study of meaning, and certainly learning a language is learning a system for expressing meaning. Much of what is usually subsumed under the heading of semantic development is word meaning, which is discussed in this text in Chapter 6 on lexical development. The meanings expressed in word combinations are discussed in Chapter 6 on the development of language structure.

### A Chronological Overview of Language Development

In the chapters that follow, we will describe the course of language development in some detail and ask how children accomplish this remarkable feat. Here, as both overview and preview, we describe language development in broad outline, based on findings from the study of monolingual children. Figure 1.1 presents the major milestones of language development on separate timelines for each language component. If you scan all four timelines from left to right, you can see that from birth to one year, children change in the communicativeness of their behavior and in the repertoire of sounds they produce. They move from understanding no words at birth to recognizing their names by 6 months and understanding a few other words by 8–10 months. On average, children begin to produce speech at about 1 year. We know, however, that these seemingly pre-linguistic babies are learning a great deal about the sounds, the words, and even the grammatical properties of their language during the first year of life and that what babies learn in their first year is built upon in subsequent language development.

**FIG-1-1 Major Milestones of Language Development**



During children's second year, the most obvious development is in the domain of vocabulary. Children typically begin this year by producing their first word, and by the end of the year, they have a productive vocabulary of about 300 words and are producing word combinations (Fenson, Dale, Reznick, & Bates, 1994). Their words do not sound quite adultlike. Both articulation abilities and underlying phonological representations undergo changes during this second year. Children are also becoming more communicative. Both the frequency and the conversational relevance of their communicative acts increase.

During the third year of life, the most obvious development is children's increasing mastery of the grammar of their language. Typically, children start this year producing two- and three-word affirmative, declarative sentences that lack grammatical endings (e.g., plural markers and past-tense markers) on nouns and verbs. By the end of the third year, children produce full sentences, including questions and negated forms with most grammatical devices in place. Vocabulary continues to grow, articulation of sounds improves, and children begin to develop an awareness of the phonological properties of their language—as evidenced, for example, in their appreciation of rhymes. Children's conversational skills increase, and they begin to introduce short accounts of past events into their conversations.

The period from 3 to 4 years is largely one of refining and further developing the skills that are already in place. The most obvious new development occurs in the area of grammar, where children start to produce complex, multiclausal sentences. Because there is nothing completely missing from the linguistic competence of most 4-year-old children, it is commonly said that language acquisition is completed during the first four years of life. Although there is some truth to that statement, language skills continue to grow in every domain after the age of 4 years. Articulation, vocabulary, sentence structure, and communicative skills all develop. There are also major transitions involved as children move from a home to a school environment and learn new ways of using language; literacy development is further associated with changes in language knowledge. We will return to each of these developments in future chapters.

## Reasons for the Scientific Study of Language Development

*Language Development as a Basic Research Topic* A child who has acquired language has acquired an incredibly complex and powerful system. If we understood how children accomplish this task, we would know something substantial about how the human mind works. The modern field of language development emerged in the 1950s when it became clear that language acquisition would serve as a test for rival theories of how change in human behavior occurs (H. Gardner, 1985; Pinker, 1984). In the 1950s, two psychological theories were pitted against each other: behaviorism and cognitivism.

**Behaviorism** holds that change in behavior occurs in response to the consequences of prior behavior. Most readers are familiar with clear examples supporting this view. For instance, rats that initially do not press levers come to press levers after receiving food pellets for producing behaviors that increasingly approximate lever pressing. Radical behaviorism holds that all behavior can be accounted for in this way. A central tenet of behaviorism is that it is not necessary to discern what goes on in the mind of the rat in order to explain the change in the rat's behavior; behavior can be fully accounted for in terms of things external to the mind.

**Cognitivism** asserts the opposite—that we cannot understand behavior without understanding what is going on inside the mind of the organism producing the behavior. From approximately 1930 to the early 1950s, behaviorism dominated American psychology. But in the 1950s, a “cognitive revolution” began (H. Gardner, 1985). During the next two decades, behaviorism came to be seen as inadequate, and the focus of the

search for explanations of human behavior shifted to internal mental processes. Studies of language played a crucial role in the cognitive revolution. The ability to speak and understand language is incredibly complex, and children acquire that ability without receiving positive reinforcement for successive approximations to grammatical sentences. Simple theories that may well explain why rats push levers, why dogs salivate at the sight of the people who feed them, and why humans get tense when they sit in the dentist's chair cannot explain how children learn to talk. When cognitivism displaced behaviorism, theoretical dispute concerning how to understand human behavior did not end. In fact, a new interdisciplinary field called **cognitive science** emerged from the cognitive revolution.

