Dear God,
I saw Saint Patrick’s Church last week when we went to New York. You live in a nice house.

Frank

Frank is a young child whose letter was part of a research project studying children’s developing ideas about God (Heller, 1986, p. 16). As Frank’s letter suggests, young children translate cultural concepts like “God” into their own “language.” Frank converted the idea of the church as God’s home into his own concrete notion of what constitutes a “nice house.” Children’s drawings similarly reveal the way they translate adult spiritual beliefs into “childese” (Figure 13.1).

In religious belief as in other areas, children frequently wrestle with concepts beyond their grasp, and their efforts reveal much about childish thought. Consider the mighty task faced by a six-year-old trying to make sense of the relation between Jesus and God in Christian theology: “Well, I know Jesus was a president and God is not—sort of like David was a king and God is not” (Heller, 1986, p. 40).

Whether children are reared Jewish, Baptist, Catholic, Muslim, or Hindu, their views of God, like their understanding of most objects of thought, are initially concrete. By the time they move into adolescence, they are likely to offer abstract conceptions, such as “God is a force within us all.” If cultural conditions permit, they may also express considerable skepticism about religious notions, because they are able to imagine and reflect on a variety of possible realities.

Changes in the way children understand reality and cultural beliefs are a central focus of developmental psychology. For years, psychologists focused largely on childhood and adolescence and tended to consider development complete by the teenage years. Most psychologists now, however, adopt a life-span developmental perspective that considers both constancy and change as well as gains and losses in functioning that occur at different points over the entire human life cycle (Baltes, 1998).

In this chapter, we first consider three issues that reverberate throughout all of developmental psychology: the roles of nature and nurture, the importance of early experience, and the extent to which development occurs in “stages.” After addressing the question of how to study development, we focus on social development and the importance of early relationships between infants and their caregivers for later life. We then turn to physical development and its impact on psychological functioning (e.g., how does an individual adapt to a changing body during puberty, menopause, or old age?), cognitive development (e.g., what can an infant...
remember?), and cognitive changes in adulthood (e.g., is “senility” the inevitable endpoint of development?). The acquisition of language and successively more complex thinking are also discussed. The chapter closes with a focus on moral development.

ISSUES IN DEVELOPMENTAL PSYCHOLOGY

Nature and Nurture

For almost as many years as psychologists have been interested in development, they have wrestled with the extent to which changes in individuals over time reflect the influence of genetically programmed maturation (nature) or of learning and experience (nurture). Maturation refers to biologically based changes that follow an orderly sequence, each step setting the stage for the next step according to an age-related timetable (Wesley & Sullivan, 1986). Infants crawl before they walk, and they utter single syllables and words before they talk in complete sentences. Unless reared in a profoundly deprived environment or physically impaired, virtually all human infants follow these developmental patterns in the same sequence and at roughly the same age.

Most psychologists believe that development, like intelligence or personality, reflects the action and mutual influence of genes and environment (Loehlin et al., 1997; Plomin et al., 1994). Nature provides a fertile field for development, but this field requires cultivation. Thus, the question is not which is more important, nature or nurture, or even how much each contributes, but rather how nature and nurture contribute interactively to development (Anastasi, 1958).

In fact, in many respects the contrast of nature versus nurture is misplaced, because genetic blueprints do not express themselves without environmental input (Bors & Forrin, 1996; Gottlieb, 1991). Environmental events turn genes on and off. Thus, sensory stimulation is necessary for some genes to become activated, such as genes that shape the functioning of neurons in the occipital lobes involved in vision (Gottlieb et al., 1998).

Psychologists now distinguish between the action of genetic and environmental influences (i.e., the way they independently affect development) and two more complex nature–nurture linkages: their interaction and correlation (or correlated action). The interaction of heredity and environment occurs when the effect of having both genetic and environmental vulnerabilities is different from that which would be predicted by simply adding up their independent effects. For example, mounting evidence suggests that both genetic and environmental factors predict later development of anxiety disorders but that the presence of both multiplies the likelihood of disorders (Chapter 14). Gene–environment correlations occur when genes influence the environments people choose or the experiences to which they are exposed. For example, a genetic propensity toward antisocial behavior can lead a teenager to choose “bad company,” which in turn encourages further antisocial behavior.

The Importance of Early Experience

Before dawn on January 9, 1800, a remarkable creature came out of the woods near the village of Saint-Sernin in southern France . . . . He was human in bodily form and walked erect. Everything else about him suggested an animal. He was naked except for the tatters of a shirt and showed . . . no awareness of himself as a human person. . . . He could not speak and made only weird, meaningless cries. Though very short, he appeared to be a boy of about eleven or twelve, with a round face under dark matted hair. (Shattuck, 1980, p. 5)
The Wild Boy of Aveyron (Figure 13.2) created an immediate sensation in Europe. To scientists, the child was a unique subject for exploring the question of critical periods in human development. Would a boy who was raised, at best, by wolves be able to develop language, interact with other people, and develop a conscience? A young doctor named Jean-Marie Itard became the boy’s tutor. Itard’s efforts met with limited but nonetheless substantial success: The boy became affectionate and learned to respond to some verbal instructions, but he never learned to talk.

EVIDENCE FOR CRITICAL PERIODS The concept of critical periods initially came from embryology, as researchers discovered that toxic substances could affect the developing fetus but only if the fetus were exposed at very specific points in development. Critical periods in psychological development have been demonstrated in many animal species. The first few hours after hatching are a critical period for goslings. They are biologically prepared to follow whatever moving object they see, usually their mother (Lorenz, 1935).

The concept of critical periods in humans is more controversial. Can a child who does not experience nurturant caretaking in the first five years of life ever develop the capacity to love? Human development is more flexible than development in other animals, but the brain is in fact particularly sensitive to certain kinds of environmental input at certain times (see Bornstein, 1989). During some periods, the nervous system is most sensitive to forming new synapses between neurons, given the right environmental stimulus. Equally important is the pruning of neurons: Infants are born with an abundance of neural connections, and those that are not used or activated by the environment are gradually lost (Greenough, 1991).

THE IMPACT OF EARLY ABUSE OR DEPRIVATION As we discussed in Chapter 3, the human brain, like that of other mammals, appears to have evolved with many innate potentials that require environmental input to be activated. Given appropriate stimulation, most children will learn to speak, think, solve problems, and love in ways accepted and encouraged by their culture. In this view, the brain has essentially been “programmed” by natural selection to expect a range of input. That range is wide, but it is not infinite.

What happens to children whose experience is outside that range? As we will see later in this chapter, one famous case concerned a girl named Genie, who received almost no exposure to language from early in life until she was discovered at age 13 (Fromkin et al., 1974; Rymer, 1993). Like the Wild Boy of Aveyron, Genie learned some aspects of language, but her use of syntax never reached normal levels (Fromkin et al., 1974).

Some psychologists, however, have questioned whether the impact of early deprivation is so indelible (Kagan, 1984; Kagan & Zentner, 1996; Lerner, 1991). In one study, children who spent their first 19 months in an overcrowded and understaffed orphanage experienced average IQ gains of 28.5 points after being moved to an environment that provided individual care (Skeels, 1966). Even the case of Genie can be used to counter the notion of critical periods, because she demonstrated remarkable progress in social and intellectual skills in just a few short years (Kagan, 1984). On the other hand, after her initial gains, Genie’s functioning stabilized and never approached the levels of a normal adolescent or adult, and she always remained socially awkward.

A similar pattern emerged from data on severely deprived children from Romanian orphanages who were adopted before age two into homes in the United Kingdom. Although all children showed substantial improvement once they left the orphanage, the longer they had experienced severe deprivation (e.g., for two years rather than just the first six months of life), the more severe their cognitive impairments remained four to six years later (O’Connor et al., 2000).

Does the evidence, then, support the notion of critical periods in humans? Probably the most appropriate conclusion to be reached is that humans have sensitive...
**Social Development**

In some domains, such as language, these sensitive periods may actually be critical; appropriate environmental input at certain points may be required or further development is permanently impaired. In most domains, however, sensitive periods are simply sensitive—particularly important but not decisive.

**Stages or Continuous Change?**

In addition to the roles of nature and nurture, and the importance of early experience, the third basic issue in development concerns the nature of developmental change. According to one view, development occurs in **stages**, relatively discrete steps through which everyone progresses in the same sequence. Behavior in one stage is not just **quantitatively** different from behavior in the next, involving a little less or more of something, but **qualitatively** different. As we will see, a stage theorist might suggest that the ability to engage in abstract thinking is a novel development in adolescence—not just a gradual refinement of the way younger children think—and that this qualitative difference may reflect maturation of the frontal cortex.

An alternative perspective sees development as **continuous**, characterized less by major transformations than by steady and gradual change. From this point of view, what may look like a massive change, such as becoming literate between the ages of 5 and 8 or rebellious at 13, may actually reflect a slow and steady process of learning at school or increased reinforcement for independent behavior. Although the behavioral change may appear to be a new stage, in fact, it may have been practiced and be making an appearance only when “practice has made perfect.”

Many theorists suggest that development involves both stages and continuous processes (Bidell & Fischer, 1992, 2000; Piaget, 1972). Stagelike phenomena are much more obvious in childhood, when the nervous system is maturing. As individuals move into adulthood, they are likely to develop in a number of alternative directions, many of which vary substantially by culture (e.g., whether a culture has a concept of “retirement”).

**INTERIM SUMMARY**

**Developmental psychology** studies the way humans develop and change over time. Nature and nurture both contribute to development, and their roles are not easily separated because environmental events often turn genes on and off. Human development is characterized by **critical periods** (periods central to specific types of learning that modify future development) or **sensitive periods** (times that are particularly important but not definitive for subsequent development), and whether development occurs in **stages** (relatively discrete steps through which everyone progresses in the same sequence) or is continuous (involving steady and gradual change) is still a matter under discussion.

**SOCIAL DEVELOPMENT AND ATTACHMENT**

Relationships are a crucial part of development. People form relationships with family, friends, and co-workers. The nature of these relationships changes over the course of the life span. **Social development** refers to changes in interpersonal thought, feeling, and behavior throughout the life span. Our initial focus will be on the earliest relationships—between an infant and his or her caregivers—because these relationships lay the groundwork for later relationships.

In the middle of the twentieth century, psychoanalysts observed that children reared in large institutional homes, with minimal stimulation and no consistent contact with...
a loving caretaker, often became emotionally unstable, lacking in conscience, or mentally retarded. Now, many of these children would be classified as suffering from reactive attachment disorder, also known simply as attachment disorder (Sheperis et al., 2003; Wilson, 2001). These observations led to recognition of the importance of attachment (Ainsworth & Bell, 1970; Bowlby, 1969). Attachment includes a desire for proximity to an attachment figure, a sense of security derived from the person’s presence, and feelings of distress when the person is absent. Attachment is not unilateral; rather, it involves an interaction between two people who react to each other’s signals.

Attachment in Infancy

For many years, psychoanalysts and behaviorists were in rare agreement on the origins of attachment behavior, both linking it to feeding. Psychoanalysts assumed that the gratification of oral needs led infants to become attached to people who satisfy those needs. According to behaviorists, mothers became secondary reinforcers through their association with food, which is a primary (innate) reinforcer (Chapter 5). Unfortunately, the two theories were similar in one other respect: They were both wrong. Definitive evidence came from a series of classic experiments performed by Harry Harlow (Harlow & Zimmerman, 1959), discussed in the Research in Depth feature. Because of the contributions of his influential research, Harlow has been called the “most influential comparative psychologist of the second half of the 20th century” (Burghardt, 2005).

To deserve to be called “the most influential comparative psychologist of the second half of the 20th century” (Burghardt, 2005), Harry Harlow (1906–1981) must have achieved some pretty remarkable things. And indeed he did. Harlow’s research with monkeys informed us not only about the role of nature versus nurture in influencing attachment but also about the importance of critical periods of attachment for subsequent psychological health.

Harlow’s research (Harlow & Zimmerman, 1959) took place in a series of stages. Initially, Harlow separated infant rhesus monkeys from their mothers a few hours after birth. The monkeys were then reared in a cage by two kinds of inanimate surrogate “mothers.” One, a wire monkey, provided no warmth or softness. The other, a cloth monkey, was covered with terrycloth to provide softness (Figure 13.3). Eight infant monkeys were randomly assigned to two groups. For the monkeys in one group, the wire monkey was equipped with a bottle to provide milk. For the monkeys in the second group, the cloth monkey was not equipped to provide milk. The infant monkeys lived with the surrogate mothers a minimum of 165 days. Baby monkeys spent much of their time clinging to the softer mother, even when the wire monkey provided the milk, leading Harlow to conclude that perceived security (i.e., contact comfort), not food, is the crucial element in forming attachment relationships in primates.

Harlow and his colleagues then exposed the monkeys to fear-producing stimuli, such as a moving toy bear. The infant monkeys consistently preferred the cloth surrogate monkey to the wire monkey in the presence of the fear-producing stimuli. They would run to the cloth mother, cling to her, and rub against her. Soothing themselves with the soft mother, the monkeys’ fear diminished, and the monkeys began inspecting the very object that had initially produced their fear. When exposed to the fear-producing stimulus in the absence of the cloth mother, however, the behavior of the monkeys was radically different. The monkeys clung to themselves, cried, and rocked back and forth. The presence of the wire mother did not provide them with the security they needed to further explore the fear-producing stimulus.
Similar findings were observed when the fear-producing situation was a strange room, called the open field test. The monkeys were placed into a strange room containing objects to which they would normally be attracted. Into the strange room the researchers also introduced the cloth mother, the wire mother, or no surrogate mother. All of the monkeys initially clung to the cloth mother, but then used her as a secure “home base” from which to explore their surroundings. In the absence of the cloth mother, however, the monkeys were inhibited, scared, and engaged in behaviors such as crying and thumb-sucking.

Additional research by Harlow examined the extent to which there are critical periods for the development of attachment relationships. Monkeys were reared in complete isolation from birth. There was not even any contact with either type of surrogate monkey. By varying the length of isolation, Harlow found that the detrimental effects of isolation could be reversed only if the maternal deprivation lasted no more than 90 days. After that period of time, the emotional damage that was done to the monkeys was permanent.

In a subsequent study, researchers attempted to measure the mothering abilities of monkey mothers who had themselves been separated from their mothers at birth, so called “motherless mothers” (Seay et al., 1964). The researchers found that the socially deprived mothers were inept in their mothering skills, ignoring, rejecting, and even abusing their babies. Interestingly, in spite of this, the babies of the “motherless mothers” displayed normal social development. Furthermore, in spite of the abusive and rejecting behavior of the motherless mothers, the babies continued to try to establish contact with them, a phenomenon that is observed among human infants and children as well.

So, what are the implications of all of these studies? One of the positive things that researchers have learned from these studies is that there is a much deeper connection between a baby and its mother (or caregiver) than strictly a hunger-satisfying driving urge due to a need for nourishment. Mothers (and other caregivers) also fulfill a much greater need in all of us: the need for affection. Harlow (1958) summed it up well when he stated that “the wire mother is biologically adequate but psychologically inept . . . the primary function of nursing as an affectional variable is that of ensuring frequent and intimate body contact of the infant with the mother. Certainly, man cannot live by milk alone” (p. 677). Harlow went on to state that “the American male is physically endowed with all the really essential equipment to compete with the American female on equal terms in one essential activity: the rearing of infants” (p. 685). Some people today still take issue with statements like that. Imagine the resistance that Harlow met when he made that comment in 1958.

Importantly, Harlow studied monkeys as opposed to humans, so complete generalization of the results would be inaccurate. For example, Harlow’s suggestion that the psychological damage of maternal deprivation could be reversed as long as the period of isolation did not exceed 90 days would translate into about six months for humans. Nevertheless, the idea of contact comfort has had important applications in areas such as the treatment of premature infants. In 1983, Neos Edgar Rey and Hector Martinez of Bogota, Colombia, created the practice of “kangaroo care.” At that time, the practice was designed to decrease the mortality rates of premature infants. Mothers carried their premature infants in slings with them throughout the day. Today, the practice serves the same purpose, but involves skin-to-skin contact between caregivers and premature infants. The practice has met with remarkable success in decreasing mortality rates among premature infants (e.g., Dodd, 2005).

In addition, although many questions were answered regarding attachment, many new ones also arose. For example, how will the removal of a “soft, cozy” mother in a child’s life affect him or her later in life? If that one source of comfort is missing, to what alternative source will children be drawn? Is there a connection between attachment issues and later issues with addictions, such as drugs or alcohol? Clearly, there is still much to be learned on the topic of attachment.
**Bowlby's Theory of Attachment**

John Bowlby (1969, 1973, 1982), who developed attachment theory, linked Harlow's findings with infant monkeys to the psychodynamic literature on children reared in institutional settings. Bowlby was both a psychoanalyst and an ethologist (a scientist interested in comparative animal behavior), and he proposed an evolutionary theory of attachment. He argued that attachment behavior is prewired in humans, as is similar behavior in other animal species, to keep immature animals close to their parents.

Bowlby noted the relation between human attachment behavior and a phenomenon studied by the ethologist Konrad Lorenz (1935) called imprinting. Imprinting is the tendency of young animals of certain species to follow an animal to which they were exposed during a sensitive period early in their lives (Figure 13.4). According to Lorenz (1937), imprinting confers an evolutionary advantage: A gosling that stays close to its mother or father is more likely to be fed, protected from predators, and taught skills useful for survival and reproduction than a gosling that strays from its parents. Bowlby argued that attachment behavior in human infants, such as staying close to parents and crying loudly in their absence, evolved for the same reasons.

Thus, when a child feels threatened, the attachment system “turns on,” leading the child to cry or search for its attachment figure. Once the child feels safe again, she is free to play or explore the environment. The attachment figure thus becomes a safe base from which the child can explore (Ainsworth, 1979) and to whom she can periodically return for “emotional refueling” (Mahler et al., 1975). Toddlers who are playing happily often suddenly look around to establish the whereabouts of their attachment figures. Once they locate their caregiver or even run to a comforting lap, they return to play, refueled for the next period of time. Later in life, a college student’s phone calls home may serve a similar function.

**The Origins of Attachment**

Attachment behavior emerges gradually over the first several months of life, peaking some time during the second year and then diminishing in intensity as children become more confident in their independence (Ainsworth, 1967). Among the first precursors of attachment is a general preference for social stimuli (such as faces) over other objects in the environment (Carver et al., 2003). Visual recognition of the mother (the primary caregiver studied in most research) occurs about three months (Olson, 1981); by five or six months, infants recognize and greet their mothers and other attachment figures from across the room.

