Chapter 1

Historical and Contemporary Perspectives on Infant Development

CHAPTER OUTLINE AND OVERVIEW

The Importance of Infancy
What can be gained from the study of infants? What can be learned by reading this book?

A Brief History of Babies
How have responses to and ideas about infants changed historically? What are the historical origins of our current ideas about infants?

Infants Enter the World of Science
What is the history of scientific approaches to infants? What is the nature vs. nurture controversy?

Systems Perspectives on Infant Development
How are infants connected to the world of people and objects around them? What is the role of the parent-infant relationship in early development?

Research Methods in Developmental Science
What are the main scientific approaches to the study of human development? Is science a viable source of information about infants? What is the role of research in changing public policy?
Have you ever wondered about the details of your own infancy? Did you cry a lot? When did you learn to crawl or to walk? What was the first word you ever said? If you know the answer to any of these questions, it is likely you have asked or were told about it by someone who was an adult when you were a baby. Infancy is mysterious to us. We appear to have no memory of our own infancy; we must rely on the memory of others who were there. And babies themselves cannot tell us what they feel, at least not in words. The mystery of the infant’s mind has intrigued parents, philosophers, and theologians for thousands of years.

The twentieth and twenty-first centuries, however, have given us powerful new methods for understanding infancy. Scientific research has helped us understand the limits and possibilities of the infant’s ability to sense, move, and feel. We now have solid evidence that some types of environments and forms of care are more conducive than others to the development of healthy and happy babies. Advanced technologies allow us to monitor the brain’s development and to observe the stages of prenatal growth. The fields of Infant-Parent Mental Health and Early Childhood Education have developed techniques to improve the lives of many infants and their parents. These approaches have generated strong public interest in babies. Why do we find babies so interesting?

THE IMPORTANCE OF INFANCY

If you read the newspapers or watch television news programs, you will recognize some of these headlines and advertisement leads:

- Sixty-year-old women can give birth to their own babies.
- Mothers may transmit AIDS to their babies through breast milk.
- Day care may have harmful effects on the mother-infant relationship.
- “Baby Einstein” and other video media can make babies more intelligent.

If these statements are correct, they have a profound impact on our lives and on society. A sixty-year-old mother may die before the child is an adolescent or become too frail to care for the child. If day care is harmful to infants, we will have to reassess the value of parental work. But are these statements correct? In fact, there is some truth to all of them—but only under certain special conditions. A sixty-year-old can give birth by having a fertilized ovum implanted into her uterus but only if she is in good health and can tolerate taking supplemental hormones. Day care can be harmful in settings where teachers are poorly trained and facilities are inadequate, or when infants are too young to tolerate the demands of a complex social environment; otherwise, it can have some beneficial effects, such as giving children advanced social and cognitive skills peers.

AIDS can be transmitted through breast milk, but this can be prevented by using formula. New research has shown that overuse of language videos and computer games in children under two years of age can actually have a harmful effect! For every hour per day that babies spend watching videos such as “Baby Einstein” and “Brainy Baby,” they understand about 6 to 8 words fewer at age 2 years than babies who did not watch these videos (Zimmerman, Christakis, & Meltzoff, 2007). In general, video media is not very helpful and may even be harmful for babies under the age of two years.

By the end of this book, you should have a much better idea about how to evaluate claims such as the ones listed above. You will read about these and other issues and learn ways to understand research so you can find the answers for yourself by searching the internet and other sources for current research.

The study of infancy is important for many reasons. A few will be listed here, and you may be able to add some of your own.

Parent, Caregiver, and Clinician Education

Infants require adult guidance, love, and support. For a young couple ready to provide this care, their
first baby can be both rewarding and anxiety provoking. What is the best way to feed babies? How much sleep do they need? Can babies be spoiled with too much holding and affection? What does it mean if a baby cries for long periods? Generally speaking, the more parents know about infants and children, the less anxious they will be, and the better the outcomes will be for the child.

