Early one morning in the cold winter of 1800, a dirty, naked boy wandered into a hut at the edge of a tiny French hamlet in the province of Aveyron to beg for food. In the months before this appearance, some of the people in the area had caught glimpses of the boy digging for roots, climbing trees, swimming in a stream, running rapidly on all fours. They thought he was inhuman, a wild beast, so word spread quickly when the boy appeared in the village; everyone came to see him.

Among the curious was a government commissioner, who took the boy home and fed him. The child, who appeared to be about 12 years old, seemed ignorant of the civilized comforts that the people offered to him. When clothes were put on him, he tore them off. He would not eat meat, only raw potatoes, roots, and nuts. He rarely made a sound and seemed indifferent to human voices. The local commissioner, in his report to the government, concluded that the boy had lived alone since early childhood, "a stranger to social needs and practices. . . . There is . . . something extraordinary in his behavior, which makes him seem close to the state of wild animals" (quoted in Lane, 1976, pp. 8–9).

The commissioner's report caused a public sensation when it reached Paris. Newspapers hailed the child as the "Wild Boy of Aveyron." France had recently overthrown its king and become the first country in Europe to embrace a democratic form of government. Many supporters of the new republic hoped that the boy could rapidly develop intellectually and socially to demonstrate that even the poor and outcast members of society are as capable as children of the wealthy as long as they are provided with a proper education. The Wild Boy seemed a perfect test case because his life had been so devoid of supportive human contact.

Unfortunately, plans to study the Wild Boy soon ran into trouble. The first physicians to examine him concluded that he was mentally deficient and speculated that he had been put out to die by his parents for that reason. (In France in the late eighteenth century, as many as one in three normal children and a greater percentage of abnormal children were abandoned by their parents, usually because the family was too poor to support another child.)

The doctors recommended that the boy be placed in an asylum. But a young physician, Jean-Marc Itard (1744–1838), disputed the diagnosis of retardation. Itard argued that the boy only appeared to be mentally deficient because he had been isolated from society and thereby prevented from developing normally. Itard pointed to the fact that the boy had been able to survive on his own in the forest as evidence against his being mentally impaired.
Itard took personal charge of the boy. He thought that he could teach him to become fully competent, to master the French language, and to acquire the best of civilized knowledge. To test his theory that the social environment has the power to shape children’s development, Itard devised an elaborate set of experimental training procedures to teach the Wild Boy how to categorize objects, to reason, and to communicate (Itard, 1801/1982).

At first, Victor, as Itard named the Wild Boy, made rapid progress. He learned to communicate simple needs as well as to recognize and write a few words. He learned to use a chamber pot. He also developed affection for the people who took care of him. But Victor never learned to speak and interact with other people normally.

After 5 years of intense work, Itard abandoned his experiment. Victor had not made enough progress to satisfy Itard’s superiors, and Itard himself was unsure about how much more progress the boy could make. Victor was sent to live with a woman who was paid to care for him. He died in 1828, still referred to as the Wild Boy of Aveyron. His unusual experiences in life left unanswered the large questions about human nature, the influence of civilized society, and the degree to which individuals are shaped by one or other of these forces that scholars had hoped would be answered by his discovery.

Most physicians and scholars of the time eventually concluded that Victor had indeed been mentally defective from birth. But doubts remain to this day. Some modern scholars think that Itard may have been right in his belief that Victor was normal at birth but was stunted in his development as a result of his social isolation (Lane, 1976). When he was found, Victor had spent many of his formative years alone. He had already passed the age when most children have acquired language. Others believed that Victor suffered from autism, a pathological mental condition whose symptoms include a deficit in language and an inability to interact normally with others (Frith, 1989). It is also possible that Itard’s teaching methods failed where different approaches might have succeeded. We cannot be sure.

The Study of Child Development

Although there was no scientific specialty called developmental science in Itard’s day, interest in children and their development had already begun to grow among philosophers and social reformers as well as scientists (Hartup & Silbereisen, 2002). Eventually, the study of child development came to encompass the physical, cognitive, social, and emotional changes that children undergo from the moment of conception onward. The basic task of the developmental sciences is to understand how these remarkable changes come about.