Cognitive scientists now agree that it is necessary to understand how the mind works in order to explain human behavior, but they do not agree on how the mind works. The study of language acquisition plays a central role in the debate over how to characterize human cognition, for the same reason that language acquisition played a central role in the cognitive revolution. That is, it is so difficult to explain how language acquisition is possible that accounting for language acquisition is a test not likely to be passed by inaccurate cognitive theories. Language acquisition is the New York City of the field of cognitive science: If you can make it there, you can make it anywhere.

***Language Development as an Applied Research Topic*** The goal for many researchers who study language development is perhaps less grandiose than discovering how the mind works, but it is more immediate. Success in modern industrialized society depends on having good verbal skills, and acquiring the verbal skills that society requires is problematic for some children. For example, some minority children and some children from lower socioeconomic strata enter school with language skills that differ from those that mainstream, middle-class teachers expect. Many children enter school with limited skills in the language of instruction because they or their parents are immigrants, and the language they have learned at home is not the language used in school. A substantial area of research conducted by developmental psychologists, speech and communication scientists, and educators is aimed at understanding the nature of the language skills that characterize children from diverse backgrounds and identifying the best approaches to educating them.

For some children, acquiring adequate language skills is problematic because of other conditions, including intellectual disability, hearing impairment, or brain injury. Some children have difficulty acquiring language in the apparent absence of any other sort of impairment. A substantial body of research focuses on trying to understand the nature of the problems that underlie such children's difficulty and on finding techniques for helping these children acquire language skills.

The areas of basic and applied research in the study of language development are not wholly separate. There are important points of contact. For example, basic research on the process of normal language development is used to develop interventions to help children who have difficulty acquiring language (S. F. Warren & Reichle, 1992), and research on the processes involved in reading has provided the basis for successful reading interventions (Bus & van Ijzendoorn, 1999; Ehri et al., 2001; Lyytinen, Erskine, Aro, & Richardson, 2007). Sometimes work on language disorders also informs basic research. For example, evidence that children with autism acquire language structure even though they have severe communicative deficiencies suggests that learning language involves more than learning how to fulfill a need to communicate (Tager-Flusberg, 1994, 2007), and studies that find late talkers differ from typically developing children in other cognitive tasks suggest that multiple skills serve normal language development (Rescorla, 2009). There are also important points of contact among the various disciplines that

study language development. For example, anthropologists' descriptions of cultures in which no one talks to babies is relevant to the work of developmental psychologists who study how mother–infant interactions contribute to language development (Hoff, 2006b; Lieven, 1994).

## The History of the Study of Language Development

Although the modern study of language acquisition began in the 1960s, the linguistic capacity of children has been a source of fascination since ancient times. One can find examples in history of many of the motives that prompt current investigations of children's language.

### Big Questions and Studies of Special Cases

***The Language in the Brain*** The first recorded language acquisition experiment was conducted by the ancient Egyptian King Psammetichus and described by the Greek historian Herodotus in the 4th century BC. The issue at hand concerned who among the peoples of the world represented the original human race. To resolve the issue, King Psammetichus ordered that two infants be raised in isolation by shepherds, who were never to speak in the children's presence. The idea behind this experiment was that the babies would start to speak on their own, and whatever language they spoke would be the language of the "original" people. According to Herodotus's account, one of the children said something like "becos" at the age of 2. *Becos*, as it turned out, was the Phrygian word for bread. In the face of this evidence, King Psammetichus abandoned his claim that the Egyptians were the oldest race of humans and concluded that they were second oldest, after the Phrygians.

Although the assumptions underlying that experiment seem slightly comical now, and the method of the experiment is certainly unethical, the idea of asking about the language the brain creates when it is not given an existing language to learn has not been discarded. Susan Goldin-Meadow has studied the gestural communication systems invented by deaf children born to hearing parents (Feldman, Goldin-Meadow, & Gleitman, 1978; Goldin-Meadow, 2003; Goldin-Meadow, Mylander, & Franklin, 2007). Because the children's parents do not know any sign language (and have been instructed not to learn or use any sign language in these cases, in accordance with the oralist method of instruction for the deaf), these deaf children are just as isolated from a language model as were the infants in King Psammetichus's experiment. Children in these circumstances invent "signs" and combine them in two- and three-sign sequences, suggesting that putting symbols together to communicate is something that naturally emerges in the course of human development. In Chapter 11, we will come back to the specifics of these findings and what they suggest.