**Infancy Is a Unique Period in the Life Course**

Infancy is a special time in one’s life. This is not only because it is the earliest stage of life, but because all of life’s stages are unique. Each has its pleasures and problems. For the first few years of life, infants are almost totally dependent on their caregivers for their needs. Most of what happens to them is not within their understanding or control. They cry easily and feel their pain deeply. Infants can spend hours immersed in the pleasure of play and exploration. They are typically not plagued by self-doubt, worries, bills to pay, and the other things that can distract adults from living in the moment. Infants have an ability to take life as it comes, be fully “present” to their experiences, and express their joy or frustration in everyday actions and sensations (Schafer, 2004). For reasons we do not fully understand, nature has required all humans to pass through this period and to experience its total reliance on others, its helpless emotional lows and its carefree emotional highs.

**The Experience of the Body and Its Movements and Senses**

The consciousness of young infants is almost entirely occupied with bodily sensations, emotions, and sensory experiences. Once children acquire the ability to talk, think, and conceptualize at about 3 years of age, they acquire an intellectual power that distinguishes humans from other animals. On the other hand, the preverbal experience of being a baby in a baby’s body is also uniquely human. After infancy, many physical and mental disorders of children and adults can be traced to their having lost touch with their own body, emotions, and senses. Cultural values can often run contrary to the needs of the body, as when work or family stresses cause muscular tension (headaches or backaches, for example) or when cultural ideals of physical beauty lead a person to eat less than her or his own body uniquely requires. We now know that stressful environments—including parental worry and stress, poverty, maltreatment, and a prolonged sense of insecurity—can also distance infants from the direct experience of their bodies, which has long-term consequences for physical and mental health.

**Reexperiencing Infant-like States Can Be Healing and Rejuvenating**

Some psychotherapeutic techniques recreate within the patient-therapist relationship the innocence and trust found in healthy parent-infant relationships. Some touch therapies use gentle, noninvasive contact to create the type of relaxation and self-awareness that babies experience in their mother’s arms. Movement, body awareness, and dance educators often use infant-like movements to help children and adults develop an awareness of their body, reduce stress, and restore a sense of calm. This book includes “Experiential Exercises” based on these practices that will allow you to get a first person perspective on infancy (see next page). Practitioners from all these therapeutic and educational methods assume that there will be a healing effect of recreating—in a safe and protected setting—some of the conditions of being a baby. Reexperiencing some of the traumas of one’s own infancy, especially within the supportive contexts of these treatment approaches, can also be therapeutic. Such clinical methods will be discussed in the final chapter.

**Improving Health by Early Prevention**

Many of the diseases of childhood and adulthood have their origins in the prenatal period and infancy. During prenatal development, for example, the brain is highly vulnerable to disease, malnutrition, parental stress, and toxic substances to which the mother may be exposed. Many disorders can be
Many of the chapters in this book will have a section like this one, called **Experiential Exercises** which are a way for adults to re-experience infancy. Why do we need special exercises to “remember” our infancy? As mentioned in the opening paragraph, most of us have no autobiographical memory of our infancy. **Autobiographical** memories are those in which we can tell a story about what happened to us: how, what, where, and when. For most people, our earliest autobiographical memories begin when we are three years or older. This corresponds to the age at which the hippocampus (see Chapter 4), the part of our brain that is responsible for “how, what, where and when” memories does not become sufficiently developed to retain experiences in autobiographical form until at least 3 or 4 years of age.

Our experiences of infancy before the age of 3 years are remembered via what are called **participatory** memories, meaning that they are not about a past experience; rather, they are felt as a being with or a reliving of past experiences. Participatory memories can be formed at any time in life but are the main type of memory during infancy. They are composed of emotions, desires, and a sense of familiarity, without any specific time or place (Bråten, 1998, 2003; Fogel, 2004; Heshusuis, 1994; Stern, 1985). A participatory memory, for example, is the re-creation of a feeling of what it was like to be cuddled and comforted, rather than a remembrance of a specific situation of being cuddled. An adult’s participatory memory of feeling being cuddled as an infant may occur when the adult’s body is curled into a fetal posture, that is, by recreating the body and sensory sensations of an earlier time.

So, re-evoking infancy experience in these Experiential Exercises requires people to behave a bit like a baby or young child. It is important to do these exercises in a quiet room where you can feel what is happening in your body. Many students feel self-conscious when first doing this. It is, after all, unusual for adults to act like babies! Almost all adults, however, change their minds after actually doing the exercises for a while.