The Rise of the New Discipline

Philosophical questions about the nature of children and their development played a central role in the earliest stages of the scientific study of children. These questions were soon supplemented by practical concerns about the welfare of children. Attempts to address these concerns gave rise to scientific methods for studying children and new theories of child development.

Philosophical Origins

More than a century before Itard encountered Victor, John Locke (1632–1704), an English philosopher, had proposed that infants enter the world as “blank slates” or, as he phrased it, their minds are a tabula rasa. He believed that in the course of experiencing their environments, the guidance of their elders shapes children’s natures. Locke
strongly believed that early experiences are especially important in shaping the psychological properties children later acquire. Although Locke did not deny that children are born with different “temperaments and propensities,” he insisted that instruction, begun at an early age, exerts the greatest influence. Itard’s faith in his ability to civilize Victor, through carefully designing an educational regime, is traceable directly to Locke. This idea has remained central to modern theories of education, for example, the strong support shown for programs like Head Start, which seek to shape children’s development well before they begin to attend elementary school.

Also influential to the developmental sciences were the ideas of Jean-Jacques Rousseau (1712–1778), an eighteenth-century French philosopher who argued that children are born “pure,” with a natural goodness that is either gradually enriched through caring and careful education or is corrupted by civilization. In Emile (1762/1911), a book that was part novel and part treatise on education, Rousseau provided a vision of childhood and education in which the role of the caretaker is to protect the child from the pressures of adult society. Emile, who stands for Everychild, passes through several natural stages of development. During each stage an adult ensures that he receives educational activities that are attuned to his current developmental needs. Rousseau’s ideas regarding developmental stages and developmentally appropriate education continue to influence today’s child-rearing practices as well as developmental theories. They underpin the widespread belief that children’s development is marked by a series of qualitatively distinct stages, and they are invoked by educators who warn that it is harmful to seek to pressure children into accomplishments for which they are not yet prepared.
Practical Concerns about Children

During the nineteenth century, philosophical questions about children's nature and development merged with more practical issues involving their welfare. Interest in child development was spurred by the larger economic and social changes occurring in Europe, America, and many other parts of the world that became ever more pronounced in the years following Victor's death. During the nineteenth century, the industrialization of Europe and North America transformed the social organization of people's lives. Industrialization also transformed the role of children in society and the settings within which they developed. Instead of growing up on farms, where they contributed their labor and were cared for by their mothers and fathers until they reached adulthood, many children were employed in factories or sprawling cities, alongside, and sometimes in place of, their parents (Heywood, 2001).

Many children in the labor force worked long hours in factories or mines under dangerous and unhealthy conditions. As political control shifted from the landed aristocracy to the urban middle classes, these conditions became a matter of social concern and they soon sparked increased scientific activity. The Factory Inquiries Committee in England, for instance, conducted a study in 1833 to discover whether children could work 12 hours a day without suffering damage. The majority of the committee members decided that 12 hours was an acceptable workday for children. Others who thought a 10-hour workday would be preferable were concerned less with children's physical, intellectual, or emotional well-being than with their morals. They recommended that the remaining 2 hours be devoted to the children's religious and moral education (Hindman, 2002).

The Beginnings of Developmental Science

Developmentalists and physicians soon began to use the data they collected to clarify basic questions about human development and how to study it. The studies of children's growth and work capacity, for example, supported Locke's philosophical assertions that the environment affects development in measurable ways. Researchers found that because of long hours and inadequate rest and nutrition, children who worked in textile mills were shorter and weighed less than local nonworking children of corresponding ages. Surveys of intellectual growth showed wide variations in children's achievements that seemed to depend on family background and individual experience. These findings fueled the continuing scientific and social debate about the factors that are primarily responsible for development. A crucial event that spurred further interest in the scientific study of children was the publication of Charles Darwin's Origin of Species, in 1859. Darwin's thesis that human beings had evolved from earlier species fundamentally changed the way people thought about children. Instead of being viewed as imperfect adults to be seen and not heard, children came to be viewed as scientifically interesting because their behavior provided clues to the ways in which human beings are related to other species. It became fashionable, for example, to compare the behavior of children with the behavior of higher, nonhuman primates to see if individual children went through a "chimpanzee stage" similar to the one through which the human species was thought to have evolved (see Figure 1.1). Although such parallels between species proved oversimplified, the idea that human development must be studied as a part of human evolution won general acceptance (Bjorklund & Pellegrini, 2002).