At six to seven months, infants begin to show separation anxiety. Separation anxiety emerges about the same time in children of different cultures (Figure 13.5), despite widely different child-rearing practices (Kagan, 1976). Similarly, blind children show a comparable pattern (although the onset is a few months later), becoming anxious when they no longer hear the familiar sounds of their mother’s voice or movements (Fraiberg, 1975). These data suggest a maturational basis for separation anxiety. In fact, separation anxiety emerges at about the same time as infants begin to crawl, which makes sense from an evolutionary perspective.

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**Figure 13.4** Imprinting. Normally, imprinting leads young animals to follow an adult member of their species. At times, however, Mother Nature may lead her children astray. Here, geese follow Konrad Lorenz, on whom they imprinted when young.

**Figure 13.5** Separation anxiety across cultures. Separation anxiety, as measured by the percentage of children who cry when separated from their mother, peaks at approximately the same time across various cultures. (Source: Kagan, 1983, p. 198.)
**INTERIM SUMMARY**

**Social development** involves changes in interpersonal thought, feeling, and behavior throughout the life span. **Attachment** refers to the enduring ties children form with their primary caregivers; it includes a desire for proximity to an attachment figure, a sense of security derived from the person’s presence, and feelings of distress when the person is absent. John Bowlby, who developed attachment theory, argued that attachment, like **imprinting** (the tendency of young animals to follow another animal to which they were exposed during a sensitive period), evolved as a mechanism for keeping infants close to their parents while they are immature and vulnerable.

**Individual Differences in Attachment Patterns**

Bowlby observed that young children typically exhibit a sequence of behaviors in response to separations from their attachment figures. They initially protest by crying or throwing tantrums. However, they may ultimately become detached and indifferent to the attachment figure if she is gone too long.

**ATTACHMENT PATTERNS** Bowlby’s colleague Mary Ainsworth recognized that children vary in their responses to separation: While some seem secure in their relationship with their attachment figure, others seem perpetually stuck in protest or detachment. Ainsworth demonstrated these differences among infants using an experimental procedure called the **Strange Situation**. In the Strange Situation, the mother leaves her young child (aged 12 to 18 months) alone in a room of toys. Next, the child is joined for a brief time by a friendly stranger. The mother then returns and greets the child (Ainsworth, 1973, 1979, 1991).

Ainsworth found that children tend to respond to their mothers’ absence and return in one of three ways, one of which she called secure and the others, insecure. Infants who welcome the mother’s return and seek closeness to her have a **secure attachment style**. Infants who ignore the mother when she returns display an **avoidant attachment style**, whereas infants who are angry and rejecting while simultaneously indicating a clear desire to be close to the mother have an **ambivalent attachment style** (also sometimes called anxious-ambivalent or resistant). Avoidant children often seem relatively unfazed by their mother’s departure, whereas ambivalent children become very upset.

Research with infants in high-risk samples, such as those who have been maltreated, has uncovered another variant of insecure attachment, called disorganized, or disorganized-disoriented (Lyons-Ruth et al., 1997; Main & Solomon, 1986). Children with a **disorganized attachment style** behave in contradictory ways, indicating helpless efforts to elicit soothing responses from the attachment figure. Disorganized infants often approach the mother while simultaneously gazing away, or appear disoriented, as manifested in stereotyped rocking and dazed facial expressions. Whereas the other attachment patterns seem organized and predictable, the disorganized child’s behavior is difficult to understand and typically comes in the context of parenting that is itself unpredictable, and hence difficult to understand from the infant’s point of view (see Carlson, 1998).

Secure attachment is the most commonly observed attachment pattern around the world (see Main, 1990; van Ijzendoorn & Kroonenberg, 1988). Nevertheless, the frequency of different styles of attachment differs substantially across cultures. For example, infants reared on Israeli kibbutzim (collective living arrangements) are much more likely to have ambivalent attachments to their mothers than infants in the West. Further, unlike European and North American children, the quality of an infant’s attachment to its daytime mother surrogate on the kibbutz, not to its parents, predicts later social adjustment in childhood (Sagi, 1990; Sagi et al., 1994).

**Basic attachment mechanisms appear very similar in humans and other primates, such as the rhesus macaque.**
MAKING CONNECTIONS

Research on attachment in infancy and early childhood has largely focused on patterns of attachment that children develop through interactions with their parents or other primary caregivers. Given the importance of social relationships (Chapter 17) to people’s lives, what role do you think close relationships with pets or the creation of imaginary friends might play in facilitating attachment behavior in infants and young children? Could children get their needs for companionship and connectedness met from these alternative types of relationships? In other words, could pets and/or imaginary friends serve as surrogate attachment figures?

Implications of Attachment for Later Development

Attachment patterns that begin in infancy can persist and find expression in a wide range of social behaviors throughout the life span (Waters et al., 2000a,b). Children rated avoidant in infancy tend to be described by their teachers as insecure and detached in nursery school and to have difficulty discussing feelings about separation at age six. In contrast, preschoolers who were securely attached as infants tend to have higher self-esteem, to be more socially competent, to show greater sensitivity to the needs of their peers, and to be more popular (see DeMulder et al., 2000; LaFreniere & Sroufe, 1985).

Security of attachment in infancy predicts a range of behaviors as children grow older, from self-control and peer acceptance to competent behavior in the classroom (Bretherton, 1990; Howes et al., 1998). Children with a disorganized style in infancy tend to be rated by their teachers in early elementary school as impulsive, disruptive, and aggressive, particularly if they are also below average intellectually (Lyons-Ruth et al., 1997).

Individual differences in attachment style are also related to different patterns of response in everyday social interactions. Using a diary methodology by which people describe their social interactions each day for a period of weeks, researchers found that securely attached individuals reported more satisfying daily interactions with others and felt that others were more responsive to them than insecurely attached individuals (Kafetsios & Nezlek, 2002). Based on the results of this study, attachment styles affect not only long-term patterns of relating but also daily satisfaction with those social interactions.

INTERIM SUMMARY

Researchers have discovered four patterns of infant attachment: secure, avoidant, ambivalent, and disorganized. Whereas secure infants are readily comforted by their attachment figures, insecure infants tend to shut off their needs for attachment (avoidant), have difficulty being soothed (ambivalent), or behave in contradictory ways that reflect their difficulty predicting or understanding the way their attachment figures will behave (disorganized). Infant attachment patterns reflect a combination of temperament, parental responsiveness, and the interaction of the two. Attachment security in infancy predicts social competence as well as school grades from preschool through adolescence.

ADULT ATTACHMENT

Some of the infants first assessed in longitudinal studies using the Strange Situation are just reaching adulthood, and evidence suggests that early attachment patterns remain influential in adult life (Waters et al., 2000b). Adult attachment refers to ways of experiencing attachment relationships in adulthood. Researchers study adult attachment by interviewing participants and coding the way they describe and recall their relationships with their parents (Main, 1995; Main et al., 1985) or by measuring the ways they describe their experiences with attachment figures such as spouses on self-report questionnaires (Brennan et al., 1998).

Patterns of Adult Attachment

Adults with secure attachment styles speak freely and openly about their relationships with their parents. People with ambivalent styles appear preoccupied with and ambivalent about their parents. Avoidant adults dismiss the importance of attachment relationships or offer idealized generalizations about their parents but are unable to back them up with specific examples. When asked about times when they felt rejected or mistreated or were separated from their parents in childhood, adults with an avoidant style tend to deny having had such experiences—all the while spiking on measures of physiological reactivity indicating emotional distress (Dozier & Kobak, 1992).
Individuals with an attachment style characterized as **unresolved** (similar to the disorganized style seen in infancy) have difficulty speaking coherently about attachment figures from their past and have generally been unable to cope with losses or other traumatic experiences from their past. As a result, their narratives are often confused and confusing, and they send conflicting signals to their own children, particularly when their own unmet attachment needs get activated under stress.

How common are these attachment patterns? Data from multiple sources find similar rates of each type of attachment pattern in adults as in infants. A large stratified random sample of over 8,000 individuals in the United States, using a self-report measure of the first three adult attachment patterns, found that roughly 60 percent of people reported a secure attachment pattern, whereas 25 percent were classified as avoidant and about 10 percent as anxiously attached (Mickelson et al., 1997). Interview studies across several cultures similarly classify roughly 60 percent of people as securely attached in relation to their own parents, with varying numbers in the other three categories (van Ijzendoorn & Bakermans-Kranenburg, 1996).

### Predicting Behavior from Adult Attachment Patterns

Attachment patterns in adults predict a range of phenomena, from whether people want to have children (Rholes et al., 1997), to how they balance the needs of those children with the needs of work (Vasquez et al., 2002), to how they cope with stressful life events (Mikulincer & Florian, 1997; Myers & Vetere, 2002), to how upset they get at airports when separating from their romantic partner (Fraley & Shaver, 1998), to how troublesome they find the increasing independence of their adolescent children to be (Hock et al., 2001). Perhaps most importantly, adults’ attachment patterns in relation to their own parents, as assessed by interview, predict their own children’s attachment styles with remarkable accuracy (Main, 1995; Steele et al., 1996; van Ijzendoorn, 1995). For example, mothers who are uncomfortable or avoidant in describing their own attachment to their mothers tend to have avoidant infants and children (Fonagy et al., 1991; Main et al., 1985).

Considerable evidence suggests that mothers whose early attachment experiences were disrupted—through death of a parent, divorce, abuse or neglect, or long-term separation from their parents—are more likely to have difficulty forming close attachment relationships with their own infants and to have infants with a disorganized attachment pattern (Lyons-Ruth et al., 1997; Ricks, 1985; Rutter et al., 1983; Zeanah & Zeanah, 1989). Mothers who have insecure attachment relationships with their own mothers are less responsive and have more difficulty maintaining physical proximity to their infants and young children (Crowell & Feldman, 1991).

### Stability of Early Attachment Patterns

Is history destiny? Can a person ever overcome a bad start in childhood or infancy? Problematic early attachments substantially increase vulnerability to subsequent difficulties. Disturbances in childhood attachment relationships predict later difficulties in childhood and adolescence (Bowlby, 1969; Ricks, 1985; Spitz, 1945). Disrupted attachments are associated with severe personality disturbances (Ludolph et al., 1990; Zanarini et al., 1989), depression (Brown et al., 1986), antisocial behavior and adjustment problems (Tizard & Hodges, 1978), and difficulty behaving appropriately as a parent (Ricks, 1985). Childhood experiences such as parental neglect or mistreatment or even parental divorce make people more vulnerable to insecure attachment in adulthood (Mickelson et al., 1997).

All generalizations such as these, however, are probabilistic statements—that is, statements about probabilities, or increased risk. Early attachment experiences are not the only determinant of later functioning. Some children are remarkably resilient in the face of neglectful or abusive life experiences (Anthony & Cobbler, 1987; Luthar et al., 2000). Furthermore, as circumstances change, so do patterns of attachment (Lewis et
Indeed, some of Harlow’s monkeys who had been raised in isolation and were extremely socially maladapted showed marked improvement in social interactions after developing a close relationship with a normal monkey who served as a simian “therapist” (Chamove, 1978; Novak & Harlow, 1975).

One study provides dramatic evidence of the possibilities for altering problematic patterns of attachment in the opposite direction. The investigators provided a group of high-risk infants and mothers with a weekly home visitor. The mothers were poor, often depressed, and exhibited enough signs of inadequate caretaking to warrant referrals from health, educational, or social service professionals (Lyons-Ruth et al., 1990). The home visitor offered support and advice, modeled positive and active interactions with the infant, and provided a trusting relationship for the mother. The results were compelling: Compared to an untreated control group, infants in the intervention group scored 10 points higher on an infant IQ measure and were twice as likely (roughly 60 versus 30 percent) to be classified as securely attached at 18 months.

**INTERIM SUMMARY**

Researchers studying adult attachment find that roughly 60 percent of people appear to have a secure attachment style. Parents tend to produce children with an attachment style similar to their own. Attachment patterns have considerable stability because internal working models tend to change slowly, but as life circumstances change, so can attachment styles.

**SOCIAL DEVELOPMENT ACROSS THE LIFE SPAN**

In discussing social development, we have thus far focused on the first quarter of the life span. However, social development continues throughout life. In this section, we begin by examining the most widely known theory of life-span development, formulated by Erik Erikson (1963). We then examine central aspects of life-span development from adolescence through old age.

**Erikson’s Theory of Psychosocial Development**

Erikson’s is not the only model of adult development, but it has three important features. First, it is culturally sensitive, reflecting Erikson’s experience living in and studying several cultures, from Denmark and Germany to a Sioux reservation. Research since Erikson’s time suggests that when and where people develop is crucial to the way they grow and change throughout their lives, even within a single culture (Elder, 1998). For example, people who were young children during the Great Depression never forgot the lessons of poverty, even when they were financially secure years later.

Second, Erikson’s theory integrates biology, psychological experience, and culture by grounding development simultaneously in biological maturation and changing social demands (Chapter 1). For example, like his mentor, the psychoanalyst Anna Freud (1958), Erikson observed that adolescents wrestle with questions about who they are and what they believe during puberty, a time in which teenagers have a surge of new feelings and impulses. Reconstituting a self-concept that now includes the self as a sexual being is a major task spurred by biological maturation. The extent to which adolescents find this conflictual, however, depends on the beliefs, values, rituals, and sexual practices of their culture (Mead, 1928).
Third, although Erikson’s theory offers a very broad framework, many aspects of his developmental model have received empirical support in cross-sectional, longitudinal, and sequential studies (e.g., Bradley & Marcia, 1998; Marcia, 1987, 1999; McAdams et al., 1998; Whitbourne et al., 1992).

Erikson intended his model of psychosocial stages to supplement Freud’s psychosexual stages (Table 13.1). Thus, the toddler years are not only a time of toilet training but also, more generally, a time of learning what it means to submit to authority, to control impulses, and to assert one’s own autonomy. At each of eight stages, the individual faces a developmental task. Each successive task provokes a crisis—an opportunity for steaming ahead or a danger point for psychological derailment. These alternative “tracks” at each juncture are not, of course, absolute. No infant, for example, ever feels totally trusting or mistrusting, and people have many opportunities over the course of development to backtrack or take a new route.

### TABLE 13.1
**ERIKSON’S PSYCHOSOCIAL STAGE MODEL OF DEVELOPMENT**

<table>
<thead>
<tr>
<th>Psychosocial Stage (approximate age)</th>
<th>Developmental Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–12 to 18 months</td>
<td>Trust versus mistrust</td>
</tr>
<tr>
<td>1 to 2 years</td>
<td>Autonomy versus shame and doubt</td>
</tr>
<tr>
<td>3 to 6 years</td>
<td>Initiative versus guilt</td>
</tr>
<tr>
<td>7 to 11 years</td>
<td>Industry versus inferiority</td>
</tr>
<tr>
<td>Teenage years (adolescence)</td>
<td>Identity versus identity confusion</td>
</tr>
<tr>
<td>20s and 30s (young adulthood)</td>
<td>Intimacy versus isolation</td>
</tr>
<tr>
<td>40s to 60s (midlife)</td>
<td>Generativity versus stagnation</td>
</tr>
<tr>
<td>60s on</td>
<td>Integrity versus despair</td>
</tr>
</tbody>
</table>

**CHILDoHOD**  During the first stage, basic trust versus mistrust, infants come to trust others or to perceive the social world as hostile or unreliable. This stage comprises roughly the first 18 months of life, when infants are developing their earliest internal working models of relationship.

By age 2, children have learned to walk and talk—a result of biological maturation that has profound psychological consequences. Now they can say what they want and move where they want. This is the time of the “terrible twos,” in which toddlers regularly assert their will. Erikson calls the period from around ages 2 to 3 autonomy versus shame and doubt, because toddlers at this stage learn to feel secure in their independence or to experience doubt in their newfound skills and shame at their failures.

Empirically, some of the feelings of excitement and shame children experience at this age are self-generated, whereas others can be traced to the ways their parents respond to their successes, failures, and efforts at mastery. During the second year, children spontaneously set standards for themselves and experience pride in their accomplishments (Kagan, 1984). Yet research also finds that two-year-olds whose mothers are critical and controlling as they attempt to teach their toddlers achievement-related tasks in the laboratory tend to demonstrate more shame and less persistence at similar tasks a year later (Kelley et al., 2000).

The third stage, roughly between ages 3 and 6, is called initiative versus guilt. The poles of this stage are a sense of goal-directness and responsibility versus a rigid, tyrannical conscience. Initiative enables a child to follow through with ideas and goals. Children who have difficulty with this stage, in contrast, may be highly self-critical or...
may become rigid and constricted to avoid acting on feelings and impulses they have learned to think of as “bad.”

The next stage, which occurs roughly between ages 7 and 11, is industry versus inferiority. In this stage, children develop a sense of competence (industriousness) or of inadequacy, as they begin to develop and practice skills they will use for a lifetime in productive work. In literate cultures, children enter school during this stage, and their experiences of academic and social success or failure shape both their self-concepts and the strategies they use to protect their self-esteem. Some children become caught in a vicious cycle, in which a sense of inferiority leads them to give up quickly on tasks, which in turn increases the probability of further failure.

ADOLESCENCE  According to Erikson, the developmental crisis of adolescence is identity versus identity confusion. Identity refers to a stable sense of who one is and what one’s values and ideals are (Erikson, 1968). Identity confusion occurs when the individual fails to develop a coherent and enduring sense of self and has difficulty committing to roles, values, people, or occupational choices. Empirically, individuals differ in the extent to which they explore and maintain commitments to ideologies, occupational choices, and interpersonal values (Marcia, 1987). Some establish an identity after a period of soul searching, while others commit early without exploration, foreclosing identity development. Still others remain perpetually confused or put off identity consolidation for many years while trying on various roles throughout their twenties.

These different paths to identity depend heavily on culture (Erikson, 1968; Schlegel & Barry, 1991). Many traditional cultures have initiation rites. A period of identity confusion occurs primarily in technologically more advanced societies or in cultures that are undergoing rapid change, as in much of the contemporary world.

Sometimes adolescents have trouble establishing a positive identity; they may be doing poorly in school or lack models of successful adulthood with whom to identify. As a result, they may develop a negative identity, defining themselves as not something or someone (such as a parent) or taking on a role society defines as bad. This is a path often taken by gang members and chronic delinquents, who seemingly revel in their “badness.”

Failure to form a cohesive identity beyond adolescence can signify problems later on. Girls who have difficulty forming an identity in late adolescence are more likely than their peers to experience marital disruption at midlife. Boys with late-adolescent identity problems are more likely to remain single and be unsatisfied with their lives in middle age (Kahn et al., 1985). Identity disturbances are common in certain forms of personality disorder in adulthood (Chapter 15), such as borderline personality disorder (Wilkinson-Ryan & Westen, 2000).