You can also enhance your experiential learning by finding opportunities to interact with infants. You might want to keep a journal of your reactions to each of these exercises and encounters with babies. It is best to write in your journal immediately following the exercise. Note your physical and emotional reactions.

When adults do these exercises, they say things like, “Being an infant is not as easy as I used to think it was,” or “Now I can understand why babies cry when they can’t roll over or sit up.” As a result of this, students often change their approach from being an observer of infants to being someone who can really share the infant’s feelings and experiences. This is a shift from a conceptual stance of learning about infants to a participatory stance of being with infants.

### Experiential Exercise

**Finger Painting**

(by Alan Fogel)

Finger painting is a wonderful and enjoyable way to begin to re-connect with participatory memories of your early childhood experience. It can be done individually or in groups. Just get the materials at any crafts or toy store, clear a space and time, and start painting. Notice the concrete feelings in yourself, such as emotions or sensations of color, temperature, texture. Notice if any memories come back to you. Are they pleasant or unpleasant? What does this experience tell you about yourself today? About yourself as a child?

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such programs for infants and parents receive government funding, politics become involved. Should all families with infants be guaranteed the right to housing, proper nutrition, medical care, and parent education? Currently, these are not guaranteed rights in the United States. They are guaranteed, however, in northern European countries such as Sweden and the Netherlands. Because the quality of day care influences infant development and the parent-child relationship, should there be national standards for day care providers? The United States is one of the few industrialized countries without such standards.

Origins of Individual Differences

Each human being is different. A lot of these differences come from experiences as a child and adult, such as one’s school experience, the effects of family and friends, the world of work, and unplanned opportunities and losses that occur during one’s life. But do any of the differences between people have their origins in early infancy? If so, which parts of one’s uniqueness are most likely connected to what happened as a baby? This is an extremely difficult question to answer because early experiences are rarely preserved in pure form, but rather combine in complex ways with later experiences. Nonetheless, many differences between people during the prenatal and infancy periods can have a lasting impact. In this book, you will discover what is known and what is yet to be discovered about the infantile origins of differences between people.

The importance of studying about infants, as illustrated by each of the topics above, may seem self-evident. The importance of infancy, however, is not always appreciated. An infant born into today’s world may experience poverty or wealth, love or abuse, health or disease. More must be done to educate parents and political leaders about the need for protecting infants, who cannot protect themselves.

Was it always this way in the life of infants—this mixture of good and bad? In general, yes. In all periods of the past for which there are archaeological or historical sources, we can find evidence of both kindness to and neglect of infants. Nevertheless, there is more money, time, and care devoted to infants today than at any other known period of history. Most large supermarkets in Europe, Asia, and North America devote an entire aisle to baby products: diapers, oils, powders, foods, furniture, toys, designer clothing, strollers, packs, books, and magazines. In wealthy countries, it is not unusual for infants to be dressed in expensive high-tech running shoes and athletic clothes before they can even walk! Some babies even have access to computer tablets filled with games and videos.

To give you some insight into these and other contemporary perspectives on infancy, the next section reviews some of the historical trends in the role of the infant in society. Because of limitations of space, the focus will be primarily on the history of Western cultures (European and American). Readers are encouraged to integrate what is known about their non-Western cultural history into this story. I have written a longer history of infancy, including pre-history and other cultures, which can also be consulted (Fogel, 2010).

A BRIEF HISTORY OF BABIES

Early Civilizations

As far back as there are recorded documents, history reveals a mixture of beliefs and practices about infants: love and cruelty, freedom and restriction, tolerance and intolerance (French, 2002). The history and literature of the ancient Greeks and Romans (200 B.C.—A.D. 300) indicates that they advocated a rather harsh upbringing for infants. Shows of affection were avoided, and infants were wrapped tightly in swaddling bands to mold the child’s body into one worthy of a citizen. Cold water was used to bathe the child to make it as round as possible and pull and stretch other body parts to shape them.
Similar beliefs in shaping the physical body of the adult by binding and manipulating the infant can be seen in such non-Western ancient practices as the foot binding of girls in China (which made their feet small but deformed). Head binding among both the ancient Maya of Mexico and among eighteenth-century Europeans was used to give the head an oblong shape (Johnson, 1992).