As a result of the excitement generated by Darwin's theory of evolution, much of the early science of human development involved comparing our species with other "animal" species (which we will discuss further in the section on continuity). Scientists sought to discover how current human abilities and behaviors are
influenced by our evolutionary past. Wilhelm Preyer (1841–1897), a leader in comparative embryology and physiology, wrote the first textbook in child development (Preyer, 1888). He felt that fuller understanding of human development also requires the “methodical investigation” of the mind of the child. Everything should be recorded, even behaviors that seem uninteresting at the time. (See Table 1.1.)

Using his rules of observation, summarized in Table 1.1, Preyer examined the development of emotion, intention, mind, and language. He was particularly keen to establish sequences of behavior because he believed that they would show how certain behavioral patterns arose, as well as the extent to which they were organized by biological or environmental processes. For example, around 9 months of age babies become capable of pointing as a means of signaling their wants and needs to others. Preyer argued that pointing follows naturally from unsuccessful attempts to seize or grasp desired objects.

Whereas Preyer’s greatest contributions to the developmental sciences were his methods of study, James Mark Baldwin (1861–1934) offered a theoretical framework that focused directly on the process of child development. Developmentalists of Preyer’s day believed that adult abilities are present and fully formed in the child, just waiting “off stage” for their cue to appear. In effect, the “child mind” was defined in terms of the “adult mind.” In contrast, the new, developmental perspective promoted by Baldwin reversed this logic. He believed that abilities progress through a series of specific stages that take on different forms and undergo systematic changes throughout childhood before they reach their mature state. Within the new discipline, Baldwin was the first stage theorist of note, and among the first to argue that the adult mind can be understood only in terms of the child mind that precedes it.

<table>
<thead>
<tr>
<th>Preyer’s Rules of Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Rely only on direct observations; avoid the reports of “persons not practiced in scientific observing.”</td>
</tr>
<tr>
<td>* Record observations immediately so that details are not forgotten.</td>
</tr>
<tr>
<td>* Make every effort to be unobtrusive, to “observe without the child’s noticing the observer at all.”</td>
</tr>
<tr>
<td>* Avoid any “training” of the young child in order to observe “unadulterated mental development.”</td>
</tr>
<tr>
<td>* If regular observations are interrupted for more than 1 day, another observer must be substituted, and his or her observations should be checked for accuracy. (Preyer observed and recorded his child’s behavior two to three times every day!)</td>
</tr>
<tr>
<td>* Everything should be recorded, even behaviors that seem uninteresting at the time.</td>
</tr>
</tbody>
</table>

Source: Preyer, 1890, pp. 187–188.
Ever since developmental science came to public attention, parents have relied on advice books to help them deal with the uncertainties of parenting. Shifting cultural fashions as well as new scientific knowledge have resulted in many changes in the advice parents receive. (Hulbert, 2003.)

Late in the nineteenth century, owing in no small measure to the efforts of scholars such as Preyer and Baldwin, the study of human development became a recognized field of scientific inquiry. Special institutes and departments in universities devoted to the study of development began to spring up in major U.S. universities. Both government agencies and philanthropic foundations began to support research on child development. Specialized magazines on infant care and parenting were published and widely circulated. To this day, research on children's development continues to be motivated by twin concerns that were present at the discipline's origins. One is the scientific and philosophic interest in the question of how our biological and cultural heritages combine to determine what it means to be human. The other is the more practical concern of understanding how best to promote the health and well-being of children. Both of these motives merge in the popular idea that conducting scientific research can make the world a better place by promoting the development of our children (Hulbert, 2003).