ADULTHOOD  Erikson was one of the first theorists to take seriously the notion of development after adolescence. He describes the developmental task confronting young adults as intimacy versus isolation. The task applies to friendships as well as romantic relationships.

Erikson describes the crisis of midlife as generativity versus stagnation, in which people begin to leave some kind of lasting legacy or feel alienated from relationships and community. Generativity means concern for the next generation as well as an interest in producing (generating) something of lasting value to society. People express their generative impulses through rearing children, participating in culturally meaningful institutions such as churches or civic organizations, mentoring younger workers, or creating something that will last beyond them, such as a work of art. Empirically, people in midlife express more generative themes than younger adults when describing their lives, and they report more generative activities (de St. Aubin et al., 2004; McAdams et al., 1993, 1998). As Erikson hypothesized, individuals also differ in the
Erikson's theory, a feeling that the promise of youth has gone unfulfilled

Other theorists argue, however, that the stormy, moody, conflict-ridden adolescent is the exception rather than the rule (Compas et al., 1995; Douvan & Adelson, 1966; Offer et al., 1990). According to the continuity model, adolescence is not a turbulent period but is essentially continuous with childhood and adulthood. Research

Development from Adolescence through Old Age

Erikson's theory provides a backdrop for empirical research on social development throughout the life span. Here we focus on some of the central issues in the study of development from adolescence through old age.

ADOLESCENCE Psychologists have offered two conflicting views of adolescent social and personality development (Arnett, 1999; Westen & Chang, 2000). One approach emphasizes that as adolescents grow less dependent on their parents and try out new values and roles, they often become rebellious and moody, shifting from compliance one moment to defiance the next. According to this conflict model, put forth at the turn of the twentieth century (Hall, 1904) and later elaborated by psychodynamic theorists (Blos, 1962; A. Freud, 1958), conflict and crisis are normal in adolescence. Conflict theorists argue that adolescents need to go through a period of crisis to separate themselves psychologically from their parents and to carve out their own identity. Beeper studies (which page, or “beep,” participants at random intervals over the course of a day to measure what they are thinking or feeling at the moment) show that adolescents do, in fact, experience a wider range of moods over a shorter period than adults (Csikszentmihalyi & Larson, 1984). Longitudinal studies find decreases in hostility and negative emotionality and increases in diligence, self-control, and congeniality as teenagers move into early adulthood (see McGue et al., 1993). Thus, members of both sexes, but particularly women, face the death of a spouse (because women tend to live longer and to marry older men) while dealing with the gradual health declines of aging themselves.

INTERIM SUMMARY

Erikson proposed a life-span model of psychosocial stages—stages in the development of the person as a social being. In basic trust versus mistrust, infants come to trust others or perceive the social world as hostile or unreliable. In autonomy versus shame and doubt, toddlers come to experience themselves as independent sources of will and power or feel insecure in their newfound skills. In initiative versus guilt, young children develop the capacity to form and carry out plans, but their emerging conscience can render them vulnerable to guilt. In industry versus inferiority, school-age children develop a sense of competence but may suffer from feelings of inadequacy. Erikson described adolescence as a period of identity versus identity confusion, in which the task is to establish a stable sense of who one is and what one values. The crisis of young adulthood is intimacy (establishing enduring, committed relationships) versus isolation. In generativity versus stagnation, middle-aged individuals attempt to pass something on to the next generation. In integrity versus despair, people look back on their lives with a sense of satisfaction or sadness and regret.

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Other theorists argue, however, that the stormy, moody, conflict-ridden adolescent is the exception rather than the rule (Compas et al., 1995; Douvan & Adelson, 1966; Offer et al., 1990). According to the continuity model, adolescence is not a turbulent period but is essentially continuous with childhood and adulthood. Research
supporting this view finds that roughly 80 percent of adolescents show no signs of severe storm and stress (Offer & Offer, 1975).

How do we reconcile these two views of adolescence? Adolescence is a time of enormous individual differences, with many alternative paths that vary according to the individual, culture, and historical period (see Hauser & Safyer, 1994). As we will see, researchers have increasingly moved away from models of life-span development that propose a single pathway to “normal” or “successful” development, particularly in adolescence and adulthood, when biological maturation is not the driving force it is in childhood and cultural differences make generalizations much more difficult. Thus, adolescence may not inherently be a stormy era, but “storm and stress” is more likely in adolescence than in either childhood or adulthood, as suggested by data on adolescents’ conflicts with parents, mood disruptions, and high-risk behavior (Arnett, 1999).

Aside from individual differences, children show some increasing gender differences in adolescence. For example, across a number of domains, boys tend to become more confident and less dissatisfied with themselves over time, whereas the opposite occurs for girls. Already by third or fourth grade, and increasingly through at least early adolescence, boys tend to overestimate their scholastic ability, and girls underestimate it (Cole et al., 1999). Similarly, at age 13, boys and girls show similar levels of body dissatisfaction (Figure 13.6), but after that point their paths diverge, at least in Western cultures (Rosenblum & Lewis, 1999).

**EARLY ADULTHOOD AND MIDDLE AGE** Erikson described the central task of young adulthood as the development of intimacy—establishing lifelong friendships and settling down and beginning to have a family of one’s own. Empirically, Erikson was probably right to name a stage of adult development “intimacy” and to tie it to finding a long-term mate. In the United States, for example, over 95 percent of people have married at least once by the age of 55, and many of the remaining 5 percent have lived with a partner outside of marriage (U.S. Bureau of the Census, 1998a).

Marital intimacy does not, however, come easily: In Western cultures, marital distress actually increases over the first three years of marriage, and maintaining intimate relationships in the face of conflict and disillusionment is a challenge that requires continuous negotiation and compromise (Gottman, 1998). Over half of divorces occur in the first three years of marriage (Whitbourne, 2001). Marital conflict is at its peak when children are young—when housework doubles, financial pressures mount, and intimate time alone is difficult to find (Belsky & Hsieh, 1998; Belsky & Pensky, 1988; Berman & Pedersen, 1987).

Women’s satisfaction with marriage appears to suffer more than men’s after the birth of a child (Cowan & Cowan, 1992). Motherhood usually involves a redefinition of roles and reallocation of time. The household division of labor tends to become more traditional, and women who are used to autonomy and are invested in their work suddenly find themselves taking on more and more responsibility at home (Hoffman & Levy-Shiff, 1994). For men, fatherhood means that they are no longer the primary recipients of their wives’ attention and love; at the same time, they incur new financial and household and child-care responsibilities (Lamb, 1987).

Precisely when young adulthood ends and middle age begins is difficult to pinpoint. Some observers have described this period as a time of midlife crisis (Jacques, 1965; Levinson et al., 1978; Sheehy, 1976). One researcher found that roughly 80 percent of the men he interviewed were in a state of crisis around age 40, as they began to think of themselves as middle-aged instead of young and to question the basic structure of their lives (Levinson, 1978). In Western culture, people are frequently at the height of their careers in their forties and fifties, enjoying leadership positions at work or in the community. At the same time, however, the death of parents, the occasional jarring death of siblings or contemporaries, and an aging body inevitably lead people to confront their mortality and to consider how they will live their remaining years.
As with adolescence, however, many psychologists have challenged the view of midlife as a time of crisis and suggest that midlife crisis may be a phenomenon that occurs primarily in upper-middle-class men (see Rosenberg et al., 1999). Empirically, only a minority of people report experiencing a midlife crisis, and in these cases, the crisis usually occurs along with a specific interruption in the normal rhythm of life, such as loss of a job or divorce (Costa & McCrae, 1988; Neugarten, 1977).

**OLD AGE** The meaning of old age changed dramatically over the course of the twentieth century. The average life span increased by almost 30 years, and the proportion of people over age 65 in North America grew from 1 in 30 in 1900 to a projected 1 in 5 by the year 2040 (Figure 13.7) (U.S. Bureau of the Census, 1998b). This demographic shift has produced substantial changes in perceptions of old age. Even three decades ago, people were considered “old” in their sixties. Today, no one is surprised to see 70-year-olds on the tennis court.

Technologically developed and Western cultures tend to devalue the elderly more than most cultures and to emphasize the despairing end of the continuum. William Shakespeare’s characterization of old age, from As You Like It (Act II, Scene vii), presents a grim picture that is not far from the contemporary Western conception of life’s final phase:

```
Last scene of all,
That ends this strange eventful history,
Is second childishness and mere oblivion,
Sans teeth, sans eyes, sans taste, sans everything.
```

Although genuine declines do make life much more difficult as people grow old, fortunately Shakespeare took some poetic license, as reality is nowhere near this bleak. For example, contrary to stereotypes, only about 5 percent of the population over 65 have physical or mental impairments serious enough to require continuous nursing care (Tolliver, 1983). In fact, most people report having more positive and less negative affect as they move toward the end of middle age, and most people cross-culturally report being happy in old age (Diener & Suh, 1998; Helson & Klohnen, 1998; Mroczek & Kolarz, 1998). Why, then, are our stereotypes so negative?

One explanation is that many stereotypes of aging are built on our emotional forecasts of how we imagine we would feel if we gained weight, lost some hair, grayed, and suffered many of the more serious indignities of old age. The reality is that humans have a remarkable capacity for dealing with life’s blows with equanimity—for gradually adjusting to realities we cannot change and regaining our emotional equilibrium. As the writer Dostoevsky once said, humans are capable of adjusting to nearly anything.

A prime culprit in our negative views of old age may also be technological development (Cowgirl & Holmes, 1972). Ironically, the same factor that has prolonged life by decades has undermined the status of the aged by making their jobs obsolete, limiting the applicability of their beliefs and values in a radically changed social and cultural milieu, and eroding the concept of the extended family. The geographical mobility associated with economic development also means that children may live hundreds if not thousands of miles from their aging parents. In contrast, in more traditional societies, the aged are by definition the most knowledgeable because they have lived the longest and accumulated the most information, and mutual ties of affection between the generations are reinforced by daily interaction.

In the face of physical decline, negative stereotypes, and the loss of spouse, friends, and social roles, what allows an individual to find satisfaction, or what Erikson describes as integrity, in the final years of life? In one study of around 1000 people aged 65 to 72, several variables predicted life satisfaction: close relationships, an active social and community life, continuing recreation, good health, and sufficient income (Flanagan, 1978).
general, research suggests that people who find satisfaction in later life tend to be characterized by three factors: lack of significant disease, high cognitive and physical functioning, and an active engagement in productive activity and community with others (Rowe & Kahn, 1997).

Longitudinal studies suggest that earlier factors also predict happiness and physical and mental health in later life (Sears, 1977; Valliant & Valliant, 1990). These include marital and career fulfillment as a younger adult, sustained family relationships, and long-lived ancestors. Risk factors from young and middle adulthood include defense mechanisms that grossly distort reality (such as projection) (Chapter 12), alcoholism, and depression before age 50. The quality of old age thus appears to depend to a substantial degree on the quality of youth.

**INTERIM SUMMARY**

Some researchers adopt a conflict model of adolescence, arguing that conflict and struggle are normal in adolescence; others propose a continuity model, viewing adolescence as essentially continuous with childhood and adulthood. Each model probably applies to a subset of adolescents. Similarly, researchers disagree on the extent to which midlife crisis is common in middle age. In all likelihood, “crises” in both adolescence and at midlife depend on individual differences and cultural and historical circumstances. Although old age inevitably involves many losses, the realities appear far better than the negative stereotypes of aging seen in many technologically developed societies.

**PHYSICAL DEVELOPMENT AND ITS PSYCHOLOGICAL CONSEQUENCES**

Having examined attachment and its potential influence on early and late development, we turn now to physical development and its impact on psychological functioning. Children develop rapidly during the early years, outgrowing clothes before wearing them out. Some of the most dramatic aspects of physical development, however, cannot be observed directly, because they take place before birth.

**Prenatal Development**

One of the most remarkable aspects of development is that a single cell, forged by the union of a sperm and an egg, contains the blueprint for an organism that will emerge—complete with billions of specialized cells—nine months later. The prenatal period (before birth; also called the gestation period) is divided into three stages (Figure 13.8). During the germinal period (approximately the first two weeks after conception), the fertilized egg becomes implanted in the uterus. The embryonic period (from the beginning of the third week to about the eighth week of gestation) is the most important period in the development of the central nervous system and of the organs. By the end of this stage, the features of the embryo become recognizably human, the rudiments of most organs have formed, and the heart has begun to beat. During the fetal period (from about nine weeks to birth), muscular development is rapid. By about 28 weeks, the fetus is capable of sustaining life on its own. (The term fetus is often used more broadly to refer to the organism between conception and birth.) Mothers often sense that their child is “willful” or has a “personality” before birth. In part, this undoubtedly reflects vivid maternal imagination. Research suggests, however, that fetuses of many species can behave and even learn in utero (prenatally).
Inserting a nipple into the mouth of a rat fetus produces the same sucking responses seen in newborns. Rat fetuses (in utero) can also learn to associate one stimulus with another through classical conditioning, as shown by the acquisition of a learned taste aversion to apple juice injected into the amniotic fluid, when paired with a chemical (LiCl) that causes nausea. Similarly, given the appropriate environment, the fetus can learn to press a miniature paddle to get milk delivered into its mouth.

In a sense, these findings should not surprise us. When a child of any species is born, it has to be ready to respond to features of its environment—that it can eat, for example. The ways human children “behave” in utero are also highly predictive of the ways they will behave once they are born (DiPietro et al., 1996a). For example, fetuses that are more active in the womb tend to be more active and difficult babies at six months.

**ENVIRONMENTAL INFLUENCES ON PRENATAL DEVELOPMENT**

Understanding the stages of prenatal development is important to every expectant parent, because at different stages the developing fetus is susceptible to different dangers at different points. Teratogens are environmental agents that harm the embryo or fetus. They include drugs, radiation, viruses that cause maternal illness such as rubella (German measles), and toxic chemicals. Cigarette smoking during pregnancy, for example, has been linked to a wide range of negative outcomes, ranging from cognitive deficits in childhood to criminality in adulthood (Brennan et al., 1999; Day et al., 2000).

One of the most widespread teratogens is alcohol. In the 1970s, researchers identified fetal alcohol syndrome (FAS), a serious condition affecting up to half the babies born to alcoholic mothers (Jones et al., 1973). Babies with FAS are born with numerous physical deformities and a wide range of mental abnormalities, including learning disabilities, behavior problems, and attention difficulties (Steinhausen et al., 1993; Streissguth et al., 1985, 1989). Whether any amount of maternal alcohol ingestion is dangerous or whether alcohol use must cross some threshold is a matter of controversy (see Knupfer, 1991; Passaro & Little, 1997). Research with rhesus monkeys finds that even moderate exposure to alcohol (the monkey equivalent of one to two drinks a day) during pregnancy produces subtle deficits in attention and motor abilities in infant monkeys (Schneider et al., 1997). The most recent research suggests that women who are trying to conceive or who know they are pregnant would do well to abstain from alcohol (Braun, 1996).

**INTERIM SUMMARY**

The prenatal, or gestational, period is a time of rapid physical and neurological growth that can be disrupted by exposure to teratogens, harmful environmental agents that damage the embryo or fetus. One of the most prevalent teratogens is alcohol. Maternal alcohol abuse can lead to fetal alcohol syndrome (FAS), but increasing evidence suggests that even moderate levels of drinking can impair the developing child.
Infancy

When asked about their babies, parents almost uniformly begin with motor milestones, such as “Jennifer can sit up now by herself” or “Now that Brandon is crawling, I have to babyproof everything in the house” (Thelen, 1995). How infants move from flailing bundles of flesh to willful little creatures with radar for breakable objects reflects a complex mixture of nature and nurture (Bertenthal & Clifton, 1998; Thelen, 1995; Thelen & Smith, 1994).

At birth, an infant possesses many adaptive reflexes. For example, the **rooting reflex** helps ensure that the infant will get nourishment: When touched on the cheek, an infant will turn her head and open her mouth, ready to suck. The **sucking reflex** is similarly adaptive: Infants suck rhythmically in response to stimulation 3 or 4 centimeters inside their mouths. Many early reflexes disappear within the first six or seven months, as infants gain more control over their movements. In general, motor skills progress from head to toe: Infants first master movements of the head, then the trunk and arms, and finally the legs (Rallison, 1986).

Motor development in infancy follows a universal sequence, from smiling, turning the head, and rolling over, to creeping, walking with support, and ultimately standing alone and walking unaided (Figure 13.9). Nevertheless, cross-cultural evidence suggests that environmental stimulation can affect the pace of development. The Kipsigis of Kenya teach their infants to sit, stand, and walk at an early age. At five or six months, infants are placed in a specially constructed hole in the ground that supports them while they sit upright, and at seven or eight months, their mothers hold them either under the arms or by the hands to help them practice walking. As a result, Kipsigi infants walk at a considerably earlier age than North American infants (Super, 1981).

In North America and the rest of the West, pediatricians are finding that infants are now walking even later than they did 25 years ago. To help prevent death from sudden infant death syndrome (SIDS), a disease in which the immature brain stem fails to “jump-start” and the infant stops breathing, parents are instructed to put infants to bed on their backs (rather than stomachs) to sleep. An unintended consequence is that infants accustomed to lying on their backs develop crawling skills (and leg muscles) more slowly—and hence walk later.

Childhood and Adolescence

Some of the most important maturational changes that influence psychological development involve changes in the size and shape of the body. A remarkable aspect of human development is the extent to which children can maintain the sense that they are the same person over time despite massive changes in the sheer size of their bodies and the shape of their faces.
Growth rates for girls and boys are roughly equal until about age 10. At that point, girls begin a growth spurt that usually peaks at age 12, and boys typically follow suit about two or three years later. Individuals of both sexes vary, however, in the age at which they enter puberty. Girls usually experience the onset of menstruation (known as menarche) at about age 11 to 13. For boys, mature sperm production is somewhat later, at about 14.5 years (Rallison, 1986).

Unusually early or late maturation tends to affect boys and girls differently. Boys whose growth spurt comes early are more likely to excel at athletics and be more popular, relaxed, and high in status than late-maturing boys. For girls, early onset of puberty tends to be associated with greater distress and delinquency than later maturation (Caspi et al., 1993; Dick et al., 2000; Ge et al., 1996). Parents report more conflict with early-maturing than late-maturing daughters but less conflict with early-maturing than late-maturing sons (Ge et al., 1996; Savin-Williams & Small, 1986).