While it may seem surprising to people today, Roman parents felt this treatment to be an expression of their love. They wanted their children to grow up strong, their bodies nicely proportioned and held in a proper posture. Roman literature, in fact, testifies to a strong devotion between parents and children, especially among the wealthy classes, and attests to the importance of hugging, kissing, and affection after infancy, as the child grew older and began to form his or her own character (Dupont, 1989; Gies & Gies, 1987). Historians of ancient Egypt (2,000–100 B.C.) and Greece (800–200 B.C.) have found evidence of toys and games for children and written documents describing the need to love and protect infants (Greenleaf, 1978).

Fathers’ and mothers’ devotion to young children, especially among the wealthy, is well documented in Roman literature. One of the most detailed descriptions of parental love at this time comes from Plutarch in the second century B.C. Plutarch shared child care with his wife for all their children. They had one daughter, Timoxena, who died when she was 2 years-old (French, 2001). Because Plutarch was away at the time of his daughter’s death, he wrote these words in a letter to his wife.

There is a special savor in our affection for children of that age; the freedom from any crossness or complaint. She herself too had great natural goodness and gentleness of temper: her response to affection and her generosity both gave pleasure and enabled us to perceive the human kindness in her nature… our daughter was the sweetest thing to fondle, to watch, and to hear; and we ought to let the thought of her also dwell in our minds and lives, for there is much more joy in it than sorrow (Pomeroy, 1999, pp. 59–60).

The recognition of the role of the body in the development of the person is an important aspect of Westerners’ Greco-Roman heritage. Both Greeks and Romans believed that exercises for the body led to the development of a strong moral character. Upper-class boys learned athletics and gymnastics, while girls learned music and dance.

It is, however, difficult for people today to reconcile the affection with the cruelty found in ancient cultures. Many early civilizations, such as ancient Rome, practiced infanticide, the deliberate killing of unwanted infants. This was partly because Roman laws considered the child as the property of parents, and also made parents responsible for raising healthy and productive heirs (Borstelmann, 1983). It was the duty of the head of the family to decide if a newborn should live or die. This practice eliminated infants who were malformed, but many healthy babies too were left to die because the family was poor or the child unwanted (Dupont, 1989). Infanticide continued in Europe throughout the Middle Ages, and some societies today still practice it (see the section on family planning in Chapter 2).

There is no evidence of infanticide, however, among the ancient Isrealites, whose practices of childrearing are known primarily through the Biblical Old Testament. The biblical period dates from 2000 B.C. to 500 B.C. There are many stories in the Old Testament that reflect the importance of infants and children. Hannah, for example, prayed and made vows to God so that she might conceive and give birth to Samuel. Unlike Rome and Greece, Israelite children were not considered the property of parents, but rather as a gift from God who needed to be protected, loved, and educated.

The Bible also gives detailed—and medically informed—prescriptions regarding women’s behavior during menstruation, pregnancy, and childbirth. Direct descriptions of infancy are rare in the Bible, but many stories imply that infants should receive loving care, appropriate blessings
for a good and holy life, and that male infants should be circumcised. Parental devotion was evident in stories of the suffering of parents who were asked to sacrifice their infants. When two mothers claimed to be the parent of the same child, Solomon’s threat to kill the child revealed the true mother, whose pain was sincere. The Hebrew slave revolt in Egypt, which led to the Exodus and return to the promised land, was precipitated by an Egyptian law to kill Hebrew first-born sons, legalized infanticide meant to limit the Hebrew population. To save Moses, his heartbroken family sent him floating down the Nile, to be adopted with love by Egyptian royal women and actually nursed by his own mother. This story suggests a comparison between the concept of human freedom from slavery in general with the act of saving a single infant from death (Frymer-Kensky, 1995).

The Bible asks parents not only to love but to educate their children. Abraham was told to “instruct” his children (Genesis 18:19). Regarding the important facets of Hebrew culture, parents were asked to “teach them intently to your children... when you sit in your home” (Deuteronomy 6:7). Childrearing involved discipline accompanied by respect for the child, as the following passages illustrate: “Train a child in his own way, and even when he is old, he will not depart from it” (Proverbs 22:6); “Foolishness is bound in the heart of the child but the rod of correction shall drive it from him” (Proverbs 22:15); and “Chasten your son for there is hope, but set not your heart on his destruction” (Proverbs 19:18). While some have interpreted these statements as grounds for justifying corporal punishment, the Old Testament does not specify the type of punishment, but rather makes clear the need for discipline in the context of love. Other Bible stories reveal the undesirable outcomes when discipline is too harsh or nonexistent or when parents fail to educate their children about the stories, rituals, ideals, and history of the culture.