***"Wild Children" and the Nature of Humankind*** Occasionally, there are children who are not only linguistic isolates but also social isolates, and these unfortunate children afford science the opportunity to ask an even broader question: What is the intrinsic nature of humankind? This question was hotly debated in the 18th century. On the one hand, there had been a long tradition of argument by philosophers such as René Descartes (1662) that human nature (including having an immortal soul) was an innate endowment. On the other hand, philosopher John Locke (1690) argued that at birth the human mind was like a sheet of blank paper and that humans become what they become as a result of society's influence. What was needed to settle this question was a human raised outside of society. Such a human appeared in the winter of 1800.

That winter was an unusually cold one, and in January, a young boy who had been living wild in the woods near Aveyron, France, approached a tanner's workshop on the edge of the forest (Lane, 1976). The child appeared to be about 12 years old. He was naked; he occasionally ran on all fours; he ate roots, acorns, and raw vegetables—but only after sniffing them first; and although he was capable of making sounds, he had no language. This “wild child” became the object of intense scientific interest because he provided an opportunity to examine the nature of the human species in its natural state. The young boy's muteness was problematic for theories of innate knowledge for two reasons: (1) Language was held to be one of the defining characteristics of humanity, and (2) his muteness made him a difficult subject to interview to determine whether he had an innate idea of God (Lane, 1976). However, the boy's muteness provided good support for the opposing idea that “man depends on society for all that he is and can be” (Lane, 1976, p. 5).

Victor, the wild boy of Aveyron, as he came to be called, was placed with young Dr. Jean-Marc Itard for training at the National Institute for Deaf-Mutes in Paris. The scientific community watched to see whether society could provide this child with the human characteristic of language. Although Dr. Itard was able to teach the boy some socially appropriate behaviors, the boy never learned more than a few words. Although we cannot be certain why the efforts to teach him failed, many of this wild child's behaviors suggested that he was autistic (Wolff, 2004). Thus, his outcome does not tell us about normal human development in the absence of society's influence. Itard's work did yield practical dividends. He later used the training methods he had devised for the wild boy of Aveyron in teaching the deaf, and some of the techniques for teaching letters that Itard invented are used in Montessori classrooms today (Lane, 1976).

Over the course of history, there have been other “wild children” who were discovered mute at an age when children in normal environments have learned to talk (see R. Brown, 1958a; Curtiss, 1989; L. R. Gleitman & H. Gleitman, 1991). The most famous modern case is that of a girl named “Genie,” who became known to the public in 1970. She was 13 years old and had been kept locked in a room by her mentally ill father since the age of approximately 18 months. Her language remediation was somewhat more successful than the boy of Aveyron's, but Genie never acquired normal language (Curtiss, 1977; Rymer, 1993). To some, such cases suggest that there may be a critical period for some aspects of language acquisition, such that language acquisition begun after childhood is never quite as successful as language acquisition begun earlier. This is also a topic to which we will return in Chapters 2 and 9.

## Baby Biographies

Another approach to investigating “the nature of humankind” is simply to observe what emerges in the course of normal development. In this vein, several investigators in the late 1800s and early 1900s kept diaries of their own children's development. The most famous of these “baby biographers” was Charles Darwin (better known for his theory of evolution), whose description of his son's communicative development (Darwin, 1877) looks remarkably like that described in Figure 1.1. Darwin's son said *da* at 5 months, and, before he was 1 year old, the young Darwin understood intonations, gestures, several words, and short sentences. At 1 year, the child communicated with gestures and invented his first word, *mum*, to mean food. Other well-known diaries include Clara and Wilhelm Stern's *Die Kindersprache* (Stern & Stern, 1907) and Werner Leopold's (1939–1949) four-volume account of his daughter Hildegard's acquisition of English and German.