Early maturation in girls may not only be a cause of stress in their families but also a consequence of it: Stressful homes tend to trigger the physiological mechanisms that initiate puberty; so, too, does the presence of a male other than the girl’s biological father living in the home, such as a stepfather (Ellis & Garber, 2000).

**Interim Summary**

At birth, infants possess many adaptive reflexes, such as rooting and sucking, which help ensure that the infant will get nourishment. Individuals vary in the age at which they enter puberty, the stage during which they become capable of reproduction. Early pubertal development tends to be associated with positive outcomes for boys but negative outcomes for girls.

**Adulthood and Aging**

By the end of adolescence, physical growth is virtually complete, and the changes that occur thereafter tend to be gradual and less dramatic. People often gain a few centimeters in height and several more centimeters in fat between ages 18 and 28—and many more centimeters in fat with middle age. By their thirties, people are already deteriorating physically, with muscular strength and sensory abilities showing subtle but clear signs of decline (see Spence, 1989; Spirduso & MacRae, 1990).

Individuals differ tremendously, however, in the extent and pace of these changes, as some 80-year-olds run marathons in seniors’ track meets. Whether the variable is muscle strength or intellectual ability, the rule of thumb is use it or lose it: Both mental and physical capacities atrophy with disuse.

**Menopause**

For women, perhaps the most dramatic physical change of middle adulthood is menopause, the cessation of the menstrual cycle. Menopause usually begins in the forties or fifties and may last several years; in Western cultures, the average age is 51 (Riley, 1991). The clinical definition of menopause is five consecutive years without a menstrual period. Because most women now live into their seventies or eighties, the postmenopausal period encompasses roughly a third of their lives.

Some women consider menopause to be traumatic because of the loss of the capacity for childbearing and symptoms such as hot flashes, night sweats, aching joints, and irritability. However, research now suggests that only a minority of women experience menopause as traumatic (Matthews, 1992). Many women enjoy the increased freedom from monthly periods and birth control. Moreover, most of the uncomfortable symptoms can be alleviated medically with hormone replacement therapy (HRT), which compensates for the ovaries’ reduced estrogen production (Freedman, 2002; Rymer et al., 2003; Sherwin, 1993; Stewart & Robinson, 1997). Although controversial, because the HRT can lead to certain cancers, it also helps to prevent or reduce the symptoms of osteoporosis and Alzheimer’s disease.
Because menopause is both a physiological and a psychological event, its impact on a woman reflects an interplay of biological processes and personal expectations (Robinson, 1996). Women who expect menopause to be very distressing tend to have more symptoms (Matthews, 1992), and many of these expectations depend on culture. Indeed, the experience of menopause differs substantially across cultures. For example, 50 to 80 percent of European and North American women report hot flashes, whereas these experiences are unusual in Japan and India (Hulka & Meirik, 1996; Robinson, 1996).

MIDLIFE CHANGES IN MEN The term male menopause is part of the American vernacular, although male reproductive ability does not undergo any specific or dramatic period of physical change. Healthy men can produce sperm and engage in sexual activity as long as they live, although male sexuality does change gradually with age. Sexual desire from the forties to the seventies shows substantial declines as testosterone levels drop (Schiavi et al., 1990; see also Chapter 10). The ability to sense touch and vibration in the penis also diminishes with age and is correlated with reduced sexual activity (see Johnson & Murray, 1992). As with women, however, individual differences are substantial, and men can enjoy sexuality through their nineties if they live that long and have an available partner. (In fact, men in retirement communities often report very active sex lives because the ratio of women to men in old age is so high!) Contrary to youthful stereotypes, masturbation is also a lifelong affair for many men and women (Gibson, 1996).

LATER LIFE As in childhood, some of the most apparent signs of aging are in physical appearance, such as wrinkled skin and gray hair. Sensory changes are also substantial. Older adults have reduced sensitivity to visual contrasts—for example, climbing stairs can be difficult because they have trouble seeing where one step ends and another begins (Fozard, 1990). Older adults also take a longer time adapting to the dark, which can cause problems driving at night, as oncoming headlights may create temporary flashes of brightness (AARP News Bulletin, 1989). Hearing loss is also common. Many older people experience presbycusis, the inability to hear high-frequency sounds (Fozard, 1990; Spence, 1989), which can make hearing the telephone ring or understanding high-pitched voices more difficult.

The inability to understand what others are saying can have disturbing psychological consequences. We often lose patience with older adults who constantly ask others to repeat what they have said. Younger people may also inadvertently treat older individuals with hearing loss condescendingly, simplifying their communications instead of speaking more loudly or distinctly.

Deterioration in certain areas of functioning is an inevitable part of aging, but development throughout the life span is characterized by gains as well as losses (Baltes, 1997). Many Western images of the elderly stem from negative cultural myths and stereotypes, such as the idea that sexuality ends in the forties or fifties or that senility is inevitable. Gerontologists—scientists who study the elderly—refer to such stereotypes as examples of ageism (Butler, 1969; Schaie, 1988). Although not all negative attitudes toward aging represent prejudice (older people do, for example, tend to have less physical and mental speed than younger people), ageism can lead not only to condescending treatment of the elderly (“How are we today, Mrs. Jones?”) but also to employment discrimination.

Experimental evidence suggests that people in the West process information about the aged in a negative way automatically, without conscious awareness (Perdue & Gurtman, 1990). Using a priming procedure (Chapter 6), investigators in one study presented college students with 18 positive adjectives (such as skillful and helpful) and 18 negative adjectives (such as clumsy and impolite) on a computer screen. Immediately prior to presenting each adjective, the computer screen randomly flashed the word old or young briefly enough to register but too briefly to be recognized consciously. The
investigators measured participants’ reaction time (in milliseconds) in identifying whether each word was positive or negative.

If people differentially associate old and young with positive and negative traits, then flashing young should facilitate responding about positive words, while old should reduce reaction time in identifying negative words. In fact, participants were quicker to identify negative traits when presented with old and substantially faster in identifying positive traits when presented with young (Figure 13.10).

**INTERIM SUMMARY**

With aging comes a gradual decline in physical abilities, including muscular strength, sensory functioning, and reaction time. People differ tremendously, however, in their physical competence throughout life. The rule of thumb is use it or lose it. For women, the most dramatic physical change of middle adulthood is menopause; for men, sexuality changes more gradually. Deterioration in certain areas of functioning is an inevitable part of aging, but the extent of deterioration in part reflects ageism.

**COGNITIVE DEVELOPMENT IN INFANCY, CHILDHOOD, AND ADOLESCENCE**

In a study performed three decades ago, three- and six-year-old children petted a good-natured cat named Maynard (DeVries, 1969). When asked what kind of animal Maynard was, every child responded correctly. In plain sight of the children, the researcher then put a dog mask on Maynard and again asked whether Maynard was a dog or a cat. Unlike the older children, the three-year old children were confused: Most of them said Maynard was now a dog!

How do children learn that physical entities, such as their pets, parents, or teddy bears, remain constant over time? This is the kind of question explored by psychologists who study cognitive development. We begin by describing perceptual and cognitive development in infancy and then examine the ways psychologists have conceptualized cognitive development through adolescence.

**Perceptual and Cognitive Development in Infancy**

For many years, psychologists underestimated the cognitive capacities of infants (Bower, 1982). With neither motor control nor the ability to describe what they are thinking, newborn infants do not appear to be a particularly impressive lot. Infants also have notoriously short attention spans, falling asleep so frequently that a researcher must schedule two hours of laboratory time for every five minutes of useful experimental time (Butterworth, 1978)!

**NEW METHODS, NEW DISCOVERIES**

A very different picture of infancy has emerged, however, as methods to study it have become more sophisticated. Three decades ago, psychologists discovered that they could learn about infant perception and cognition by taking advantage of the orienting reflex, the tendency of humans, even from birth, to pay more attention to novel stimuli than to stimuli to which they have become habituated, or grown accustomed (Fantz et al., 1975). Thus, even though a picture of a face might hold an infant’s attention at first, after repeated exposures, the infant will show much less interest.

By recording the amount of time an infant looks at visual stimuli (i.e., the infant’s fixation time), researchers can tell when an infant is discriminating between two objects,
such as the face of its mother and the face of another woman. For example, if researchers present infants with pictures of cats and horses and then show them novel examples of these categories (e.g., a kind of cat they have not seen before), 10-month-olds will consistently discriminate the two kinds of animals, but 7-month-olds will not (Younger & Fearing, 1999). Thus, we know that by 10 months infants are already forming basic-level categories for animals (Chapter 7).

Researchers have subsequently found other ways of assessing infants’ knowledge, such as measuring brain-wave activity: Certain waveforms assessed by EEG (Chapter 3) indicate when an infant differentiates between an old stimulus and a new one. Also, because infants prefer novelty, with the use of a simple conditioning procedure they can be conditioned to suck in response to novel stimuli. Sucking rate decreases as the infant habituates to a stimulus (i.e., gets used to it and stops responding) (Chapter 5) and increases with the presentation of a new one. Thus, researchers can answer some very subtle questions about infant perception, memory, and cognition. For example, can infants form abstractions of concepts such as “ball”? Will they habituate quickly to a red ball they have never seen if they have previously habituated to blue and yellow balls—a response implying that they “get” the general concept of a ball?

**WHAT CAN INFANTS SENSE AND PERCEIVE?** Infants are born with many sensory capabilities, some better developed than others, such as the sense of hearing. Even before birth, fetal heart rate and movements increase in response to loud sounds, and habituation studies in newborns show that infants hear and recognize their mothers’ voices before they are born, despite a wall of flesh and an earful of amniotic fluid.

By contrast, vision is not well developed at birth. The visual cortex, retina, and some other structures are still immature (Candy et al., 1998). At birth, visual acuity is estimated to be approximately 20/500 (i.e., an object 20 feet away looks as clear as an object 500 feet away would look to an adult), but it improves to about 20/100 by six months (Dobson & Teller, 1978). Infants focus best on objects between 7 and 8 inches away—approximately the distance between a nursing infant and its mother’s face.

**Intermodal Understanding** Sensory processing occurs in anatomically discrete neural modules (Chapter 4). Thus, when infants hear their mothers talking and see their mouths moving, different circuits in the brain become active. How and when do infants connect these sights and sounds? Do infants associate the voice with the visual image, or is the world like a dubbed movie, with lips moving and people talking out of sync? And do infants learn to make these connections across sensory modes, or are these capacities innate?

Research over the last 25 years suggests that infants are far more capable of intermodal processing than anyone would have expected. Infants show some recognition of the relation between sights and sounds even minutes after birth, turning their eyes toward the direction of a sound (Bower, 1982; Wertheimer, 1961). By three months, infants pay more attention to a person if speech sounds are synchronized with lip movements (Dodd, 1979; Kuhl & Meltzoff, 1988). By four to five months, they follow a conversation by shifting visual attention between two speakers (Horner & Chethik, 1986). Thus, they recognize not only features of objects from different senses but also the temporal order of those features—that is, that events across different senses unfold over time, such as lips moving and sounds of particular sorts coming out of them (Bahrick & Lickliter, 2000; Lewkowicz, 2000).

In one study, infants appeared to know by sight something they had explored by touch (Meltzoff, 1990). One-month-old infants sucked on one of two kinds of pacifiers—smooth, or with nubs—exploring them with their lips and tongues (Figure 13.11). The experimenters then visually presented similar objects constructed from orange Styrofoam, reasoning that the infants would fixate on the stimulus they had sucked. In fact, of 32 infants tested, 24 stared longer at the shape they had sucked, demonstrating that they knew with their eyes what they had felt with their mouths. In another study,
newborns between 12 and 21 days old were able to imitate the facial gestures of an adult (Figure 13.12) (Meltzoff & Moore, 1977).

How does an infant—who has no idea what a tongue is—recognize that she can move her own as an adult model does? Although such capacities are probably in large measure innate, since they have been demonstrated in children as young as 42 minutes old and in many other species (Lewkowicz, 2000), research with other animals suggests that they may also depend in part on experience in utero (Lickliter & Bahrick, 2000).

**Perceiving Meaning** Infants may perceive more than psychologists once imagined, but do they attribute meaning to the objects they perceive? According to ecological theorists, who understand perception in its environmental, adaptive context, they do (Gibson, 1984, 1964). Ecological theorists argue that the nervous system is wired to recognize certain dangers, and to recognize the potential “value” of some stimuli, without prior learning (Chapter 4).

Ecological researchers have used looming-object studies to demonstrate their point (Figure 13.13). As an alert infant sits in a seat, an object suddenly begins moving directly toward the infant at a constant rate. The object may be real, such as the box shown in the figure, or it may be an expanding shadow. As early as two weeks after birth, infants show a defensive response to the looming object, drawing their heads back, jerking their hands in front of their faces, and showing distress (Bower, 1971).

**WHAT CAN INFANTS REMEMBER?** Most people completely lack explicit memory for events before age three or four, a phenomenon known as infantile amnesia. This does not imply, however, that experience is lost on infants and young children. What infants remember varies considerably depending on the task and reflects in large part the maturation of neural circuits involved in different kinds of memory (Meltzoff, 1995;
Various forms of implicit memory are present from birth. In one study, six-month-olds exposed once to a stimulus responded faster to it two years later than peers not previously exposed to it (Perris et al., 1990; see also Rovee-Collier, 1990). Some intriguing research finds few differences at all between implicit learning in children as young as age four and adults, suggesting that the machinery of implicit learning and memory may be "up and running" very early (Vinter & Perruchet, 2000).

The rudiments of explicit memory are also present from birth, but more complete development of explicit memory depends on maturation of the hippocampi and the temporal lobes sometime between 8 and 18 months (Nelson, 1995). In the earliest days of life, infants prefer novel words to those to which they had habituated a day before, suggesting recognition memory that lasts at least a day (Swain et al., 1993). EEG recordings suggest that five-month-olds can even tell the difference between tones of two different pitches—preferring the novel one—a day later (Thomas & Lykins, 1995).

The rudiments of working memory can be seen by six months of age, as infants appear to be able to hold spatial information in mind for three to five seconds (Gilmore & Johnson, 1995). However, working memory appears to be the slowest-developing memory system, relying on the maturation of the prefrontal cortex (Chapter 6).

**Piaget’s Theory of Cognitive Development**

The first psychologist to trace cognitive development systematically was Jean Piaget (1896–1980). The philosopher of science Thomas Kuhn (1970) observed that major innovations often come from outsiders who have not yet been indoctrinated into the discipline, and this was the case with Piaget. Although Piaget waited until age 21 to complete his doctorate in biology, he published his first paper at the ripe old age of 11 and was offered the curatorship of a Geneva museum’s mollusk collection while still in high school. (The offer was rescinded when the museum realized he was a child.)

Piaget (1970) proposed that children develop knowledge by inventing, or constructing, reality out of their own experience, mixing what they observe with their own actions to behaviors they have observed visually, a phenomenon called intermodal processing. Research from an ecological viewpoint suggests that infants innately appreciate the meaning of some experiences important to adaptation. Whereas various forms of implicit memory are present at birth and rudiments of explicit memory also exist in early infancy, explicit memory requires maturation of the hippocampus over at least the first 18 months of life. Working memory is the slowest-developing memory system.
or events in terms of one’s present schemas—that is, fitting reality into one’s existing ways of understanding. According to Piaget, a schema is an organized, repeatedly exercised pattern of thought or behavior (Flavell, 1992), such as an infant’s tendency to suck anything that will fit into its mouth (a nipple, a finger, a pacifier, etc.). All of these objects can be assimilated—taken in without modifying an existing schema—by sucking. Similarly, a person with a cognitive schema about police can drive into a crowded intersection and immediately understand the role of the person directing traffic.

If humans only assimilated information into existing schemas, no cognitive development would take place. The second process, accommodation, is the modification of schemas to fit reality. At the behavioral level, accommodation takes place when an infant with a sucking schema is presented with a cup: She must modify her existing schema to drink from this new device. At the thought level, accommodation is likely to occur if the reader looks carefully at the spelling of accommodation—it has two cs and two ms, which is highly unusual in English. The word accommodation requires revision of the implicit schema most people hold that would lead them to double only one consonant or the other.

For Piaget, the driving force behind cognitive development is equilibration—that is, balancing assimilation and accommodation to adapt to the world. When a child comes across something he does not understand, he finds himself in a state of cognitive disequilibrium that motivates him to try to make sense of what he has encountered. He may attempt to fit it into existing schemas (assimilation) or he may combine schemas or construct an entirely new schema to fit the new reality (accommodation). Thus, an infant whose father is holding him in front of a large mirror may not realize that he is the baby at whom he is smiling so broadly, but he has to make sense of the fact that there seem to be two identical daddies in the room, one holding him and one smiling at him in the mirror! Eventually he constructs the understanding that a mirror is a special kind of surface that reflects images.

**INTERIM SUMMARY**

Piaget argued that children develop knowledge by constructing reality out of their own experience, mixing what they observe with their own ideas about how the world works. They do this through a process of equilibration, which means balancing assimilation (fitting reality into their existing knowledge) and accommodation (modifying schemas to fit reality).

**STAGES OF COGNITIVE DEVELOPMENT**

According to Piaget, people assimilate and accommodate when confronted with new information throughout their lives. At each stage of development, however, children use a distinct underlying logic, or structure of thought, to guide their thinking. The same four stages—sensorimotor, preoperational, concrete operational, and formal operational—occur in the same sequence for everyone, although the age for each individual may vary somewhat (Table 13.2). A fundamental principle of Piaget’s developmental theory is that every stage builds on the next, as children wrestle with problems their old structures will not resolve and work their way toward new solutions by trying out and adjusting schemas currently in their repertoire (Siegler & Ellis, 1996).

**Sensorimotor Stage**

The sensorimotor stage, in which infants think with their hands, mouths, and senses, lasts from birth to about two years of age. Sensorimotor thought primarily takes the form of action, as infants learn about the world by mouthing, grasping, watching, and manipulating objects. According to Piaget, the practical knowledge infants develop during this period forms the basis for their later ability to represent things mentally.

The label sensorimotor emphasizes that infants are bound by their sensations and actions and are capable of little explicit reasoning beyond what they are sensing and
During the sensorimotor stage, children learn with their hands and mouths.

object permanence in Piaget’s theory, the recognition that objects exist in time and space independent of one’s actions on, or observation of, them.

ego-centric being thoroughly embedded in one’s own point of view.

preoperational stage Piaget’s second stage of cognitive development, beginning roughly around age two and lasting until age five to seven, characterized by the emergence of symbolic thought.