The Middle Ages and the Renaissance

Following the Greeks and Romans, a mix of concern for children coexisted with what people today would consider harshness and deprivation. The early Middle Ages in Europe (A.D. 300–1100) began with the fall of the Roman empire and the gradual spread of Christianity throughout the continent. The largely rural population began to move to cities and towns. At the same time, the political boundaries changed frequently as empires dissolved and local powers asserted themselves. These social changes contributed to an increasingly educated urban population, on the one hand, and to the growth of a class of urban poor who suffered from disease, malnutrition, pollution, and ignorance, on the other. The poor people in the cities lived in much more unhealthy conditions than did the poor in the countryside.

Because of inadequate sanitation and other sources of urban pollution (pollution is not a new problem), infants of the urban poor were more likely to die or to suffer birth defects than those from rural areas. Because cities drew people away from family roots and because disease claimed the lives not only of infants but of mothers in childbirth, many orphaned children walked the streets as beggars, thieves, and prostitutes. As you can see, childhood among the urban poor then was not too much different from what it is today. This is especially true in the large and growing slums found in many of the “megacities” of the twenty-first century (cities with more than 10 million people) such as Lagos (Nigeria), Bombay (India), and Mexico City. This does not mean that poverty inevitably causes problems for parents and children, but it does increase the risk that problems will occur.

The Christian church began to have an impact on the beliefs and practices of European child rearing after around A.D. 400 Christians, following the ancient Hebrew beliefs and practices, advocated parental love and worked to protect children from infanticide, abortion, and maltreatment. Gravestones for infants began to appear at this time, as well as special penances if a parent had done some wrong to a child (Gies & Gies, 1987).

During the late Middle Ages (A.D. 1100–1300), a few written medical texts giving advice on childbirth and early infant care appeared. Trotola, a
female physician in twelfth-century Italy, advised rubbing the newborn’s palate with honey, protecting the infant from bright lights and loud noises, and stimulating the infant’s senses with cloths of various colors and textures and with “songs and gentle voices” (Gies & Gies, 1987). In England during the same period, birth often occurred in a warm chamber with plenty of bathwater, accompanied by the scent of olives, herbs, and roses. It was attended by a female midwife and female friends wishing mother and baby good fortune and joy (Hanawalt, 1993).

Infanticide, however, was still practiced. Although parents had to suffer penances, it was not a crime equivalent to homicide, as it is in most countries today. By the thirteenth century, some cities in Europe had created church-run hospices to adopt orphaned children as an alternative to infanticide. This was partly because of the belief that all life is sacred, and also, according to medieval church doctrine, a child who died unbaptized was barred from heaven for all eternity (Le Goff, 1987). In some countries today, because of urban stress and poverty, infants are left in woods, rivers, and trash bins. Some cities in the United States have begun programs that allow mothers to drop off unwanted infants at local hospitals without fear of prosecution. Social workers then help to find foster homes for these children. Times may have changed, but the problem of unwanted children still remains.

Not until the European Renaissance (1450–1650) do we begin to see the emergence of written philosophies of child rearing in Western cultures. Writers, mostly from the church, condemned the ancient practice of giving children to wet nurses

Painting from the late Middle Ages depicting Christ as an infant, but with adult-like features and gestures. Source: Art Resource
from the poorer classes (a wet nurse was a woman who was paid to nurse the child with her own milk to spare wealthy women the task of nursing the baby themselves) because the child could pick up the habits and diseases of the nurse. The famous Renaissance artist Michelangelo jokingly claimed that his skill in sculpture came from his wet nurse, who was the wife of a stonecutter (Gies & Gies, 1987).

During the Middle Ages, the infant Christ is typically shown in stylized clothing, with adult facial features and mannerisms. One painting depicts Christ as an infant making the Catholic gesture of benediction to a group of people kneeling before him. In Renaissance art (after 1400), by contrast, infants and children began to look and behave differently from adults. Children were sometimes shown playing with toys (Koops, 1996). Not only does the infant Christ begin to look more like a real baby, but we also see the emergence of secular paintings of everyday family life and portraits of individual children. As an aside, Islamic and Jewish traditions forbid the depiction of God in works of art because one of the Ten Commandments prohibits “graven images,” and it is rare to see images of people in these traditions because humans were created by God.