Modern Developmental Science

Since becoming established as a discipline at the start of the twentieth century, the study of children’s development has been dominated by psychologists, following in the footsteps of scholars such as Preyer and Baldwin. In recent decades, however, the study of development has become increasingly interdisciplinary. That is, research on development has contributed to, and profited from, the insights of a wide range of disciplines, such as anthropology, biology, linguistics, neuroscience, and sociology. Studies of development have also become increasingly international, reflecting a growing appreciation of the importance of cultural context in the developmental process and recognition of the increasing interaction among the world's people. As a result of the broad scope of modern studies of development, we have adopted the term developmentalist to describe its practitioners and the term developmental science to designate the discipline to which they contribute.

Not only has the scope of developmental science increased, but so have the pace and complexity of research. A rapid increase in the number of scholars who study development partly explains this change. There were only 500 members of the Society for Research in Child Development in 1960, at present there are more than 5000, and the number of new practitioners is increasing rapidly every year.

The pace and complexity of research have also been driven by important advances in technology. The ability to record children's behaviors with video cameras, to obtain images of their brain activity, and to analyze data with high-speed computers has revolutionized the way developmentalists do research. Growing concerns about the welfare of children have created new questions for researchers—questions encompassing topics such as the influence of maternal stress and nutrition on fetal brain growth, the effects of neighborhoods on family dynamics, the risks attached to medicating children who experience difficulty in school, and the
special challenges facing children of immigrant families in their attempts to deal with an alien culture and unfamiliar language. The title of a recent report prepared for the National Research Council, *From Neurons to Neighborhoods*, captures the breadth of contemporary developmental science.

In addition to their roles as researchers looking for answers to these complex questions, developmentalists are often practitioners who work to promote the healthy development of children. They work in hospitals, child-care centers, schools, recreational facilities, and clinics. They assess children’s developmental status and prescribe procedures for assisting children who are in difficulty. They design special environments, such as cribs that allow premature babies to develop normally outside the womb. They devise therapies for children who have difficulty controlling their temper, and they develop techniques for teaching children how to read more effectively (Lerner et al., 2003).

As you read about the research, methods, and practical applications of developmental science, it is essential to keep in mind the general goal of developmental inquiry: to assemble the facts into larger patterns, called theories. A theory is a framework of ideas or body of principles that can be used to guide the collection and interpretation of a set of facts in order to increase our understanding of human nature and its development as a whole.

**The Central Questions of Developmental Science**

Despite great variety in the work they do, and in the theories that guide their research, developmentalists share an interest in four fundamental questions about the process of development:

1. **Continuity.** Is development a gradual, continuous process of change, or is it punctuated by periods of rapid change and the sudden emergence of new forms of thought and behavior? The question of continuity applies to changes within the lifetime of a single person and to comparisons between humans and other species.

2. **Sources of development.** What are the contributions of genetic heredity and the environment to the process of developmental change, and how do they interact?

3. **Plasticity.** To what extent and under what conditions is it possible for the course of development to change, as the result of either deliberate intervention or accidental experience?

4. **Individual differences.** No two human beings are exactly alike. How does a person come to have stable individual characteristics that make him or her different from all other people?

As researchers and practitioners, developmentalists are strongly committed to exploring these questions. The answers provide insight into principles of development, as well as guidelines for how to promote development.

**Questions about Continuity**

Developmentalists ask two basic questions about continuity: (1) How similar are the principles of development in humans to those in other species? In other words, how much continuity is there between human beings and other animal life? (2) To what extent is individual development continuous, consisting of the gradual accumulation of small quantitative changes, and to what extent is development discontinuous, involving a series of qualitative transformations as we grow older?
Is Human Development Distinctive?