TABLE 13.2
PIAGET’S STAGES OF COGNITIVE DEVELOPMENT

<table>
<thead>
<tr>
<th>Stage</th>
<th>Approximate Ages (years)</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensorimotor</td>
<td>0-2</td>
<td>Thought and action are virtually identical, as the infant explores the world with its senses and behaviors; object permanence develops; the child is completely egocentric.</td>
</tr>
<tr>
<td>Preoperational</td>
<td>2-7</td>
<td>Symbolic thought develops; object permanence is firmly established; the child cannot coordinate different physical attributes of an object or different perspectives.</td>
</tr>
<tr>
<td>Concrete operational</td>
<td>7-12</td>
<td>The child is able to perform reversible mental operations on representations of objects; understanding of conservation develops; the child can apply logic to concrete situations.</td>
</tr>
<tr>
<td>Formal operational</td>
<td>12+</td>
<td>The adolescent (or adult) can apply logic more abstractly; hypothetical thinking develops.</td>
</tr>
</tbody>
</table>

During the sensorimotor stage children are extremely egocentric. When an infant closes her eyes, the whole world becomes dark; when a ball is no longer in view, it ceases to exist. For Piaget, development entails a gradual movement away from egocentrism toward a recognition of alternative points of view (see Flavell, 1996; Selman, 1980).

Preoperational Stage The preoperational stage begins roughly around age two and lasts until ages five to seven. It is characterized by the emergence of symbolic thought—the ability to use arbitrary symbols, such as words, to represent concepts. Once children learn to manipulate symbols and mental images, thought becomes detachable from action. To put it another way, when children can play with the world in their minds, they no longer have to think exclusively with their hands or mouths. Symbolic thought allows preschool children to converse with other people and imagine solutions to problems before actually doing anything.

Preoperational thought continues, however, to be limited by egocentrism. A classic demonstration of egocentrism at this stage occurs in the three-mountain task. A child is seated at a table displaying three model mountains (Figure 13.14), with a teddy bear...
or doll seated at another chair at the same table. The child is shown a number of pictures of the table from different perspectives and is asked which view the teddy bear is seeing.

Preschool children often answer that the bear sees their own view of the table (Piaget & Inhelder, 1956). They are not egocentric in every situation and can even solve simplified versions of the three-mountain task (Burke, 1975; Ford, 1979; Lempers et al., 1977). Nevertheless, preschoolers are much more likely to make egocentric cognitive errors than older children, like the three-year-old who covers her eyes and declares, “You can’t see me!”

A related limitation of preoperational thought is centration, the tendency to focus, or center, on one perceptually striking feature of an object without considering other features that might be relevant. When asked which of two candy bars is bigger, a long, thin one or a short, thick one, the preschooler is likely to pick the longer one and ignore thickness, even though the amount of chocolate is identical.

Preoperational thinking also tends to be fairly literal. The mother of a three-year-old tried to teach her son the meaning of compromise when he wanted her to read him three bedtime stories instead of the usual one. She suggested they compromise on two. A few days later, they were debating whether he should go to bed at eight or nine o’clock, and the mother asked, “Billy, do you remember what compromise means?” “Yes,” he replied earnestly, “two.”

Perhaps the major limitation of preoperational thought is the feature that gave this stage its name. For Piaget, to know an object is to operate on it. Operations are internalized (i.e., mental) actions the individual can use to manipulate, transform, and then return an object to its original state (Piaget, 1972). Alphabetizing a list of names is an operation, because a person can put names in alphabetical order and then scramble their order again. Similarly, imagining what one could have said to someone who behaved rudely is an operation. Operations are like actions a person “tries out” in her head. According to Piaget, the capacity to carry out mental operations of this sort is the defining feature of the next stage of development.

Figure 13.14 The three-mountain task. Preoperational children typically do not recognize that the stuffed animal “sees” the mountain from a perspective different from their own, although they can do so if the stimulus is very simple.

INTERIM SUMMARY

Piaget argued that cognitive development occurs through a series of stages. During the sensorimotor stage, infants think with their hands and eyes. A major achievement of the sensorimotor stage is object permanence, when infants recognize that objects exist in time and space. During the sensorimotor stage children are extremely egocentric. The preoperational stage is characterized by the emergence of symbolic thought, which allows preschool-age children to imagine solutions to problems mentally rather than through action. Children at this stage remain egocentric; they have difficulty imagining reality from other viewpoints, and they have a tendency to center on one perceptually striking feature of an object.

Concrete Operational Stage Piaget called the third stage of cognitive development the concrete operational stage, roughly ages 7 to 12. At this point, children are capable of operating on, or mentally manipulating, internal representations of concrete objects in ways that are reversible. In other words, children can imagine performing mental manipulations (operations) on a set of objects and then mentally put them back the way they found them (Piaget, 1972). For example, school-age children are able to imagine different ways of explaining why they came home late from playing with their friends, picture the likely consequences of each, and pick the one with the best odds. Younger children, in contrast, are more likely to blurt out an obvious lie or the truth, neither of which may satisfy their cognitively more developed parents.
The major achievement of the concrete operational stage is demonstrated in Piaget's classic experiments with conservation problems. According to Piaget, once children reach this third stage, they are able to understand the concept of conservation—that basic properties of an object or situation remain stable (are conserved) even though superficial properties may be changed.

For example, if preoperational children are shown the three beakers in part (a) of Figure 13.15, they easily recognize that the two same-sized beakers contain the same amount of liquid. They will not realize, however, that the tall and short beakers contain the same amount of liquid even if they watch the experimenter pour the liquid from the short to the tall beaker. In contrast, concrete operational children understand that the amount of liquid remains unchanged even though it has been poured into a beaker of a different shape. If asked to justify their answers, they usually say something like, “You just poured it from one container to another!” Whereas preoperational thought is characterized by centration on one dimension, concrete operational thinkers are able to decenter, that is, to hold in mind multiple dimensions at once.

Two other types of conservation problems, conservation of number and conservation of mass, are shown in parts (b) and (c), respectively, of Figure 13.15. Children typically master different kinds of conservation at slightly different ages. Many children understand conservation of number by age six but do not understand conservation of mass until about age eight (Elkind, 1981; Katz & Beilin, 1976).

At the concrete operational stage children also understand transitivity—that if \( a < b \) and \( b < c \), then \( a < c \). Although preoperational children can be trained to make some transitive inferences, they have difficulty keeping enough information in mind to solve transitive-thinking problems (Bryant & Trabasso, 1971). One transitivity problem asks, “If Henry is taller than Jack, and Jack is taller than Claude, which boy is the shortest?” Preschoolers are equally likely to pick Jack or Claude because each one is shorter than someone else. They fail to put together the two pieces of information.
about relative height into a single transitive proposition. In general, before age seven or eight, children have difficulty recognizing logical inconsistencies (e.g., that a person cannot be both tall and short, except in relation to different people) (Ruffman, 1999).

**Formal Operational Stage**  Piaget’s fourth stage, formal operations, begins about ages 12 to 15, when children start to think more abstractly. The **formal operational stage** is characterized by the ability to manipulate abstract as well as concrete objects, events, and ideas mentally. That is, teenagers can reason about “formal” propositions (e.g., whether democracy is the best form of government) rather than only concrete events. Teenagers are less likely to argue that the two beakers in the conservation task contain the same amount of liquid because they saw the liquid being poured back and forth. They may instead discuss the law of conservation or argue that surface appearances do not always reflect the underlying reality. Another hallmark of formal operational reasoning is the ability to frame hypotheses and figure out how to test them systematically (Inhelder & Piaget, 1958).

**PUTTING PIAGET IN PERSPECTIVE**  Piaget’s theory literally defined cognitive development for several decades, and it continues to have a profound influence. Nevertheless, researchers now criticize a number of aspects of his theory.

First, Piaget focused too heavily on the kind of rational thinking typical of scientific or philosophical pursuits and underplayed the extent to which people’s thinking is biased, irrational, and influenced by motives or emotions. For example, despite their ability to think abstractly, teenagers show the same kinds of biases as adult scientists in weighing arguments against their pet theories (see Klaczynski, 1997, 2000).

Another criticism concerns Piaget’s assumption that a child’s thinking tends to be “at” one stage or another. Cognitive development often progresses unevenly, as the same child shows higher-level reasoning in one domain than another (e.g., the ability to think abstractly in science but a lack of complexity in thinking about social relationships) (Case, 1992; Flavell, 1982). Children also exhibit a range of responses on any task and when “thinking aloud,” while solving a problem often provide responses that range from quite mature to quite immature (Siegler & Ellis, 1996).

Piaget also underestimated the capacities of infants and preschool children (Gelman & Baillargeon, 1983). For example, research suggests that at 20 days, infants are aware, at least for a few seconds, that a hidden object still exists, and by two months they can distinguish between an object moved out of sight and one that ceases to exist (Breuer, 1985). Preoperational children can sometimes accomplish conservation tasks as well. By age five, children recognize that a substance can dissolve and no longer be seen but still preserve certain qualities, such as sweet taste (Rosen & Rozin, 1993). Children most often fail when conservation tasks are unfamiliar and the answer is quantitative (Siegler & Ellis, 1996).

In some respects, a difference between Piaget and his critics is that he generally required his participants to demonstrate explicit knowledge before he would describe them as “getting” a concept or task. Explicit knowledge also tends to produce generalizability to other domains, because if a child can reason explicitly about conservation of liquids, she can probably do the same for solids. Subsequent researchers, in contrast, have documented a multitude of ways in which children implicitly show that they grasp certain concepts, as expressed in their behavior, even though they may be able to do so only under certain circumstances.

Other critics charge that Piaget failed to pay enough attention to the role of culture in development. Numerous cross-cultural studies have found that children progress through stages similar to those described by Piaget but that the age at which children attain particular stages often varies greatly and depends on the task (Mishra, 1997; Price-Williams, 1981). By and large, cognitive development proceeds more slowly in preliterate societies, although children’s abilities tend to reflect their cultural and environmental circumstances. Mexican children of potters show delayed development...
on the conservation task using beakers, but they demonstrate a relatively early understanding of conservation when asked if a ball of clay has the same volume when it is stretched into an oblong shape (Price-Williams et al., 1969). Similarly, children in nomadic societies, which travel from location to location for their survival, tend to outperform other children on spatial tasks (Dasen, 1975; Dasen & Heron, 1981).

In sum, Piaget was correct in many of the broad strokes he used to describe cognitive development: Children become less egocentric, increasingly able to think symbolically, and increasingly able to reason abstractly as they develop (Halford, 1989). At the same time, many of the specific strokes, hues, and textures of his portrait require revision. Development is less uniform and unitary than his model suggests, and infants and young children appear to be more competent—and adults less competent—than Piaget believed (Flavell, 1992).

**INTERIM SUMMARY**

During the **concrete operational stage**, children can mentally manipulate representations of concrete objects in ways that are reversible, as can be seen in their understanding of **conservation** (that basic properties of an object or situation remain stable even though superficial properties change). The **formal operational stage** is characterized by the ability to manipulate abstract as well as concrete representations, to reason about formal propositions rather than concrete events. Many of Piaget’s broad principles have withstood the test of time, but many specifics of the theory no longer appear accurate.

**Information-Processing Approach to Cognitive Development**

The information-processing approach is well suited to sketching some of the finer details of cognitive development. Information-processing researchers have tried to track down the specific processes that account for cognitive development and have focused on continuous, quantitative changes more than the broad, qualitative stages studied by Piaget.

**PROCESSING SPEED** One of the variables that appears to account most for cognitive development is surprisingly simple: processing speed (Kail, 2000; Miller & Vernon, 1997). As we saw in Chapter 8, mental quickness is a central aspect of intelligence. As children get older, they are able to do a range of cognitive tasks—from categorizing objects to making decisions—more quickly (Figure 13.16). This increase in speed allows them, among other things, to hold more information in working memory at any given moment and hence to solve problems more effectively. Speed of processing across a wide array of simple and complex tasks increases throughout childhood and levels off around age 15 (Kail, 1991a,b).

**AUTOMATIC PROCESSING** A second factor that influences children’s cognitive skill is their increasing ability to perform cognitive tasks automatically (Chaiken et al., 2000; Sternberg, 1984). **Automatization** refers to the process of executing mental processes with increasing efficiency so that they require less and less attention. In many tasks, from performing addition problems to driving a car, increased competence involves shifting from conscious, controlled processing to automatic, or implicit, processing. In reading, for example, children begin by sounding out words bit by bit. As they get more proficient, they immediately recognize common words and only have to sound out new, more complicated words.

**KNOWLEDGE BASE** Another factor that influences children’s cognitive efficiency is their **knowledge base**. Compared to adults, children’s knowledge bases are obviously limited because of their comparative inexperience with life. To what extent, then, does
the limited size of children’s knowledge base, rather than some other factor, account for their cognitive inefficiency compared with adults?

One study explored this question by reversing the usual state of affairs, selecting children who were more knowledgeable than their adult counterparts (Chi, 1978). The cognitive task was to remember arrangements of pieces on a chessboard. Child participants (averaging age 10) were recruited from a local chess tournament; adult participants had no particular skill at chess. That the children easily outperformed the adults demonstrates that knowledge base was more important than age-related factors in this cognitive task. Other studies have corroborated this finding using stimuli such as cartoon characters, with which children are more familiar than adults (Lindberg, 1980).

**COGNITIVE STRATEGIES** Use of cognitive strategies also develops throughout childhood and adolescence (Siegler, 1996). In memory tasks, young children tend to rely on simple strategies such as rote repetition. As they get older, children use increasingly sophisticated rehearsal strategies (Chapter 6), such as arranging lists into categories before trying to remember the items (see Alexander & Schwanenflugel, 1994; Brown et al., 1983). In many respects, cognitive development reflects a process akin to evolution: Children try out new “mutations” (different problem-solving strategies), weed out those that do not work as well, and gradually evolve new strategies depending on changes in the situation (Siegler, 1996).

**METACOGNITION** A final variable involved in cognitive development is metacognition—thinking about thinking (Bogdan, 2000; Flavell, 1977; Metcalfe & Shimamura, 1994). To solve problems, people often need to understand how their mind works—how they perform cognitive tasks such as remembering, learning, and solving problems. For example, when asked if they understand something, young children often have trouble discriminating whether they understand something or not, so they simply nod in assent or fail to ask questions (Brown et al., 1983). Similarly, preschoolers do not recognize the importance of “inner speech”—using words inside one’s head—while performing tasks such as mental arithmetic (Flavell et al., 1977).

An important aspect of metacognition is metamemory—knowledge about one’s own memory and about strategies that can be used to help remember (Flavell & Wellman, 1977; Metcalfe, 2000). Metamemory is impaired in many patients with frontal lobe damage (Shimamura, 1995). Not surprisingly, it is also less developed in children, whose frontal lobes remain immature for many years. In one classic study, researchers asked younger and older children to view some pictures and predict how many they could remember. The younger children often predicted total recall (Flavell et al., 1970)! Although metamemory, like metacognition in general, frequently involves explicit processes, many metamemory processes are implicit, such as knowing how, where, and how long to search memory (Reder & Schunn, 1996).

**INTERIM SUMMARY**

Many aspects of information processing change with age. Among the most important are processing speed, children’s knowledge base (store of accumulated knowledge), automatization (executing mental processes automatically and relatively effortlessly, with increasing efficiency and decreased attention), more efficient use of cognitive strategies, and metacognition (knowledge about how one’s mind works—or cognition about cognition).

**Integrative Theories of Cognitive Development**

Piaget viewed cognitive development as a progression through qualitatively different stages, whereas the information-processing approach focuses on small-scale, quantitative refinements in children’s ability to think and remember. As different as these
Theorists who attempt to wed a stage model of cognitive development with research on information processing and domain-specific knowledge are known as neo-Piagetian theorists. They argue that children actively structure their understanding, that knowledge progresses from a preconcrete to a concrete and then to an abstract stage, and that all of these aspects occur in roughly the order reported by Piaget (Bidell & Fischer, 1992; Case, 1998; Fischer, 1980). Like information-processing theorists, however, the neo-Piagetians pay more attention to discrete components of cognitive processing and emphasize domain-specific development—that is, the way cognition can develop in one domain without simultaneously developing in others.

One such theory was proposed by Robbie Case (1992, 1998). Case argues for a general stage theory similar to Piaget's, from a sensorimotor stage to an abstract, complex, formal operational stage. Each stage differs qualitatively from the others in the way children represent problems and strategies for solving them (Case, 1984).

Case's theory differs from Piaget's, however, in some key respects. Case argues that cognitive progress within each stage is possible because humans are innately motivated to solve problems, explore, imitate others, and engage in social interaction. Development occurs within each stage as children set goals, formulate problem-solving strategies, and evaluate the results of those strategies. They then integrate existing problem-solving strategies to create more elaborate strategies as new situations arise, and they practice those new strategies until they become automatic.

According to Case, development across stages also depends on cultural input, but the most important factor in qualitative changes in development (i.e., movement across stages) is an increasing capacity for working memory. Attending to both length and width in a conservation task is much easier if a child has a large enough working memory capacity to hold both dimensions in mind simultaneously while imagining how, for example, a ball of clay might look if those dimensions changed. Research suggests that the central executive function of working memory, which is involved in allocating attention, coordinating different kinds of information held in short-term storage, and handling multiple tasks at once, continues to develop throughout childhood, at least through age 10 (Hale et al., 1997).

Figure 13.17 illustrates the way expanded working memory allows for more complex cognition. Ten- to eighteen-year-olds were asked to draw a picture of a mother looking out the window to see her son playing peek-a-boo with her in the park (Dennis, 1992, cited in Case, 1992). The youngest participants could keep in mind the image of the mother in the house and the image of the boy in the park, but they could not integrate the two images. This study illustrates the advantages of a neo-Piagetian model over classical Piagetian theory. Certain broad processes, particularly limitations in working memory, constrain the thinking of young children, putting an upper limit on what a child within a given age range can achieve. This leads to qualitative differences in thought at different stages that appear across a variety of domains (such as art, language, and mathematics), just as Piaget postulated.

At the same time, neo-Piagetian models recognize that development occurs in specific domains and is influenced by culture and experience (Bidell & Fischer, 2000). By ages 8 to 10, children in Western cultures incorporate artistic conventions developed over the past several centuries for depicting perspective (Chapter 4), such as represent-
ing closer objects as larger. However, a four-year-old with a crayon is unlikely to out-perform an adult regardless of culture or experience.

**INTERIM SUMMARY**

Neo-Piagetian theorists attempt to integrate an understanding of the broad stages of Piaget’s theory with an information-processing approach. According to Case’s theory, the main variable responsible for cognitive development across stages is expansion of working memory capacity.