Diary studies are not entirely a thing of the past. Child language researchers often have children of their own, and some researchers have kept detailed records of their children's language development. Some of the data we will refer to in later chapters come

from such diaries (e.g., Bowerman, 1985, 1990; Dromi, 1987; Halliday, 1975; Mervis, Mervis, Johnson, & Bertrand, 1992; B. F. Robinson & Mervis, 1998; Sachs, 1983; Tomasello, 1992b). In addition, researchers have sometimes trained mothers to keep diaries so that detailed records of the early language development of several children could be studied (e.g., L. Bloom, 1993; A. Gopnik & Meltzoff, 1987; M. Harris, Barrett, Jones, & Brookes, 1988; Naigles, Hoff, & Vear, 2009; Nelson, 1973).

### Normative Studies

In the period between the end of World War I and the 1950s, the goal of most research on language acquisition was to establish norms (Ingram, 1989). Toward that end, several large-scale studies were undertaken to provide data on when children articulate different sounds, the size of children's vocabularies at different ages, and the length of their sentences at different ages. Consonant with the behaviorist orientation of the times, the goal was not to ask theoretical questions about either the nature of humankind or the nature of language development but simply to describe what could be observed. These older studies are still valuable as descriptions of normative development (e.g., McCarthy, 1930; Templin, 1957), and as new instruments for assessing children's language are developed, new normative studies continue to be conducted (e.g., Fenson et al., 1994).

### The Chomskyan Revolution

In the 1960s, the study of children's language development changed radically. The catalyst for this change was the 1957 publication of a slim volume entitled *Syntactic Structures*, written by Noam Chomsky, then a young linguist at the Massachusetts Institute of Technology. That piece, along with Chomsky's subsequent prolific work, revolutionized the field of linguistics and, within a few years, the study of language development. Before Chomsky's work, linguists concentrated on describing the regularities of languages. Linguists could study their own language or, better yet, a little-known language, but the job was the same: to find the patterns in what speakers do. Chomsky caused a revolution by saying that what speakers do is not as interesting as the mental grammar that underlies what speakers do. Since Chomsky's writings, the work of linguists consists of trying to describe what is in the minds of speakers that explains how speakers do what they do.

That new goal of linguistics raised a question about children. If adults have a mental grammar that explains what they do when they talk, then children must have a mental grammar that explains what children do. Children's speech is different from adults' speech; therefore, children's mental grammars must be different. What are children's grammars like, and how do children eventually achieve adult grammars? In 1962, Professor Roger Brown and his students at Harvard University began to study the grammatical development of two children given the pseudonyms Adam and Eve (R. Brown, 1973). Somewhat later, a third child, Sarah, was added to the study. Every week for Sarah, and every two weeks for Adam and Eve, graduate students visited these children in their homes and tape-recorded their spontaneous speech. Transcripts of the children's speech were then analyzed with the goal of describing the grammatical knowledge that underlay the speech they produced. That project, begun by Brown, along with just a few other projects (L. Bloom, 1970; Braine, 1963; W. Miller & Ervin, 1964), marks the beginning of the Chomskyan era of studying children's language. The graduate students who met with Roger Brown to discuss the analyses of Adam's, Eve's, and Sarah's language—along with a few notable others who were not at Harvard that year—became the first generation of child language researchers. We will discuss some of these pioneering projects when we discuss grammatical development in Chapter 6.

Chomsky focused on grammar (the structure of language), and the first new wave of research on language development in the 1960s was on children's grammatical development.



Later, in part following theoretical trends in linguistics, child language researchers shifted their focus more toward semantics and the acquisition of word meanings. In the late 1970s, the domain of language development was further expanded. Again following developments in linguistics, language use was added to the field of inquiry, and child language researchers began to study pragmatic and sociolinguistic development. In the 1980s and 1990s, linguistics and language development returned to focus on syntax, but the other questions about the lexicon and pragmatics have not been abandoned (or solved). The study of phonology and phonological development has also continued throughout this period, and the study of phonological development is becoming increasingly central to the study of language acquisition as evidence mounts that phonological development provides the underpinnings for other aspects of language and literacy development. This topic will come up again, particularly in Chapters 4 and 5. (Accounts of the early history of child language research can be found in Golinkoff & Gordon, 1983; Ingram, 1989.)