For centuries people have debated the extent to which humans differ from other creatures and the extent to which we are subject to the same natural laws as other forms of life. The study of human uniqueness focuses on **phylogeny**, the evolutionary history of a species. When Charles Darwin (1809–1882) published *Origin of Species*, the idea of evolution was already a subject of widespread speculation. Darwin was a firm believer in continuity among species. He saw evolution as a process of small, accumulating changes. As he put it, the difference between humans and our near evolutionary neighbors is “one of degree, not of kind” (Darwin, 1859/1958, p. 107).

To test Darwin’s claim that our species evolved continuously as a part of the natural order, scientists have searched for evidence of evolutionary links—intermediate forms that connect us with other forms of life—and have compared our genetic makeup and behavior with those of other organisms. On the side of continuity between ourselves and other animals, it has been established that we share at least 99 percent of our genetic material with chimpanzees (Marks, 2002). There is also abundant evidence regarding behavioral similarities between humans and a variety of species—ranging from chimpanzees to wolves. For example, like many other animal species, we play, we communicate with each other, and we develop relatively stable social hierarchies. Even our facial expressions show remarkable continuity with the facial expressions of nonhuman primates (de Waal, 2001).

Despite the obvious similarities, it is nevertheless clear that there is something distinctive about our species. The difficult question is, what is that something?

Two general phenomena have long been associated with human distinctiveness. First, humans develop in a unique environment that has been shaped by countless earlier generations of people in their struggle for survival (Bruner, 1996; Cole, 1999). This special environment consists of *artifacts* (such as tools, clothing, words), *knowledge* about how to construct and use those artifacts, *beliefs* about the world, and *values* (ideas about what is worthwhile, right, and wrong) (Kagan, 2001), all of which guide adults’ interactions with the physical world and with each other and their children. Anthropologists call this accumulation of artifacts, knowledge, beliefs, and values, **culture**. Culture is the “man-made” part of the environment that greets all human beings at birth (Herskovitz, 1948) and provides each developing individual with a “design for living” that he or she acquires from the community (Kluckhohn & Kelly, 1945).

Second, humans shape and pass on their culture to succeeding generations largely through their use of language. It is not surprising, then, that since antiquity, language has been proposed as a defining characteristic of our species. In the seventeenth century the philosopher René Descartes stated the traditional view eloquently:

> Language is in effect the sole sure sign of latent thought in the body; all men use it, even those who are dull or deranged, who are missing a tongue, or who lack the voice organs, but no animal can use it, and this is why it is permissible to take language as the true difference between man and beast. (Quoted in Lane, 1976, p. 23)

Even Charles Darwin, who believed strongly in the continuity of species, agreed that our distinctiveness, insofar as humans are distinct, is the result of our capacity to communicate through language. In recent years, scientists have demonstrated that chimpanzees and other primates have rudiments of culture and language (Bekoff & Colvin, 2002). However, as we shall see in later chapters, the capacities for using culture and language, considered as an ensemble, are far greater in humans than in other species. Nonhuman primates in their natural habitats rarely, if ever, show objects to each other or bring others to locations to observe things there. Nor do they intentionally teach others ( Tomasello, 1999).
Is Individual Development Continuous?

The second major question about continuity concerns **ontogeny**, the development of an individual organism during its lifetime. As a rule, developmentists who believe that ontogeny is primarily a process of continuous, gradual accumulation of small changes emphasize *quantitative* change, such as growth in the number of brain cells, in vocabulary, or in memory capacity. Those who view ontogeny as a process punctuated by abrupt, discontinuous changes emphasize the emergence of *qualitative* change. Qualitative change is seen in the emergence of new patterns of behavior at specific points in development, such as the change from babbling to talking or from crawling to walking. Qualitatively new patterns that emerge during development are referred to as **developmental stages**. The contrast between the continuity and discontinuity views is illustrated in Figure 1.2.

The psychologist John Flavell (1971) suggests four criteria that are central to the concept of a developmental stage:

1. **Stages of development are distinguished by qualitative changes.** The change in motor activity associated with the transition from crawling to walking upright illustrates what is meant by a qualitative change to a new stage of development. Walking does not arise from the perfection of the movements used to crawl. Rather, the child undergoes a total reorganization of movement, using different muscles in different combinations.