**COGNITIVE DEVELOPMENT AND CHANGE IN ADULTHOOD**

All cultures consider adolescents and adults better decision makers than children, but they differ dramatically in their beliefs about cognition and aging. Many cultures associate age with wisdom. In contrast, Western cultures associate age with decline. Although real changes in speed of processing and capacity for learning and memory occur cross-culturally (Crook et al., 1992), as we will see, cognitive decline varies not only across cultures but also across individuals within a single culture.

**Cognitive Changes Associated with Aging**

A number of cognitive changes occur with aging, ranging from changes in psychomotor speed to changes in memory (Craik & Salthouse, 2000; Park & Schwarz, 2000).

**PSYCHOMOTOR SPEED**

One of the clearest changes that accompanies aging is *psychomotor slowing*, an increase in the time required for processing and acting on information (Park et al., 1996; Salthouse, 1996, 2000). This deceleration actually begins early, around the mid-twenties. Psychomotor slowing can be observed both on relatively simple tests, such as pushing a button when a light flashes, and on tests that require more complex thinking (Era et al., 1986; Spirduso & MacRae, 1990). In practical terms, psychomotor slowing can be seen in the difficulty older people have relative to younger people when first learning to use a mouse at the computer—particularly double-clicking (Smith et al., 1999)!

For most people, psychomotor slowing is so gradual that it goes unnoticed until the fifties or sixties. For professional athletes, however, increased reaction time means a retirement age in the early thirties. Middle-aged athletes, such as George Foreman, who shocked the world in 1994 by winning back the heavyweight championship in his late forties, know their days are numbered. Even so, they can stage temporary comebacks through extra practice, increased skill, and compensatory strategies.

Does reaction time matter much for the rest of us, whose livelihood does not depend on ducking blows or anticipating the direction of a ball heading toward us at 90 miles an hour? Actually, it does, because it has indirect effects on all kinds of reasoning and problem-solving abilities (Parkin & Java, 1999). Researchers are just beginning to tease apart the reasons why processing speed appears to matter so much, but two explanations may help explain the link between speed and intellectual functioning (Salthouse, 1996).

The first is limited time. If complex mental operations rely on the execution and coordination of many simpler mechanisms, in the brief period of time people have to make most decisions, including implicit decisions, the person will simply have less time to process multiple pieces of information and combine them in complex ways. From a connectionist perspective (Chapter 7), if people categorize, perceive, and remember
MAKING CONNECTIONS

Connectionist models propose that when we perceive, think, and remember, we activate networks of neurons that have been activated together in the past (Chapter 7). Thus, connectionist models suggest one possible reason for slowed reaction time with age: If a mental process or representation is distributed across a number of neurons that form a circuit, any small break that occurs with aging will require adding additional steps to recomplete the circuit. Because every synaptic connection adds processing time, the more broken connections that amass over the years, the more time is required to find alternative routes to carry out psychological processes (from Cerella, 1990, p. 203).

A second way decreased processing speed can affect cognitive performance is its influence on working memory. If cognitive processes take longer to execute, less information is available simultaneously in working memory, and relevant information may no longer be available by the time the person needs to think about it.

MEMORY A common stereotype is that older people are constantly forgetting things—names of people they have just met, what they did yesterday, or where they put their house keys. This stereotype has grains of truth but is far too sweeping. Understanding declines in memory requires distinguishing different types of memory (Chapter 6).

Working Memory Older people do well on simple short-term storage tasks, such as remembering a string of digits (Hultsch & Dixon, 1990; Labouvie-Vief & Schell, 1982). However, they show substantial deficits in complex working memory tasks, such as repeating a list of digits backward, dealing with multiple tasks at once, or dividing their attention between tasks (Einstein et al., 1997; Farrimond et al., 2006; Ponds et al., 1988). These deficits translate into very practical problems, such as how to keep track of multiple cars at an intersection with a four-way stop. If neo-Piagetian theorists such as Robbie Case are right that the key to cognitive development in childhood is increased working memory capacity, then advanced aging means development in reverse. Indeed, neuroimaging studies find not only decreased activation of areas of the prefrontal cortex known to be involved in working memory in people in their sixties and older but also less efficient activation (Reuter-Lorenz & Stanczak, 2000; Rybma & D’Esposito, 2000). For example, older people show activation of both right and left hemispheres in verbal working memory tasks, which are lateralized to the left hemisphere in younger people (Chapter 6).

Long-Term Memory As for long-term memory, some aspects remain intact throughout the life span, whereas others decline. Although older people take more time to learn new information than younger people, given ample encoding time, their performance approaches that of younger participants (Perlmutter, 1983). Furthermore, if they are healthy, people continue to add to their knowledge base until the day they die; in this sense, people can add to their supply of “wisdom” until their last breath (Horn & Hofer, 1992; Salthouse, 1992, 2000). Nor is implicit memory impaired with age, as assessed by tasks such as the tendency to complete a word stem (e.g., per-) with a previously primed word (e.g., perfume) (Gaudreau & Peretz, 1999; Russo & Parkin, 1993; Schacter et al., 1992).

The problems older people have with long-term memory lie more in retrieving explicit memories than in either encoding new information or in learning or expressing knowledge implicitly. Although some studies find small declines in recognition memory (e.g., Did you see the word dove on the list presented a few minutes ago?), older people have particular trouble in recall tasks (e.g., What words did you see on that list?). If older people have trouble retrieving new information, do they “live in the past”? Interestingly, the years between 10 and 30 seem to be peak years for storing significant episodic (autobiographical) memories (Rubin et al., 1998). When older adults are asked to recall significant episodic memories (memories of events they have experienced), they tend to call up memories from that period more than other memories, and the memories they produce are more vivid. They also show greater semantic knowledge for facts such as current events and who won an Oscar or the World Series during that period.

Everyday Memory Many researchers interested in everyday memory—memory as applied in everyday life (Chapter 6)—have wondered whether the somewhat gloomy pic-
ture painted by some laboratory studies of memory in older people reflects the realities of their daily lives (see Blanchard-Fields & Chen, 1996).

In everyday tasks, changes in cognition appear to involve both gains and losses (Baltes, 1987, 1998). For example, when asked to remember the events of a story, middle-aged and older participants in one study remembered slightly fewer details of the story but were more likely than late adolescents (age 16 to 19) to get the gist of it—that is, to encode and remember its meaning (Adams, 1991). This can be seen in people's work lives: An analysis of nearly 100 studies with a combined total of more than 38,000 participants found that the correlation between worker productivity and age is essentially zero (McEvoy & Cascio, 1989). Older workers apparently compensate for declines in processing power with a larger knowledge base and alternative strategies for carrying out tasks (Baltes, 1987; Perlmutter et al., 1990).

Intelligence has many facets, and different aspects of intelligence change in different ways as people age. As we saw in Chapter 8, fluid intelligence refers to intellectual capacities used in many forms of information processing (assessed by measures of speed of processing, ability to solve analogies, etc.), whereas crystallized intelligence refers to people's store of knowledge (Horn & Cattell, 1967; Horn & Hofer, 1992).

Fluid intelligence peaks in young adulthood and then levels off and begins declining by mid-adulthood, largely because of a decline in speed of processing. In contrast, crystallized intelligence increases throughout most of life, showing declines only in very old age (Figure 13.18) (Horn, 1998; Horn & Hofer, 1992). In sum, intelligence is multifaceted and cumulative, and most of us would do well to be half as productive or creative at 20 or 30 as Picasso was at 90.

INDIVIDUAL DIFFERENCES IN AGING AND COGNITION Many of the studies showing declines with aging have been cross-sectional. A major limitation of these studies is that they can show, on average, how people fare at different ages, but they cannot show the proportion of people whose cognitive capacities decline. Statistically, if a sizable minority of older people show substantial cognitive deterioration, mean scores for their age group will be lower than for younger groups, leading to an apparent conclusion that intelligence declines with age. But longitudinal studies can ask a different question: Of people in different age groups, how many actually deteriorate?

A major longitudinal project, called the Seattle Longitudinal Study (Schaie, 1990, 1994; Schaie & Zanjani, 2006), provides an important corrective to a view of inevitable cognitive decline. The investigators have followed a large sample of individuals in seven-year intervals since 1956. In the original sample in 1956, 500 people, ranging in age from their early twenties to their late sixties, completed a battery of cognitive tests. At each seven-year interval, current participants are invited to participate again, and new participants are added to the sample. As of 2005, 30 of the original participants remained, and over 6000 individuals had participated. The results of the assessments have been striking: Most people do not show significant mental declines. Even on the average, intellectual functioning does not decline until the sixties and seventies (Figure 13.19). In fact, cognitive decline can be an indicator of impending death: Older people who begin to show signs of substantial psychomotor slowing and declines in crystallized intelligence are more likely to die in the next several years than those whose cognitive functioning remains relatively intact (Bosworth & Schaie, 1999).

The Seattle study, like other longitudinal studies, shows that people differ tremendously in the way they age. People who are healthy and mentally active experience fewer mental declines than those who are not (Diamond, 1978; Horn & Meer, 1987). The “use it or lose it” theory applies to mental functioning as much as to physical. B. F. Skinner, Pablo Picasso, Sigmund Freud, Eleanor Roosevelt, Jean Piaget, and a host of other septagenarians and octogenarians have shown remarkable cognitive longevity in diverse fields. Data from a recent 11-year longitudinal study of a large community sample found that “using it” early in life may also be important for “keeping it” later: People who had less than eight years of formal education showed substantially greater
A disorder marked by global disturbance of higher mental functions

cognitive declines than those who had nine or more (Lyketsos et al., 1999). Having a certain amount of intellectual training early in life may reduce future deterioration.

Although most people function well for most or all of their lives, cognitive decline generally escalates in the mid-eighties as the brain’s hardware begins to wear out (Korsten et al., 1997). A prime culprit appears to lie in the frontal lobes (Parkin & Java, 1999; Souchay et al., 2000). Most cognitive tasks that involve bringing material to consciousness and manipulating it—from remembering a phone number to figuring out how to solve a novel problem to having that “feeling of knowing” when asked whether this is the street to turn on—rely on an intact prefrontal cortex. As the frontal lobes begin to function less effectively, not only does working memory become impaired, as we have seen, but explicit memory and decision making decline or at best hold steady if the person finds alternative ways to compensate (see Parkin et al., 1995; West, 1996).

Neuroscientists have long suggested a simple maxim that applies to developmental gains in childhood and losses in late life: last in, first out. The frontal lobes are the last to mature in childhood and adolescence, and they seem to be among the first (and most) affected by normal aging.

**Aging and “Senility”**

One of the most pervasive myths about aging is that old people lose their memory and their ability to think and reason—that is, they become “senile” (Butler, 1975). In fact, only about 5 percent of the population suffer progressive and incurable dementia (Morris & Baddeley, 1988). Another 10 to 15 percent experience mild to moderate memory loss. The majority of people—around 80 percent—retain sharp mental functioning even through old age (Butler, 1984; Schaie, 1990).

Organic brain disease, or what people often call senility, is far more prevalent among people in their eighties and nineties than among those in their sixties and seventies. Rates of dementia vary slightly across cultures but are everywhere linked to advancing age (van Duijn, 1996). Even among people in their eighties, however, only about 20 percent are affected by senile dementia (Roth, 1978).

Senile dementia has a variety of causes, including reduced blood supplies to the brain and exposure to toxins such as alcohol. Roughly 10 to 20 percent of dementias are curable by diagnosing and eliminating an environmental toxin (Elias et al., 1990).
Alzheimer’s disease is a progressive and incurable illness that destroys neurons in the brain, causing severe impairment of memory, reasoning, perception, language, and behavior. Well over half the cases, however, are caused by Alzheimer’s disease (see Ashford et al., 1996; Gilleard, 2000). Although early warning signs (particularly decreased ability to think abstractly and to retain new information) may not be apparent to the naked eye, a recent longitudinal study of a community sample of over 1000 people found that those who developed Alzheimer’s showed subtle declines on neuropsychological tests a decade before developing overt symptoms (Elias et al., 2000).

The characteristic changes in brain tissue in Alzheimer’s include tangled neurons and protein deposits that disrupt the functioning of cells in the cortex. Alzheimer’s patients also have abnormally low levels of several neurotransmitters, most importantly acetylcholine, which plays a central role in memory functioning (Coull & Sahakian, 2000). Recent neuroimaging research has found a direct correlation between the extent of damage in the temporal lobes, particularly the hippocampus and axons connecting it to the cortex, and the degree of cognitive impairment in Alzheimer’s patients, which makes sense in light of the pervasive effects of the disease on explicit memory (Bierer et al., 1995; Schroder et al., 1997). The result of lesions to this area may be difficulty in remembering what happened moments earlier.

Alzheimer’s disease may have several different causes, but at least one major form of the disorder is genetic (Coyle, 1991; Nussbaum & Ellis, 2003; Rosenberg, 2003; Williams, 2003). Researchers have isolated genes on at least three chromosomes implicated in the genetic transmission of Alzheimer’s. One form of the disease has been linked to a defect on chromosome 21 (Holland & Oliver, 1995), the chromosome implicated in Down syndrome, a form of mental retardation (Chapter 8). Down syndrome patients who live into late middle age often develop symptoms and neurological changes similar to Alzheimer’s disease.

**INTERIM SUMMARY**

Cognitive declines in later life tend to be selective rather than global. Processing speed decreases; working memory capacity declines; explicit memory retrieval becomes more difficult; problem-solving strategies become less efficient; and fluid intelligence declines. Other functions show little or no noticeable decline, including many encoding processes, implicit memory, aspects of everyday memory, and crystallized intelligence. People also show tremendous variability in the way their minds change with aging. About 5 percent of the population suffers progressive and incurable dementia, a disorder marked by global disturbance of higher mental functions. The most common cause of dementia is Alzheimer’s disease.

**LANGUAGE DEVELOPMENT**

For most people who have ever studied a foreign language and then visited a country where that language is the native tongue, watching five-year-olds speak is a humbling experience. Without benefit of years of coursework and hours of rote memorization, these tiny creatures with their half-baked cortexes typically run linguistic circles around their fumbling foreign elders. How do they do it?

**A Critical Period for Language Development?**

Psychologists and linguists have wrestled with the question: Does a critical period exist for language learning; that is, is the brain maximally sensitive to language acquisition at a certain point in development (Lenneberg, 1967)?
Readers who have tried to learn a foreign language as teenagers or young adults have probably found that language acquisition is not so easy at later stages of life. As we have seen (Chapter 3), the development of the brain depends on certain kinds of environmental enrichment, and neurons and neuronal connections not used at age-appropriate times may die or disappear. Exposure to language may be necessary for normal lateralization of linguistic processes to the left hemisphere, which is typically completed between ages 2 and 5 (Kinsbourne & Smith, 1974; Marcotte & Morere, 1990).

Similarly, exposure to particular phonemes in the first three years may be required in order to attain native fluency in a second language, particularly if that language is very different from one’s own (such as Chinese and English). Learning a second language becomes steadily more difficult after age 3, up until at least age 12. After that point, people are seldom able to attain even near-native fluency, and the brain appears to recruit different neural circuits to carry out linguistic tasks than it uses to process first languages (McDonald, 1997).

Perhaps the most convincing evidence of critical periods comes from the study of deaf children whose parents did not know sign language and who did not become exposed to sign language until enrolled in schools for the deaf as late as adolescence (Mayberry & Eichen, 1991; McDonald, 1997). Late learners generally do not catch up to early learners in their ability to use sign language, particularly if they begin in adolescence. They have more trouble learning to comprehend the language fluently and to produce signs as rapidly and effortlessly, suggesting that they “speak with an accent,” much like adults who try to learn a second language. Even after 30 years of using sign language, native signers outperform people who learned to sign later in childhood, who in turn outperform later learners (Newport, 1990).

Researchers have also examined a handful of cases of children who were not exposed early to language because they were raised in extreme isolation. The most famous case was a child known as Genie. Authorities found Genie at age 13; she had been living in a tiny room tied to a chair from the time she was 20 months old. Her abusive father rarely spoke to her except for occasional screaming. After Genie was discovered, linguists and psychologists worked with her intensively. She acquired a reasonable vocabulary and learned to combine words into meaningful phrases, but she never progressed beyond sentences like “Genie go” (Curtiss, 1977, 1989). She also did not appear to have the normal left-hemisphere lateralization for language.

**INTERIM SUMMARY**

For many years psychologists have debated the existence of a critical period for language learning. The first three years of life seem to be the optimal time to attain native fluency. After age 12, even near-native fluency is difficult to achieve, and language appears to be processed using different neural circuits than in native speakers.

**What Infants Know about Language**

Although psychologists disagree about the relative roles of nature and nurture in language development, no one doubts that children learn language with extraordinary speed. First, however, they must learn to segment the continuous streams of speech they hear into units so they can distinguish one phoneme, morpheme, word, or phrase from another. As anyone knows who has ever traveled to a country with an unfamiliar language, this is no easy task, because native speakers talk rapidly and do not typically “brake” for learners.

Infants use a number of cues to segment speech, such as pauses, pitch, and duration. By the time they are nine months old, they already show a preference for speech interrupted at the boundaries of phrases (Jusczyk et al., 1999; McDonald, 1997). They
can also recognize recurring patterns in a string of uninterrupted syllables (such as *badigo* in *badigotababadigo*) (Saffran et al., 1996).

Although infants must learn to segment speech, they appear to have an innate sensitivity to distinctions among the phonemes that make up human languages long before they even start speaking (L. B. Cohen et al., 1992a; Miller & Eimas, 1995). Researchers have documented this ability by measuring the rate at which one- and four-month-old infants suck on a pacifier as they listen to various sounds (Eimas et al., 1971, 1985). Infants have a preference for novel stimuli, and over time, they will suck faster on a specially wired pacifier when presented with a new stimulus when they realize that their sucking controls what they hear. This allows psychologists to learn how infants think and perceive.

One classic study found that a change in phonemes that could signal a different meaning if used in a word (e.g., from a *b* to a *p*) produced a much greater increase in sucking rate than a similar change that carried no potential linguistic meaning (Eimas, 1985). Interestingly, though, humans are not alone in their capacity to distinguish linguistic sounds. Newborn human infants can distinguish Dutch from Japanese—but so can cotton-top tamarin monkeys (Ramus et al., 2000)! Human language seems to take advantage of sound processing mechanisms present in other animals (Bonvillian, personal communication, 2000).

Once infants learn to segment speech, one of the next tasks is to classify words into syntactic categories, such as nouns, verbs, and noun phrases (McDonald, 1997). That young children implicitly classify words into parts of speech by noticing regularities in their use can be seen in the tendency of preschoolers to overgeneralize (to generalize rules that normally apply to irregular instances). For example, just as they create words such as *hisself*, they also create sentences such as *She hitted me*.