The Enlightenment

By the eighteenth century, new ideas about the value of human life, dignity, and freedom had begun to emerge, a shift of consciousness called the Enlightenment. In France, for example, Jean-Jacques Rousseau (1712–1778) argued that childhood was a time of special privilege, that children bring goodness, not original sin, into the world, and that education should be sensitive to the needs and inclinations of the infant and young child. The social movement Rousseau represented, focusing on the natural abilities of the child, was called romanticism. Its followers included such great English romantic poets as William Wordsworth (1770–1850), who wrote of childhood in idealized terms.

Behold the Child among his new-born blisses, A six years’ darling of pygmy size! See, where ’mid work of his own hand he lies, Frettet by sallies of his mother’s kisses,With light upon him from his father’s eyes!

(From “Intimations of Immortality from Recollections of Early Childhood,” in Williams 1952, 263)

William Blake (1757–1827), another English poet, rejected these simple romantic notions of innocence. In a poem called “The Scoffers,” Blake suggested that the scientific achievements of Sir Isaac Newton were far more lasting intellectual milestones than the mocking voice of Rousseau. Charles Dickens was another author who rejected romanticism. Instead of depicting childhood in nineteenth-century England as a time of happy contentment, in Oliver Twist and other famous stories he courageously exposed the effects of disease, poverty, child abuse, and child labor for all to see.

All of these writers revealed a new concern for the individual and for the value of children, but they disagreed about what was “natural” compared to what needed to be provided for the child’s healthy development. The English philosopher John Locke (1632–1704) accepted the importance of early education for children but believed that children needed more structure than the romantics advocated. Locke thought children needed specific guidance and discipline. Beginning with the assumption that the infant’s mind is a tabula rasa, a blank slate on which anything could be written, Locke argued that education should provide the skills to make rational choices. The philosophical movement to which he belonged, focusing on education and training, is called empiricism.

Both Rousseau and Locke revived the ancient Greek ideals of the body’s importance in healthy moral development. Locke wrote that “a sound mind in a sound body is a short but full description of a happy state in this world.” Rousseau suggested that children should “run, jump, and shout to their heart’s content.” Their ideas were carried into educational practice by nineteenth-
century educational reformers in Europe and North America, who made sure that school curricula offered art, music, and physical education (Friedrich-Cofer, 1986).

The romantic ideas of freedom and happiness combined with the empiricist ideas of reason and realism to create the philosophical foundations for the revolutions in France and the United States. This period also saw the rise in society of the value of the individual. It had been the custom in the past to give a newborn the same name as an older sibling, or the name of a sibling who had died. Such practices gave way in the eighteenth century to a newfound respect for the individuality of the child. Not only did advice books for parents proliferate, but by 1800 a wide range of inexpensive books were being published exclusively for young children. There was a corresponding recognition of the importance of the nuclear family and the maintenance of a private and sacred family home.

Domesticity became a value for the first time in human history. During the American colonial period, the main value of the family was to raise children according to the family’s particular beliefs and values. Many of these families came to the New World specifically to practice their own beliefs, away from the conservativism and religious persecution then pervasive in Europe (Clarke-Stewart, 1998). These values of individuality, autonomy, and self-determination had never before existed in the history of the world, and they changed how adults conceptualized the meaning and value of infancy and childhood.

These ideas also led in the nineteenth century to the growth of social responsibility toward infants and children and the rise of the idea of the child as an integral part of the definition of the family. The so-called “discovery” of the child was due to urban forces in Europe and North America that segregated the family from the workplace, defined the mother’s role as major supervisor of the domestic scene, and allowed love or sentiment (rather than family inheritance or economic well-being) to be the bond holding the family together (Hareven, 1985).