2. **The transition from one stage to the next is marked by simultaneous changes in a great many, if not all, aspects of a child’s behavior.** The transition from crawling to walking is accompanied by a new quality of emotional attachment between children and their caregivers as well as the new forms of child-caregiver relations that the child's greater mobility requires.

---

**ontogeny** The development of an individual organism during its lifetime.

**developmental stage** A qualitatively distinctive, coherent pattern of behavior that emerges during the course of development.
3. When the change from one stage to the next occurs, it is rapid. The transition from crawling to walking typically takes place within the space of about 90 days.

4. The numerous behavioral and physical changes that mark the appearance of a stage form a coherent pattern. Walking occurs at about the same time as pointing, the ability to follow the gaze of another, the child’s first words, and a new relationship between children and their parents.

Supporters of the stage concept argue that development is characterized by sequences of discontinuous, qualitative changes in the way the child experiences the world and the way the world influences the child. For example, infants are especially sensitive to differences in the sounds of language but they do not understand what is being said (Karmiloff & Karmiloff-Smith, 2001). Once they begin to understand and produce language themselves, the way they learn about the world appears to change fundamentally, and so does the nature of their interaction with others. The discontinuity represented by the emergence of the child’s active participation in conversation is so notable that it marks the boundary between infancy and early childhood in a great range of societies.

Nevertheless, some developmentalists deny that the stage concept is crucial for understanding development. For example, Allison Gopnik and Andrew Meltzoff believe that even very young children—as well as adults—use some of the same methods that allow scientists to learn about the world. Gopnik and Meltzoff argue, for example, that young children use unobservable constructs such as beliefs and desires to explain, predict, and understand other people’s behaviors and that they modify their theories when their predictions are incorrect (Gopnik, Meltzoff & Kuhl, 1999). In a similar spirit, Elizabeth Spelke and her colleagues have argued that “infants perceive fundamentally the same world as adults” (Condry, Smith & Spelke, 2000).

During most of the twentieth century, stage theories of development have been more numerous and more influential than continuity theories. Yet stage theories are confronted with a variety of facts that appear to violate one or more of the criteria for developmental stages proposed by Flavell.

One acute problem for modern stage theories is that, contrary to their depiction of qualitatively consistent, across-the-board shifts in behavior and thinking, children often appear to be in one stage on one occasion and in a different stage on another. According to one influential stage theory of cognitive development, for example, 4-year-olds are in a stage in which their thinking is largely egocentric, making it very difficult for them to see anything from a point of view other than their own. And, in fact, 4-year-olds frequently do seem limited to their own perspective—they often fail to appreciate that someone looking at an object from a location different from their own may not see the object as they themselves see it or that someone who has just returned to the room doesn’t know, as they do, what has transpired while he or she was gone. Yet when they are talking to a 2-year-old, they usually simplify their speech, apparently taking the younger child’s perspective and realizing that he or she might otherwise have difficulty understanding them. The fact that at a given point in development a child can exhibit behaviors associated with different stages seems to undercut the idea that being in a particular stage defines the child’s general capabilities and psychological makeup.

Questions about the Sources of Development

The second major question that preoccupies developmentalists is the way in which genetically directed biological factors interact with environmental factors to influence development. This issue is often posed as a debate about the relative importance of “nature” and “nurture.” Nature refers to the inherited biological predispositions of the individual; nurture refers to the influences of the social and cultural environment on the individual, particularly those of the family and the community.
Much of the argument about Victor, the Wild Boy of Aveyron, was about the relative influences of nature and nurture: Was Victor incapable of speech and other behaviors normal for a boy his age because of a defective biological endowment (nature) or because of inadequate nurturing?

The extent to which development is linked to nature or nurture can have far-reaching effects on the way society treats children. If, for example, it is assumed that girls, by nature, lack interest and ability in mathematics and science, they are not likely to be encouraged by their parents, teachers, and other members of society to become mathematicians or scientists. If, on the other hand, it is assumed that mathematical and scientific talent are largely a result of nurture, a society may train girls and boys equally in these activities.