### From Babbling to Bantering

Babies’ first recognizable speech sounds are called babbling. These utterances, such as *lalala* or *baba*, begin sometime between six months and one year. However, by the end of this period, even before they speak their first words, their language development bears the imprint of their culture. Babies’ innate attention to phonemic distinctions becomes markedly limited to phonemes in the language they habitually hear, so that their babbling sounds resemble their parents’ language sounds (Eimas, 1985; Miller & Eimas, 1995). One study showed that at six months, infants of English-speaking families could discern phonemic distinctions typical of both the Hindi language and a Native American language called Salish. By 12 months, however, their ability to discriminate phonemes from these foreign languages had declined substantially (Werker & Tees, 1984).

#### USING WORDS

Sometime between about one and one and a half years, babbling gives way to a stage in which children utter one word at a time. Children’s first words refer to concrete things or action, such as *mama*, *ball*, or *go*. So, too, do the nonlinguistic symbolic gestures children often develop even before they have words, such as a knob-turning motion that means “I want to go out” (Goodwyn & Acredolo, 1998).

At about 18 to 20 months, toddlers begin to form two-word phrases. From that point, the number of morphemes they combine in their utterances steadily increases. The use of grammatical niceties such as articles, prepositions, and auxiliary verbs expands as well.

Young children characteristically use telegraphic speech, utterances composed of only the most essential words for meaning (as in a telegram). Thus, *Dog out* might stand for “The dog is outside.” The words they tend to omit are words like *if*, *the*, and *under*. Although they tend not to use these words in speech, children as young as two actually *comprehend* some of these words, responding more accurately to sentences that
Sometime after the first year of life, children utter a single word at a time, often pointing to things. By age four, the vast majority of children’s sentences are fully grammatical (Stromswold, 1995). Table 13.3 illustrates the progression from telegraphic to grammatical speech in five children whose language was studied intensively.

Children’s vocabulary increases exponentially after they achieve their first 50 to 100 words. Their repertoire of words blossoms to several thousand by the time they are six years old (Bloom, 1993; MacWhinney, 1998).

### INFLUENCES ON LANGUAGE DEVELOPMENT

Although the stages of language development are virtually universal, children acquire language at widely different rates (Goldfield & Snow, 1989; Richards, 1990). These differences stem in part from genetic predispositions, but they also reflect environmental influences. Probably the most important environmental factor is the day-to-day input and feedback that children get from their caregivers.

One way caregivers facilitate infants’ language development is by speaking “Motherese.” Everyone is familiar with this dialect, as it is virtually irresistible when talking to a baby. Motherese is characterized by exaggerated intonation, a slow rate of speech, and high pitch (Fernald & Kuhl, 1987). Among other things, the exaggerated style of Motherese may help infants recognize where phrases and sentences begin and end (Gleitman et al., 1988; Morgan, 1986). With young babies, people often speak “multimodal Motherese,” which combines motion or touch with words (Gogate et al., 2000).

The content of the primary caregiver’s speech is also important in language acquisition. When parents repeat themselves (“Shall we go to the store? Let’s go to the store”) and expand on their children’s telegraphic utterances (e.g., responding to “Dog out” with “Is the dog out?”), their children tend to develop earlier in their ability to use verbs correctly. In contrast, merely acknowledging what the child has said without adding any new information (“That’s right”) is associated with delayed syntax development (Hoff-Ginsberg, 1990; Newport et al., 1977).

### Table 13.3

**PROGRESSION FROM TELEGRAPHIC SPEECH TO COMPLETE SENTENCES IN CHILDREN AGES 25 1/2 TO 35 1/2 MONTHS**

<table>
<thead>
<tr>
<th>Model Sentence</th>
<th>Eve, 25½</th>
<th>Adam, 28½</th>
<th>Helen, 30</th>
<th>Ian, 31½</th>
<th>June, 35½</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It goes in a big box.</td>
<td>Big box.</td>
<td>Big box.</td>
<td>In big box.</td>
<td>It goes in the box.</td>
<td>C</td>
</tr>
<tr>
<td>3. I will not do that again.</td>
<td>Do again.</td>
<td>I will that again.</td>
<td>I do that.</td>
<td>I again.</td>
<td>C</td>
</tr>
</tbody>
</table>

*Note:* — indicates no intelligible imitation was obtained; C indicates imitation was correct.

*Source: Brown & Fraser, 1963.*
Deafness and Early Language Acquisition  In addition, at least one study suggests that simple sign language can facilitate the development of language (Goodwyn et al., 2000). Participants were 40 babies who began signing their needs, starting at 11 months of age. By age 3, their verbal ability was 4 months ahead of nonsigning babies. An added bonus was that both baby and parent were less frustrated by the parent’s not knowing what was the cause of distress: hunger or a wet diaper. By communicating with signs, before language develops, the infants strengthened the connections that were critical for communication.

INTERIM SUMMARY

Language development progresses through a series of stages. Before infants can start to acquire vocabulary or syntax, they have to learn to segment the continuous streams of speech they hear into units. They then have to learn to classify words into syntactic categories. Babies’ first recognizable speech sounds occur as babbling in the first year. Sometime in the second year they begin to speak in one-word utterances. Young children use telegraphic speech, leaving out all but the essential words. By age four, most of the sentences children produce are grammatical. Although the stages of language development are virtually universal, children acquire language at widely different rates depending on environmental input.

MORAL DEVELOPMENT

INTERVIEWER: Should boys get more? Why should they get more?
FOUR-YEAR-OLD BOY: Because they always need more.
INTERVIEWER: Why do they need more?
BOY: Because that’s how I want it.

(Damon, 1977, p. 121)

Fortunately, children’s thinking about what is fair (and why) changes dramatically over the years, so that older children and adults do not operate at the same level of morality as the four-year-old above (or they do it with more subtlety and conviction borne of biased reasoning). Researchers who study the development of morality—the set of rules people use to balance the conflicting interests of themselves and others—have focused on the roles of cognition and emotion in children’s evolving sense of right and wrong (see Rest, 1983; Turiel, 1998).

The Role of Cognition

Several theories focus on cognition in moral development. These include cognitive–developmental, cognitive–social, and information-processing theories.

COGNITIVE–DEVELOPMENTAL THEORIES  The cognitive–developmental models of Jean Piaget and Lawrence Kohlberg focus on moral reasoning. These models propose that moral development proceeds through a series of stages that reflect cognitive development.

Piaget’s Theory  Piaget observed a simple type of event—games of marbles among children—and noted important differences in the way younger and older children thought about the rules (Piaget, 1932/1965). The youngest children, who were essentially pre-moral, arbitrarily altered the rules to enhance their enjoyment of the game and
Piaget called this first stage of moral judgment, in which children believe that morals are absolute, the **morality of constraint**. This form of moral reasoning is typical of children before the age of 9 or 10. Piaget described this morality as one “of duty pure and simple,” in which children conform to societal rules that are viewed as unchanging and unchangeable (1932/1965, p. 335). When judging the actions of others, children in this stage tend to center on the most salient characteristic of the act—its severity—and have difficulty simultaneously keeping in mind other aspects of the act, such as the intention behind it.

Consider what happens when a child is asked to decide who is more blameworthy, a boy who went to steal a cookie from the kitchen and broke a glass while reaching into the cookie jar or another boy who accidentally slipped and broke five glasses. In line with the tendency of preoperational children to focus on only one salient attribute at a time (Chapter 13), a five-year-old is likely to reason that the boy who broke more glasses has committed the worse offense, even though his “crime” was accidental.

Older children and adults focus more on their inferences about others’ intentions. They also tend to view rules as means to ends, as strategies for keeping social interactions safe, fair, and comfortable. In this **morality of cooperation**, moral rules can be changed if they are not appropriate to the occasion, as long as the people involved agree to do so. Older children playing marbles may thus change the rules by mutual consent without believing they are violating something sacred.

**Kohlberg’s Theory** Lawrence Kohlberg shared two of Piaget’s central convictions about moral development. The first is that changes in moral reasoning result from basic changes in cognitive structures—that is, changes in ways of thinking. For example, as children’s thinking becomes more abstract, so, too, does their moral reasoning. Second, Kohlberg conceptualized children as active constructors of their own moral reality, not passive recipients of social rules.

Kohlberg (1976; Kohlberg & Kramer, 1969) proposed a sequence of three levels of moral development, each comprised of two stages. He assessed moral development by presenting participants with hypothetical dilemmas and asking them how these dilemmas should be resolved and why. Each dilemma forces a person to choose between violating the law and helping another person in need. An example is the dilemma of Heinz and the druggist:

> In Europe a woman was near death from a special kind of cancer. There was one drug that the doctors thought might save her. It was a form of radium that a druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging ten times what the drug cost him to make. He paid $200 for the radium and charged $2,000 for a small dose of the drug. The sick woman’s husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about $1,000, which is half of what it cost. He told the druggist that his wife was dying and asked him to sell it cheaper or let him pay later. But the druggist said, “No, I discovered the drug, and I’m going to make money from it.” So Heinz got desperate and broke into the man’s store to steal the drug for his wife. Should the husband have done that?

(Kohlberg, 1963, p. 19).

Kohlberg’s example of Heinz and the druggist turned out years later to be a real-life moral dilemma that found its way into the courtroom, when the South African government tried to compel the Western pharmaceutical industry to sell, at a reduced price, medications for life-threatening illnesses such as AIDS to people who could not otherwise afford them.
The level of moral development a person shows in answering this question depends not on the particular answer (to steal or not to steal) but on the reasoning behind the response (Table 13.4). At the first level, preconventional morality, children follow moral rules either to avoid punishment (Stage 1) or to obtain reward (Stage 2). A preconventional child might conclude that Heinz should steal the drug “if he likes having his wife around.” At the second level, conventional morality, children (and adults whose moral reasoning remains conventional) define what is right and wrong by the standards they have learned from other people, particularly respected authorities such as their parents. People with conventional morality justify their choice of moral actions on the basis of their desire to gain the approval or avoid the disapproval of others (Stage 3) or on the need to maintain law and order (e.g., “If everyone stole whenever he wanted to, what would this world come to?”) (Stage 4).

The third level, postconventional morality, is a morality of abstract, self-defined principles that may or may not match the dominant morals of the times. A postconventional adult, like a preconventional child, might condone stealing the drug, but for a very different reason, such as “the value of a human life far exceeds any rights of ownership or property.” (Distinctions between two postconventional stages originally outlined by Kohlberg have not proven empirically useful and will thus not be described here.) Only about 5 percent of people actually reach the postconventional level (Colby & Kohlberg, 1984).

The basic logic of Kohlberg’s theory is that at the preconventional level, the person accepts moral standards only if doing so is personally advantageous; this is an ethic of hedonism or self-interest. The child is preconventional in the sense that he has not yet come to accept society’s conventions in their own right as rules that good people should follow. At the conventional level, the individual believes in the moral rules he has learned. The person with postconventional morality, in contrast, views the values of the time as conventions—rules established by social contract rather than by any absolute or divine power—and hence as both potentially fallible and changeable. Virtually all normal children progress to Stage 3 by the age of 13. Beyond Stages 3 and 4, only about 5 percent of people actually reach the postconventional level (Colby & Kohlberg, 1984).

**TABLE 13.4**  
**KOHLMERG’S LEVELS OF MORAL DEVELOPMENT**

<table>
<thead>
<tr>
<th>Level</th>
<th>Reasons to Steal the Drug</th>
<th>Reasons Not to Steal the Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preconventional: Morality</td>
<td>He should steal it if he likes her a lot; if he gets caught, he won’t get much of a jail term, so he’ll get to see her when he gets out.</td>
<td>He’ll get caught; he shouldn’t have to pay with jail time for his wife’s problem.</td>
</tr>
<tr>
<td>centers on avoiding punishment and obtaining reward.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional: Morality</td>
<td>If he doesn’t steal it, everyone will think he’s a terrible person; it’s his duty to care for his wife.</td>
<td>If he steals it, everyone will think he’s a criminal; he can’t just go stealing things whenever he wants to—it isn’t right.</td>
</tr>
<tr>
<td>centers on meeting moral standards learned from others, avoiding their disapproval, and maintaining law and order.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postconventional: Morality</td>
<td>If he has to run from the police, at least he’ll know he did the right thing; sometimes people have to break the law if the law is unjust.</td>
<td>If he steals it, he’ll lose all respect for himself; other people might say it was okay, but he’ll have to live with his conscience, knowing he’s stolen from the druggist.</td>
</tr>
<tr>
<td>centers on abstract, carefully considered principles.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
however, the development of moral reasoning is not related to age and is more a matter of individual differences and culture.

**COGNITIVE–SOCIAL THEORIES** Cognitive–social theories (Chapters 5 and 12) focus less on moral reasoning than on moral *behavior*. According to behaviorist and cognitive–social theories, moral behaviors, like other behaviors, are learned through processes such as conditioning and modeling (Bandura, 1977b; Mischel & Mischel, 1976). Cognitive–social researchers measure moral development in terms of *prosocial behavior* (Holmgren et al., 1998; Mischel & Mischel, 1976). Anyone who has ever watched (or been) a child knows how powerful the words *good boy!* or *good girl!* can be in shaping prosocial behavior.

From this point of view, morality develops as children come to discover through trial and error and deliberate instruction that certain actions will be reinforced or punished. Thus, children learn that stealing is wrong because they are punished for it, see someone else punished (vicarious conditioning), or are told they will be punished (direct tutelage). They acquire expectancies about the outcome of their behaviors under different circumstances (whether they will or will not be punished), and they develop conditioned emotional responses (such as anxiety or guilt) to behaviors that are regularly punished. They also generalize from one situation to the next, recognizing, for example, that talking in one library is no more acceptable than talking in another.

Clear cultural differences in how altruistically children behave toward others have been observed (Whiting & Edwards, 1988). Children raised in more individualistic cultures, such as the United States, behave more selfishly and with less concern for the needs and well-being of others. In more collectivist cultures, however, where the needs of the group are emphasized and children are required to contribute to the family income, empathy and concern for others is much more apparent.

**INFORMATION-PROCESSING THEORIES** An alternative cognitive view of moral development is an information-processing approach (Darley & Schultz, 1990; Grusec & Goodnow, 1994; Nelson & Crick, 1999). Information-processing theories do not postulate broad stages of moral development. Rather, they break moral thinking down into component processes and examine the way each of these processes changes during childhood.

According to one such view (Schultz & Schliefer, 1983), when adults make decisions about whether an act is immoral and whether it deserves punishment, as in jury
deliberations, they make a series of sequential judgments. As Figure 13.20 shows, the first question concerns cause: Did the person cause or contribute to the damage? If so, the next question is one of moral responsibility, which rests on intentions (did he mean to?) and judgment (could he have foreseen the results?).

If the individual is morally responsible, the next question is whether he is blameworthy—that is, did he do significant harm, and were his actions justified in some way? For example, jurors often make very different judgments about the blameworthiness of defendants who attacked someone who had molested their child. Finally, if the person caused unjustified harm, what should be his punishment? People in the West tend to determine appropriate punishment, whether in a jury trial or in the discipline of their children, according to three criteria: the extent of the damage, whether the perpetrator has already made appropriate restitution (e.g., by apologizing), and whether the perpetrator has suffered as a result of his actions.

From an information-processing view, then, understanding moral development means understanding changes in the way children answer these multiple questions. For example, when do children come to understand the difference between directly causing someone to suffer (e.g., taking something from the person) as opposed to taking an action that, combined with someone else’s action, produces suffering (e.g., forgetting to lock a door, which contributed to a theft)? According to this view, global stage theories cannot capture developmental changes in the multiple components of moral reasoning, which often occur at different times.

**INTERIM SUMMARY**

Cognitive theories stress the role of thought and learning in moral development. According to Piaget, children at first believe moral rules are immutable but ultimately come to understand that they are the product of convention. Young children also tend to center on consequences rather than intentions in making moral judgments. Kohlberg distinguished three levels of moral development: *preconventional morality* (people follow moral rules either to avoid punishment or to obtain rewards), *conventional* (individuals define what is right by the standards they have learned from other people, particularly respected authorities), and *postconventional* (people reason using abstract, self-defined moral principles that may not match conventional moral beliefs). Cognitive–social approaches measure moral development in terms of *prosocial behavior*. Information-processing approaches examine changes in the component processes involved in moral thinking.
Chapter 13
LIFE-SPAN DEVELOPMENT

The Role of Emotion

The theories discussed thus far emphasize the role of cognition—judgment and decision making—in moral development. Other approaches, however, focus on the emotional side (see Eisenberg, 2000), particularly on guilt and empathy as motivators of moral action.

Psychodynamic Theories  The psychodynamic view of moral development proposes that children start out relatively narcissistic (self-centered and interested in gratifying their own needs), as when a young child who wants an extra piece of cake simply grabs it. This orientation begins to change with the development of a conscience between ages two and five (Chapter 12) but can be seen in individuals with narcissistic and antisocial personality disorders, who remain self-centered and focused on their own needs as adults (Chapter 14).

From a psychodynamic perspective, moral development occurs through identification or internalization: Children take in the values of their parents, which are at first external, and gradually adopt them as their own. Empirically, parents and their children do tend to think similarly about moral questions (Speicher, 1994), and four-year-olds, unlike older children (whose conscience is more internalized), do not associate lying with self-disapproval or truth-telling with positive feelings about themselves (Bussey, 1999).

From a psychodynamic perspective, guilt is the primary emotion that motivates people to obey their conscience. A substantial body of research supports the role of guilt in moral development and behavior (Eisenberg, 2000). Guilt arises from discrepancies between what people feel they should do and what they contemplate or observe themselves doing. When toddlers are learning about morals, they may feel anxious or ashamed at being caught. Yet they do not experience genuine guilt until they actually internalize their parents’ values as their own—that is, until they not only know these values but also believe in them.

Young children’s moral beliefs are very concrete and specific and are often tied directly to a mental image of a parent. Toddlers may thus be observed telling themselves “No!” even as they follow a forbidden impulse, or repeating their parents’ admonitions as a way of stopping themselves from doing something they have been told is wrong (“Don’t make a mess!”). Research suggests that as children get older, they rely less on an internalized parent “sitting on their shoulder” and more on abstract moral demands integrated from their parents and the wider culture (see Williams & Bybee, 1994).