Educators in the nineteenth century continued to emphasize the importance of the young child’s body in the development of the whole individual. Children who were obese, physically awkward, or handicapped could expect to get guidance from the school. The curriculum included free expression and creativity for the body, such as gymnastics and dance. Team sports and other exercise programs were meant to lay the foundation for the continuation of physical exercise through adulthood. Students were expected to understand the principles of health and hygiene. These programs grew out of the Greco-Roman and Enlightenment emphasis on the importance of the body as well as the mind (Friedrich-Cofer, 1986). Although such programs were gradually dropped from schools, programs of physical activity and healthy lunches are returning now because of a need to reduce the growing epidemics of childhood obesity, diabetes, and sedentary use of electronic devices.

Not only did the child emerge as an individual during this period, but the role of full-time mother and housewife appeared on the historical stage for the very first time. It may be shocking for people in Western cultures in the twenty-first century to realize that the idea of a loving mother taking full-time care of an infant is a very recent cultural invention brought about by the rise of the nuclear family. For most of human history, mothers worked while infants were raised by many different caregivers, such as nurses, siblings, and other relatives.

It should be noted, however, that the development of this segregated nuclear family and its full-time mother was at first confined to the white middle class. Families from other classes and ethnic and racial groups preserved the preindustrial extended family, in which love, work, and education all took place within the home, and child care was shared by all family members. Women worked in the fields and in the home in the company of their babies, just as they had done for most of human history (Hareven, 1982).

One can see a similar pattern of change even in recent history as a result of increasing urbanization of cultures around the world. In Turkey between
the 1970s and 2000, to take one example, as mothers became more urban and educated, their concerns shifted from the survival and basic nutrition of the infant toward investing time and energy into the psychological development of children. During the same period, parental insistence on child obedience changed to encourage children to develop more independence and self-reliance. In the United States and other industrialized nations, immigrant families follow the same pattern of change as new generations adopt the mainstream cultural patterns of psychological well-being and individual self-reliance (Greenfield, 2009).

Going against this trend, on the other hand, recent cultural and economic forces have led to the decline of the nuclear family, the reemergence of extended families and communal living, non-parental childcare, and the rise of single-parent families. In the United States, the average divorce rate is 50 percent, and in some states such as California only 25 percent of marriages will last.

Social changes in the nineteenth century led to the growing awareness of the public's responsibility for the welfare and development of infants. Although the first English-language pediatric textbook appeared in 1545, welfare and medical institutions devoted exclusively to children did not open in Europe and the United States until the 1850s, around the same time as the rise of immunization and the pasteurization of milk. Maternal deaths during childbirth declined in this period due to the invention of anesthesia and procedures for sterilizing medical instruments (Greenleaf, 1978).

These medical advances further solidified the family by reducing infant mortality. As each child could be counted on to live a healthy life, families began to consciously reduce the number of children so as to invest more emotional energy in each child. By the middle of the nineteenth century, infancy and childhood had emerged in the public mind as a separate and valuable stage of life (Hareven, 1985). Manufactured baby dolls first appeared in Europe in 1825. In 1840, half of all three-year-olds in Massachusetts were attending infant schools, a practice that later declined because experts began to doubt the wisdom of sending such young children to school (Clarke-Stewart, 1998). The first public playground was developed in Boston in 1885 (a few heaps of sand dumped in a vacant lot), but by 1915, there were well-planned public playgrounds in 430 U.S. cities (Blank & Klig, 1982; Greenleaf, 1978; Zeitz, 1969).

Imagine what it must have been like to raise a baby in North America or Europe before 1850. The pain of childbirth could be helped by home remedies and the advice of a midwife, but there was no protection from serious problems and severe pain. Women could not be sure if they would survive childbirth, and many husbands were left without a wife and mother to raise the new baby. Infants died frequently of causes that were unknown at the time. Daily life with the baby was also much harder than it is today. There were no disposable diapers, no manufactured toys, and no baby foods parents could buy. Parents had to make the infant's clothing, diapers, toys, and food from scratch. A baby gets a lot of diapers dirty in a day, and there were no washers and driers. In fact, cotton fabric did not become widely available until the early nineteenth century (the textile mills of that period contributed to the exploitation of child labor, as depicted in the novels of Charles Dickens, among others). Most clothing before that time was made of wool and was hot and heavy. If you were among the few who were wealthy, you could hire a servant and a wet nurse to care for and feed the baby, although wet-nursing declined rapidly at the end of the nineteenth century because maternal love was deemed better for children. For most families, however, having a baby affected all aspects of their lives. There were no readily available forms of contraception, so most women gave birth regularly every three to five years.