Modern developmentalists emphasize that we cannot adequately describe development by considering nature and nurture in isolation from each other because the organism and its environment constitute a single life process (Gottlieb, 2002). Nevertheless, as you shall see, debates about the relative roles of genetic inheritance and experience as sources of development have by no means ceased to preoccupy developmental science.

**Questions about Plasticity**

The third major question follows from the second and concerns **plasticity** — the degree to which, and the conditions under which, development is open to change and intervention. Early ideas about plasticity were influenced by researchers who identified certain "critical periods" in several nonhuman species. A **critical period** is a period of growth — in some cases only a few hours long — during which specific environmental or biological events **must** occur if development is to proceed normally. For example, certain birds that can walk at birth run the risk of being separated from their mothers. It is therefore important for the chicks to have a critical period just after hatching during which they become attached to the first moving object they see, which is usually their mother. Thereafter, they follow the object wherever it goes. If the chicks are prevented from seeing any moving object for a certain number of hours after hatching, they fail to become attached to anything at all and may wander around alone. As you can imagine, lost chicks have little chance for survival (see Figure 1.3) (Izawa, Yanagihara, Atsumi, & Matsushima, 2001).

Examples of "all-or-nothing" critical periods in any species are rare. In our own species they tend to be limited to fetal development. For example, during a specific period in prenatal development, the presence or absence of certain hormones will determine whether the fetus becomes male or female. Although evidence that specific experiences actually **induce** specific developments is rather thin, there is abundant evidence pointing to periods of plasticity during which development can be **facilitated** through certain experiences (Gottlieb, 2002). For example, in order for children to develop normal language abilities, it is essential that they be exposed to language during childhood, but there is no specific period during childhood in which language input is known to be essential. Children seem to be most sensitive to language input in the first few years of life, but even if they are not regularly exposed to language until the age of 6 or 7, it appears that they are still capable of acquiring it. Thereafter, the risk of failing to acquire language increases (Newport, Bavelier & Neville, 2001). For this reason, the periods of plasticity are often called **sensitive periods** rather than critical periods. **Sensitive periods** are defined as times in an organism's development when a particular experience (or lack of it) has a more pronounced effect on the organism than does exposure to the same experience at another time (Bruer, 2001).

**Figure 1.3** Ethologist Konrad Lorenz proposed the existence of a critical period in the development of newly hatched geese during which they form an attachment to the first moving thing they see. These goslings, which were allowed to see Lorenz rather than an adult goose when they hatched, follow him in the water as he swims.
Sensitive periods may not be limited to development that involves biological readiness. Yasuko Minoura (1992) reports the existence of a “cultural sensitive period.” She found that Japanese children who had resided in the United States for the 4 years between the ages of 9 and 13 had great difficulty reincorporating themselves into Japanese society when they returned to their native land as teenagers. They had learned and accepted an American way of thinking and feeling that made the Japanese way of interacting and thinking seem strange. For example, the returnees reported that they found it difficult to hide their feelings, which made them unpopular with the Japanese children they met. The same was not true of younger children who had spent an equal amount of time in the United States but returned to Japan before they were 11 years old. The younger children’s reentry into Japanese culture, while not trouble-free, was rapid and thorough.

Questions about Individual Differences

In some respects, you are like all other people, like some other people, and like no other person. You are like all humans because we are all members of the same species; you are like some people but not others insofar as you share important biological characteristics (males are like each other and different from females) or cultural characteristics (Australian Aborigines are alike in comparison with the Inuit people of North America); and you are psychologically and physically unique. As you shall see in Chapter 2 (p. 50), even identical twins, who have exactly the same genetic constitutions, are not alike in every respect.

Two questions about individual differences must be taken into account in trying to understand the nature of development: (1) What makes individuals different from one another, and (2) to what extent are individual characteristics stable over time?