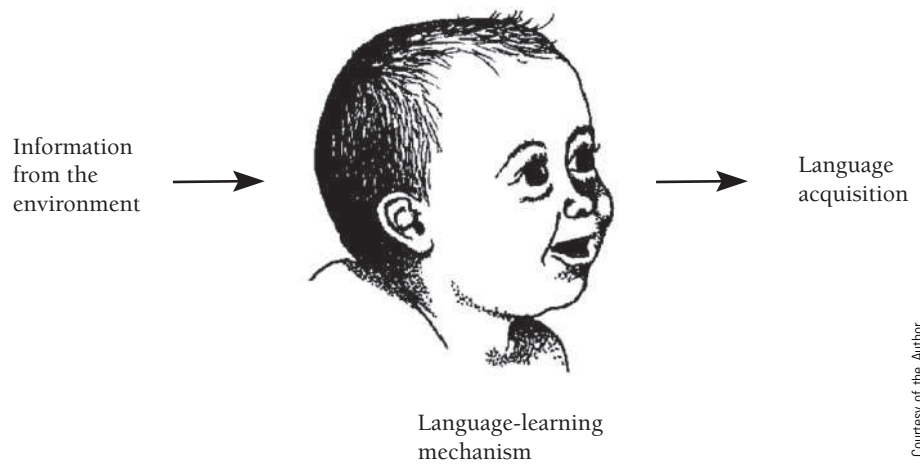
## The Current Study of Language Development

**Current Topics** The current study of language development includes a much wider range of topics and a much wider range of populations than it did at its inception. New methods have also become part of the enterprise of trying to understand the nature of the human language capacity. Researchers now search for the basis of language in images of brain activity during language processing and in maps of the human genome (see Kovelman, 2012; and Chapter 2). Hypotheses about processes of language development are tested in computer simulations (see the section on methods in this chapter). Cross-cultural and cross-linguistic research has grown and become central to the field. The relation of language to thought and of language development to cognitive development has become a major topic. The study of bilingual development and the study of literacy have burgeoned. Currently, the study of language development is a multifaceted field that includes a variety of very different research questions and approaches (Bavin, 2009; Hoff, 2012).

**Current Approaches** Research on language development has always been guided by views of what language is, and there are currently several such views. One can think of language development as the process of learning to communicate in the way that the adults in one's social or cultural group do so. Language, in this view, is a social behavior, and language acquisition is really **language socialization**. The goals of language socialization research are to describe children's language use and their underlying understandings of language as a vehicle for social interaction at different ages and to identify the factors that influence that developmental course. This work includes, for example, studies of gender differences and cultural differences in styles of language use, studies of how children recount stories, negotiate conflicts, and tell jokes (e.g., Slobin, Gerhardt, Kyratzis, & Guo, 1996) and studies of how children in bilingual environments learn which language to use when (Tare & Gelman, 2011). We will pursue these lines of work more fully in Chapters 7, 8, and 9.

In addition to being a social behavior, language is also a complex system that maps sounds (for oral language) to meanings. If one thinks of language development as the acquisition of this system, the research question is, how does the child do it? That is, what is the mental capacity that underlies the human ability to learn to talk? This question can be conceptualized in the following manner: The human capacity for language is a device residing in the human brain that takes as its input certain information from the environment and produces as its output the ability to speak and understand a language. (This model is presented in Figure 1.2.) Everything that is part of adults' knowledge of language (i.e., the output of the device) must be in the input, be in the internal device, or somehow result from the way the device operates on the input it receives. Noam Chomsky (1965) termed this capacity the **Language Acquisition Device (LAD)**. Not everyone uses this terminology,

**FIG-1-2** A Model for Studying the Nature of the Language Learning Capacity



Courtesy of the Author

because it is associated with a particular, Chomskyan, approach to the field, but everyone who is interested in how children acquire the language system is, in essence, asking the question: What is the nature of the human language acquisition capacity?

Researchers do not start out completely neutral with respect to an answer to this question. (Scientists must always start out with some ideas of how things work; the work of scientists is testing those ideas.) Current research on language development can be usefully organized in terms of four different approaches that researchers take—each motivated by a different premise regarding the nature of the LAD and the language development it produces. The approaches are the biological, the linguistic, the social, and the domain-general cognitive approaches. We introduce them briefly here so that readers are familiar with them when they come up in more detailed discussions of particular domains of language development. The biological approach starts with the premise that the human capacity for language is best understood as a biological phenomenon, and language development is best understood as a biological process. This premise then leads to research that investigates the degree to which language and language development share the hallmark features of other biological processes. Research in this vein looks for universal features of language development, for a hereditary basis to language ability, for evidence of a biologically based timetable for development, and more. In addition, biologically motivated research leads to the study of the structures and processes in the brain that underlie language development (see Friederici, 2009; Kovelman, 2012).