Empathy  Unpleasant emotions such as guilt, anxiety, and shame are not the only emotions involved in moral behavior. Some theorists emphasize the motivational role of empathy, or feeling for another person who is hurting (see Holmgren et al., 1998). Empathy has both a cognitive component (understanding what the person is experiencing) and an emotional component (experiencing a similar feeling). Research supports the view that empathy contributes to prosocial behavior, although empathizing too much emotionally can actually make people self-focused and hence less helpful (Strayer, 1993).

According to one theory (Hoffman, 1978, 1998), the ability to respond empathically changes considerably over the course of development. During the first year, infants experience global empathy; that is, they feel the same distress as the other person but cannot separate whose distress is whose. An 11-month-old who witnesses another child fall and cry may put her thumb in her mouth and bury her head in her mother’s lap as if she were hurt herself.

As children become better able to distinguish their own thoughts and feelings from those of others, they begin to experience genuine empathic distress, which motivates moral or prosocial behavior. As early as the second year of life, children can recognize when someone is hurting, feel bad for that person, and try to take action to
make the person feel better (Zahn-Waxler et al., 1992a). The response may nonetheless be egocentric: A 13-month-old may give a sad-looking adult his own favorite stuffed animal or bring his own mother over to comfort a crying playmate, reflecting the immature perspective-taking ability of the young child.

As children get older, they respond more accurately to cues about what other people are feeling. By adolescence, a more mature form of empathy emerges, as individuals begin to think about suffering that exists beyond the immediate moment and hence become concerned about broader issues such as poverty or moral responsibility.

If empathy leads to prosocial actions, what type of actions do individuals who lack empathy display? Do they try to hurt others or are they simply unaware of the needs and feelings of others? The answer appears to favor the former. For example, children with conduct disorder display violent and aggressive behavior directed toward other people and/or animals. They may also destroy property and lie. In short, they display behaviors that clearly run counter to the social norms of society. Although a number of explanations have been offered to explain the origins of conduct disorder, one recent hypothesis suggests that people with conduct disorder lack empathy. To test this idea, levels of empathy among individuals with conduct disorder and normal individuals were compared. The adolescents viewed videotaped vignettes portraying people in distress. They then completed a series of questionnaires assessing their reactions to the vignettes. Indeed, the individuals with conduct disorder showed significantly less empathy than did the normal controls to whom they were compared (Cohen & Strayer, 1996).

**MAKING SENSE OF MORAL DEVELOPMENT**

Cognitive and emotional approaches to moral development each present part of the picture, but none alone covers the entire landscape.

**Cognitive Approaches**

The strength of the cognitive–social approach is its emphasis on precisely what is missing from most other approaches, namely, moral or prosocial behavior. Thinking about morality is irrelevant if it does not affect action. Research does not, in fact, show particularly strong correlations between moral reasoning and prosocial behavior in older children and adults; correlations between empathy and prosocial behavior tend to be relatively small as well (see, e.g., Eisenberg et al., 1991; Miller et al., 1996).

The cognitive–social approach, however, tends to assume that certain behaviors are prosocial and generally does not address situations that require choices between imperfect moral options. For example, during the Vietnam War, people agonized over the question of what was moral or “prosocial.” Was it moral to answer the draft, even though many considered the war immoral or nonsensical? Evade the draft and let other people die instead? Protest the war? These kinds of questions are the essence of moral decision making.

Cognitive–developmental models have advantages and disadvantages as well. Kohlberg’s theory highlights a phenomenon that no other theory addresses—that moral development may go beyond the internalization of society’s rules. This has been the principle of many moral leaders, from Jesus to Gandhi to Martin Luther King.

At the same time, Kohlberg’s theory has drawn considerable criticism. People at the higher stages of moral reasoning do not necessarily behave any differently from people who are conventional in their moral reasoning. The philosopher Martin Heidegger, who reflected deeply and abstractly on a range of human experiences, found ways to rationalize cooperation with the Nazi regime, which many more “ordinary” Europeans did not (Chapter 18).
Relatedly, moral reasoning does not always translate into moral behavior. Indeed, as noted earlier, Kohlberg was less concerned with the ultimate decisions people make and more with the reasoning processes by which they arrive at them. Thus, according to the model, morality is clearly determined by the level of reasoning rather than the behavior itself.

Other critics argue that Kohlberg’s model overlooks the role of educational level in influencing moral reasoning. People with higher educational levels display higher levels of moral reasoning than people with less education, but this characteristic does not necessarily mean that they are more moral. Rather, they are more articulate in their reasoning abilities (Eckensberger, 1994). Furthermore, people do not always display the same level of moral reasoning in different situations (Fishkin et al., 1973). In other words, in the face of one moral dilemma, a person’s reasoning may be at the conventional level; when confronted with another moral dilemma, the person may reason at the postconventional level of morality.

Yet other critics, notably Carol Gilligan (1982, 1996), contend that Kohlberg’s theory is gender biased. In Kohlberg’s early studies, women rarely transcended Stage 3 morality, which equates goodness with pleasing or helping others. Men more often reached Stage 4, which focuses on maintaining social order. Does this mean women are morally inferior? Gilligan thinks not—and a glance around the globe at most of the perpetrators of violence supports her view. According to Gilligan, women and men follow divergent developmental paths, with one no less mature than the other. Women’s moral concerns, she argues, more likely center on care and responsibility for specific individuals, whereas men tend to favor the justice orientation emphasized by Kohlberg. A meta-analysis (a review that summarizes the data across dozens or hundreds of studies quantitatively, by averaging their findings) (Chapter 15) found that women and men do tend toward care and justice orientations, respectively, but that the differences are relatively small (Jaffee & Hyde, 2000).

Both Gilligan’s and Kohlberg’s theories may require some modification when applied to cultures in which concepts of duty and caring are different and less gender based than in the West—that is, where both men and women show a greater orientation toward relationships and community than in the West (Miller, 1994). For example, when six-year-olds in the United States and China tell stories in response to pictures or describe emotional memories, Chinese children show a greater concern with social engagement and obedience to authority, whereas Western children’s stories show more themes related to autonomy (Wang & Leichtman, 2000).

The information-processing approach to moral development fills in and clarifies many of the broad strokes painted by stage theories. Nevertheless, it leaves many questions unanswered, particularly about the way motivation influences moral reasoning and behavior. Why do children accept values in the first place, when doing so produces guilt? Why are they willing to control their impulses at all? How do their judgments about their own guilt or responsibility differ from their judgments about others’? Asking people to make judgments about what other people have done is very different from understanding their own struggles to remain faithful to their lovers, to report their income honestly to the Internal Revenue Service, or to resist saying something unkind behind a friend’s back.

**Emotional Approaches**

Perspectives that focus on the emotional side of morality fare better in answering these questions. Because morality so often requires self-sacrifice and self-restraint, an emotional counterweight such as anxiety or guilt seems essential to balance out the net losses in gratification. Empathy adds a further source of motivation for moral behavior: Helping other people leads to a sense of satisfaction.
and reduces the empathic distress that comes from observing someone else’s suffering (Chapter 17).

Emotional approaches, however, also have their pitfalls. Why children internalize moral values is unclear. Freud linked identification with the father to the fear of castration in boys (Chapter 12). This seems a rather unlikely impetus for the development of morality and cannot account for moral development in females. Moreover, research indicates that mothers are more responsible for moral training in most Western families (Hoffman & Saltzstein, 1967) and that internalization of values is associated with the extent to which mothers engage in an emotionally responsive, reciprocal relationship with their children (Kochanska et al., 2000). Identification with the father is probably not as central as Freud supposed, although research on moral reasoning does show particularly strong links between fathers’ level of moral reasoning and the moral reasoning of both their sons and daughters (Speicher, 1994).

Empathy theories do not provide insight into specifically moral questions, which arise when people’s needs are in conflict. Prosocial responses are common by 18 to 20 months when infants witness other people’s distress but not when they cause the distress themselves (Zahn-Waxler et al., 1992b). Infants as young as 12 to 18 months often share toys with other children or with their parents, but by age 2 they are less likely to share if it means giving up their toys (Hay et al., 1991). Perhaps not incidentally, by this age most children have mastered the word mine. Prosocial responses aimed at making up for a transgression emerge around two years of age, precisely when theorists have argued for the beginnings of moral conscience fueled by guilt.

Research suggests that the roots of conscience may lie in both the fear emphasized by Freud and the empathy emphasized by recent researchers (Kochanska, 1997). For children who have a fearful temperament, gentle discipline by mothers predicts the emergence of conscience at age four. For children who have a fearless temperament and are less responsive to discipline, positive mother–child interactions appear to predict conscience development. These data make sense in light of research suggesting that some people are more driven by fear, whereas others are more pulled by rewards (Chapter 10). What is interesting is the possibility that these basic temperamental variables may affect the way children internalize moral values as well.

**An Integrated View**

An integrated account of moral development would spell out the interactions of cognition, affect, and motivation that are involved when children and adults wrestle with moral questions. Infants and toddlers have many selfish impulses, but they also have prosocial impulses based on an innate capacity for empathy. When self-centered and other-centered motives clash, young children tend to opt for the most gratifying course of action.

This behavior probably changes over time for a number of reasons. Children mature in their capacity to love and care about other people and to understand the perspective of others. They also become more able to regulate their impulses as neural circuits in the frontal lobes mature and as expanding cognitive abilities allow them to transform situations in their minds.

Furthermore, through social learning, children come to associate actions such as sharing with positive reinforcement and hitting and lying with punishment. By identifying with people they fear and admire, children’s fear of punishment gradually becomes transformed into fear of their own internal monitor of right and wrong—and hence into guilt. Eventually, they reflect more abstractly about moral questions and try to integrate the moral feelings and beliefs they have accrued over the course of their development.
Emotion, like cognition, is central to moral development. Psychodynamic theories emphasize the role of guilt in moral development and argue that conscience arises through identification with parents. Other theories emphasize empathy, or feeling for another person who is hurting. Moral development probably reflects an interaction of cognitive and affective changes that allow children to understand and feel for other people as well as to inhibit their own wishes and impulses.

The Nature of Development

This chapter began with three questions about development: What are the relative contributions of nature and nurture? To what extent is development characterized by critical or sensitive periods? And to what extent is development stagelike or continuous? All three questions address the way maturational, cultural, and environmental forces interact over time to create an organism capable of responding adaptively to its social and physical environment.

Maturational factors provide both the possibilities and limits of physical and cognitive development. Young children cannot think in the abstract ways that adolescents can about justice, God, or conservation of mass. Maturation of the frontal lobes permits a new kind of thinking that may well be described as a new “stage.” Old people cannot think as quickly as their younger counterparts, and in their ninth or tenth decades, they may become much less efficient in their thinking. In both young and old, the nervous system determines the range within which people can function. Except in cases of mental retardation or severe neural degeneration, however, that range is extraordinarily large. Experience, genetics, and physical health all play a substantial part in determining where in that range people find themselves.

Even this conclusion—that neural hardware constrains the kind of “software” that can be run on it—does not tell the whole story because, as we have seen, the hardware changes in response to the environment. Although the nervous system establishes certain constraints on and possibilities for cognitive functioning, the nervous system itself partially a product of its environment. Experience can enrich the developing brain, increasing the connections among neurons that underlie the capacity for complex thought, just as impoverished experience, particularly during sensitive periods of development, can constrain psychological functioning by limiting the processing power of the brain. The human brain evolved to “assume” certain basic experiences, such as caregivers who speak. Without these experiences, the brain will compensate as best it can, but it is unlikely to do so with the efficiency of a nervous system that got the right environmental input at the right time.

Understanding development thus means living with ambiguities. Perhaps that is a developmental achievement in itself.

ISSUES IN DEVELOPMENTAL PSYCHOLOGY

1. Developmental psychology studies the way humans develop and change over time. A life-span developmental perspective examines both constancy and change as well as gains and losses in functioning that occur at different points over the human life cycle.

2. Three basic issues confront developmental psychologists. The first concerns the relative roles of nature (particularly genetically programmed maturation) and nurture. The second is the relative importance of early experience and whether human development is characterized by critical or sensitive periods. The third issue is the extent to which development occurs in stages—relatively discrete steps through which everyone progresses in the same sequence—or whether it is continuous or gradual.

SOCIAL DEVELOPMENT AND ATTACHMENT

3. Social development refers to predictable changes in interpersonall thought, feeling, and behavior over the life span.
4. Attachment refers to the enduring emotional ties children form with their primary caregivers. Separation anxiety—distress at separation from attachment figures—occurs around the same time in all human cultures and peaks in the second year of life. Harlow’s experiments with monkeys showed that security, not food, is the basis for attachment. Integrating psychodynamic and evolutionary theory, Bowlby proposed that attachment is a mechanism to keep immature animals close to their parents.

5. Using a procedure called the Strange Situation, researchers have identified four styles of attachment: secure, avoidant, ambivalent, and disorganized. Early attachment patterns have a powerful impact on later social functioning and form the basis of adult attachment styles.

SOCIAL DEVELOPMENT ACROSS THE LIFE SPAN

6. The most widely known theory of life-span development is Erik Erikson’s theory of psychosocial stages: basic trust versus mistrust, autonomy versus shame and doubt, initiative versus guilt, and industry versus inferiority in childhood; identity versus identity confusion in adolescence; and intimacy versus isolation, generativity versus stagnation, and integrity versus despair during adulthood.

7. Psychologists disagree on the extent to which people experience “crises” in adolescence and midlife, but in general, there does not appear to be any single path to “successful aging.” Nor do the data support a stereotypically bleak view of aging. People who have high life satisfaction in later life tend to have had fulfilled lives earlier and to be characterized by physical and cognitive health and active engagement with productive activities and other people.

PHYSICAL DEVELOPMENT AND ITS PSYCHOLOGICAL CONSEQUENCES

8. Prenatal (before birth) development is divided into three stages: the germinal, embryonic, and fetal periods. Prenatal development can be disrupted by harmful environmental agents known as teratogens, such as alcohol.

9. Neural development, both prenatally and throughout childhood, proceeds through myelination, trimming back of neurons, and increasing dendritic connections.

10. Physical development and psychological development are intertwined. At birth, an infant possesses many adaptive reflexes. Motor development follows a universal maturational sequence, although cross-cultural research indicates that the environment can affect the pace of development. By the end of adolescence, physical growth is virtually complete. With aging comes a gradual decline in physical and sensory abilities with which people must cope psychologically.

COGNITIVE DEVELOPMENT IN INFANCY, CHILDHOOD, AND ADOLESCENCE

11. For many years psychologists underestimated the substantial abilities of infants. Researchers now know, for example, that babies are capable of intermodal processing—the ability to associate sensations about an object from different senses and to match their own actions to behaviors they observe visually—in the earliest days of life.

12. Piaget proposed that children develop knowledge by inventing, or constructing, a reality out of their own experience. According to Piaget, people cognitively adapt to their environment through two interrelated processes. Assimilation means interpreting actions or events in terms of one’s present schemas, that is, fitting reality into one’s previous ways of thinking. Accommodation involves modifying schemas to fit reality.

13. Piaget proposed a stage theory of cognitive development. During the sensorimotor stage, thought primarily takes the form of perception and action. Gradually, children acquire object permanence, recognizing that objects exist in time and space independent of their actions on or observation of them. Sensorimotor children are extremely egocentric, or thoroughly embedded in their own point of view. The preoperational stage is characterized by the emergence of symbolic thought. Operations are mental actions the individual can use to manipulate, transform, and return an object of knowledge to its original state. Piaget called the third stage the concrete operational stage because at this point children can operate on, or mentally manipulate, internal representations of concrete objects in ways that are reversible. The concrete operational child understands conservation—the idea that basic properties of an object or situation remain stable even though superficial properties may change. The formal operational stage is characterized by the ability to reason about formal propositions rather than only concrete events.

14. In its broadest outlines, such as the movement from concrete, egocentric thought to abstract thought, Piaget’s theory appears to be accurate. Psychologists have, however, criticized Piaget for underestimating the capacities of younger children, assuming too much consistency across domains, and downplaying the influence of culture.

15. The information-processing approach to cognitive development focuses on the development of different aspects of cognition. Several variables that develop over time are children’s knowledge base, their automatization of processing, their ability to use cognitive strategies, and their metacognitive abilities (understanding their own thinking processes).

16. Integrative, or neo-Piagetian, theories attempt to wed stage conceptions with research on information processing and domain-specific knowledge.

COGNITIVE DEVELOPMENT AND CHANGE IN ADULTHOOD

17. As with muscle strength, the rule of thumb with intellectual ability is use it or lose it: Mental capacities atrophy with disuse.

18. Although many cognitive functions decline in later life, substantial intellectual decline occurs in only a minority of people. The most common declines with age are psychomotor slowing, difficulty with explicit memory retrieval, and decreased speed and efficiency of problem solving. Whereas fluid intelligence (intellectual capacities used in processing many kinds of information) begins to decline gradually in midlife, crystallized intelligence (the person’s store of knowledge) continues to expand over the life span.

19. Senile dementia is a disorder marked by global disturbance of higher mental functions. Well over half the cases of senile dementia result from Alzheimer’s disease, a progressive and incurable illness that destroys neurons in the brain, severely impairing memory, reasoning, perception, language, and behavior.
Language Development

20. For years researchers have debated the existence of a critical period for language learning. The first three years of life seem to be the optimal time to attain native fluency. After age 12, even near-native fluency is difficult to achieve.

21. Cross-culturally, children go through similar stages of language development. They begin by babbling in the first year and produce one-word utterances toward the beginning of the second year. Young children’s speech is telegraphic speech, omitting all but the essential words. By age four, children’s sentences largely conform to the grammar of their language. The stages of language development are virtually universal; however, the precise timing and course of individual language development depend on both nature and nurture.

Moral Development

22. Moral development refers to the acquisition of values and rules for balancing the potentially conflicting interests of the self and others. Behaviorist and cognitive-social theories assert that prosocial behavior (behavior that benefits others), like other behaviors, is learned through processes such as operant conditioning and modeling. Cognitive-developmental models focus less on moral behaviors than on moral reasoning. Kohlberg’s stage theory distinguishes three levels of moral reasoning: preconventional (following moral rules to avoid punishment or obtain reward), conventional (defining right and wrong according to learned cultural standards), and postconventional (applying abstract, self-defined principles). Information-processing approaches break moral development down into component processes and examine the way each changes during childhood.

23. Psychodynamic and other theories suggest that children internalize their parents’ values and that guilt motivates people to obey their conscience. Other research emphasizes the role of empathy (feeling for someone who is hurting) in motivating prosocial behavior. Recent research suggests that the paths to internalization of conscience in children depend on an interaction of temperament and parenting styles. Moral development reflects an interaction of cognitive and emotional development.