The question of what makes individuals different from one another is really another form of the question about the sources of development: Are we different from one another primarily because of our nature or because of our nurture? If baby Sam is unusually fussy, is it because he inherited a tendency to be easily upset or because his parents continually overstimulate him? If baby Soon-Jae becomes an accomplished pianist, is it because she inherited musical talent from her parents or because she grows up in a family that values and promotes the development of musical skills? Although powerful statistical techniques and ingenious methods of data collection have been used in an effort to tease apart the fundamental sources of variation among individuals, disagreements of theory and fact remain (Etem & Hewitt, 2001; Joseph, 2001).

Insofar as individual characteristics are innate and stable, they provide a glimpse of what children will be like in the future. If baby Sam is innately fussy, perhaps he will be an irritable child. If baby Georgia has inherited a low metabolism rate, maybe she will be overweight as a teenager.

Determining the extent to which the past provides a guide to the future is a major task facing developmentalists, so the idea that some of our psychological characteristics remain stable over extended periods of time is an appealing one. Parents sometimes remark that their children have been friendly or shy since infancy. However, demonstrating such stability scientifically—at least from an early age—has proved difficult. The problem is that measures that seem appropriate for assessing psychological traits such as memory or affability during infancy are not likely to be appropriate for assessing the same traits in an 8-year-old or in a teenager. Perhaps for this reason, many studies have observed only moderate stability of psychological traits in childhood (Caspie & Roberts, 2001). Nevertheless, some investigators do find moderately stable individual differences in a number of psychological characteristics. There is evidence, for example, that children who were shy and uncertain at 21...
months of age are still likely to be timid and cautious at age 12 or later and that infants who rapidly processed visual information at 7 months of age display rapid perceptual processing when tested at the age of 11 years (Emde & Hewitt, 2001).

The stability of children's psychological characteristics over time depends on stability in their environment in addition to any stability that might be attributed to their genetic makeup. Studies have found that children who remain in an orphanage that provides only minimal care from infancy through adolescence are lethargic and unintelligent. But if they are given extra, stimulating care by the orphanage staff or if they are adopted into caring families, their condition improves markedly, and many of them become intellectually normal adults (Clarke & Clarke, 2000).

The Discipline of Developmental Science

There are two broad approaches to the study of human development. One is to seek out intimate knowledge of specific individuals and their biographies. The other is to focus on identifying and understanding characteristics common to groups of people—to all 4-year-olds, or girls, or Europeans, or Asians, or Native Americans, for example.

The difference between these two ways of knowing is a source of constant tension in scientific attempts to understand development (Valsiner & van der Veer, 2000). It is also an ongoing source of difficulty in bringing together the two roles of developmentalists as researcher and developmentalists as practitioners. The more developmentalists want to know about individuals, the more they need to know about each person's life history and current circumstances. But the more they concentrate on unique histories and patterns of influence, the less they can generalize their findings to other individuals. Uncertainties about how to draw correct conclusions concerning the relationship between general trends and individual cases occur across the broad spectrum of methods that psychologists use in their research.

The Goals of Scientific Description

Whether dealing with an individual or a group of children, developmentalists, like any other scientists, begin their research with particular goals in mind. The goals can range widely. Some seem "purely scientific"—for example, the desire to know whether the ability to perceive depth is inborn or learned. Other goals, however, are inspired by more practical considerations, such as how to assess the effectiveness of different kinds of violence prevention programs in schools.

It is helpful to consider three categories of research that differ according to the particular goals that motivate the researcher.

The goal of basic research is to advance basic, scientific knowledge of human development. Although the results of basic research might be used to help solve practical problems, it is often undertaken simply to satisfy a thirst for new knowledge. Basic research often explores major theoretical issues, such as questions of developmental continuity, plasticity, and the sources of development. Scientists engaged in basic research go to great lengths to control the variables and conditions affecting the process they are studying. However, absolute precision and control are difficult, and sometimes impossible, to achieve. (It is impossible, for example, to control the entire language environments of different groups of children in a precise manner to determine how language input influences language development.)

Applied research is designed to answer practical questions that arise in the quest of trying to improve children's lives and experiences. In many cases, it also borrows from and extends our basic scientific knowledge. The primary