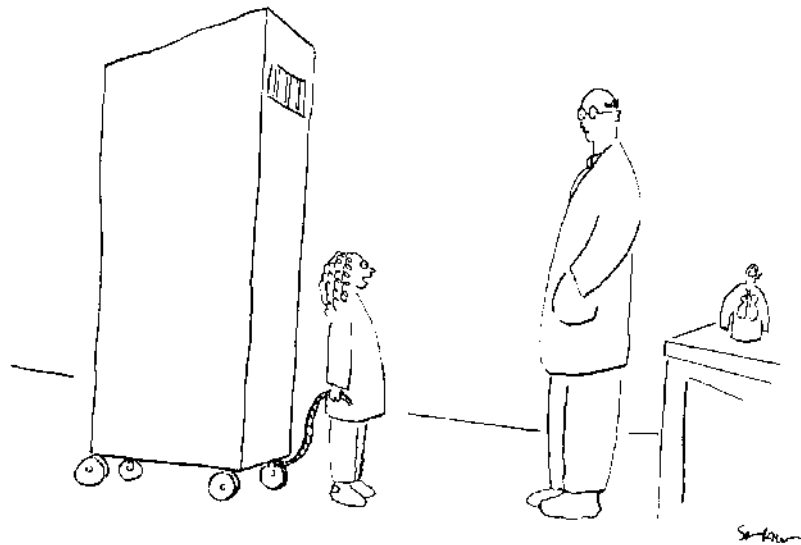
The generative linguistic approach to the study of language acquisition focuses on describing the nature of the child's innate linguistic knowledge. This approach works from the premise that the LAD must contain some knowledge of the structure of language in order for language acquisition to be possible. That innate knowledge cannot be specific to any particular language; thus, it is **Universal Grammar (UG)**. This approach seeks to describe UG and how it interacts with language experience to produce linguistic knowledge as a result (see Deen, 2009; Goodluck, 2007; Lust, Foley, & Dye, 2009; de Villiers & Roeper, 2011).

Other approaches reject this nativist premise. The social approach starts from the premises that language is essentially a social phenomenon and language development a social process, and seeks to describe the social processes that produce language acquisition. Research in this vein focuses on the social aspects of interaction as the experience relevant to language acquisition and on the social cognitive abilities of the child as the relevant learning capacities (see Baldwin & Meyer, 2007; Tomasello, 2009). The domain-general cognitive approach starts from the premise that language acquisition is

a learning problem no different from any other and that children solve it in the same way that they solve other learning problems. Research in this vein seeks an account of how language might be learned by the child's application of domain-general cognitive processes to the information available in input (see J. R. Saffran & Thiessen, 2007; Thiessen, 2009). Other work, such as that which has identified relations between early attention and early speech perception on later vocabulary development, illustrates what is often termed a developmental systems approach (e.g., Colombo et al., 2009; Kuhl, 2009; Spencer et al., 2009). The premise of this research approach is that early developments and/or genetically based characteristics in one domain provide the foundation for subsequent developments in other domains. Thus, language development reflects cascading effects in which both the child's language knowledge and the child's language learning capacity change with development, and the outcome reflects the complex interaction between capacity and experience over time (e.g., Colombo et al., 2009).

Finally, the dynamical systems approach rejects the premise that language is a static system of knowledge and that language development consists of acquiring that knowledge. According to **dynamical systems theory (DST)**, language emerges as a result of the continuous interaction of the components of the system and the environment. This self-organizing process accounts for both change in the child's language abilities over developmental time and the moment-to-moment processes that occur as the child assembles words and longer utterances (see Evans, 2007; Vihman, DePaolis, & Keren-Portnoy, 2009). Dynamical systems theory has its roots in the fields of complex, nonlinear, dynamic systems in physics and mathematics. It is best known within developmental psychology in the work of Esther Thelen who brought a dynamical systems approach to the study of early motor development (Thelen & Smith, 1998). At this point, it is not a comprehensive approach to understanding language development, but DST does direct attention to certain phenomena that are relatively ignored in other approaches. These phenomena include variability in children's performance and the influence of transitory states, as opposed to stable states of knowledge, on children's language performance. For example, it is standard in the field to take the words

FIG-1-3



*"The title of my science project is 'My Little Brother: Nature or Nurture.'"*

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