INFANTS ENTER THE WORLD OF SCIENCE

Once infancy was deemed important in the public mind, scientists began to turn their attention
toward babies. One of the first scientists to consider the role of infancy was Charles Darwin (1809–1882). Darwin’s theory of the evolution of the species views infant and child development as a time when individuals grow and learn the skills needed for survival. In a process Darwin called natural selection, individuals who can successfully adapt to the environment will live long enough to reproduce and pass their genes down to the next generation. According to Darwin, the environment does not change the genes but rather influences which genes will survive in future generations to promote the most efficient survival skills (Darwin, 1859).

Darwin’s legacy has shaped how we think about infancy. Human infancy bears some resemblance to infant development in all mammals and most especially to the great apes, all of whom share ancient ancestors who evolved to eventually create different animal species. An example of a general cross-species behavior related to survival is the attachment bond between parent and infant seen in most mammals, but each species shows this in different ways. Mother cats lick and nuzzle their infants, while mother monkeys groom and cuddle their babies and carry them around. All mammals nurse their young, but the styles of nursing differ between species. In dogs, the mother lies on her side while her puppies nurse. The mother dog does not look at her babies, as in humans, but she may lick them and smell them.

Another thing we have in common with many other species is that the young are biologically more susceptible to the acquisition of new behavior than older individuals. Often there is a limited period of time early in life during which environmental input can make a difference in later behavior. This period of maximum susceptibility is called a critical period and is a relatively short (compared to the individual’s life span) and clearly demarcated period of time in which learning can occur and during which whatever the animal learns has a permanent and irreversible effect.

In some species of birds, for example, attachment of the infant to an adult occurs only during a period of about two hours, several days after hatching. If a gosling follows its mother around during the critical period, it will develop a preference for the mother over other adults and will stay close to her after the critical period ends and for a long time afterward. This learning of preferences for particular adults is called imprinting.

Konrad Lorenz (1965) found imprinting depends not only on genetic codes that program the animal to be available to follow the mother, but on changes that may occur in the environment. Lorenz showed that goslings could become imprinted on a number of different objects including flashlights, electric trains, and even himself. He would walk near the goslings during the critical period, squatting and honking like a mother goose. In his description of these early studies, he wrote, “In the interest of science, I submitted myself literally for hours on end to this ordeal” (Lorenz, 1952, p. 42).

Imprinting can be turned off by environmental events. Ducklings need to hear their own call prior to hatching. In experiments in which duck embryos were made unable to vocalize, they did not recognize the mother’s call after hatching and thus could not imprint (Gottlieb, 1991a). Imprinting can also be disrupted by visual events. If, instead of seeing their mothers, quail chicks are exposed to patterned light during the first days after birth, they will not imprint even if they can hear the mother’s call (Lickliter & Hellewell, 1992).

Imprinting does not occur in humans and other primate species because the infants are too immature to follow their parents around. Human parents, therefore, play a greater role in the mutual maintenance of proximity. The lasting emotional tie that promotes this proximity is called attachment. The critical period for attachment in humans, monkeys and apes is longer and the environmental conditions under which attachment may occur are more complex.

Although Darwin’s theory had a major impact on how infancy is conceptualized, he never studied infants directly, except for his own children (see below). The beginning of the twentieth century saw the rise of the direct scientific study of infant development. Earlier debates over romanticism
versus empiricism were replaced by discussions about the contributions to development of nature (evolution and genes) versus nurture (learning and environment).

**Nature vs. Nurture**

Arnold Lucius Gesell (1880–1961), working out of the nature-romantic tradition, thought that the orderly changes seen in early development were specified by the genes. The genetic timetable for the patterning of development was called maturation. Gesell made a career out of the careful measurements of developmental changes in size, motor skill, and behavior in infants and young children. He was the first scientist to use a one-way mirror to observe infants unobtrusively and the first to use film to record their behavior.

Because Gesell believed in genetic maturation, he cared little about individual differences and focused instead on the “average” child. This created anxiety or pride in parents who read his works and discovered that their own children walked or talked later or earlier than the average child. Even today, most parents want their babies to be above average. We now know that babies vary widely in the ages at which they attain developmental milestones, and that most babies—whether slow or fast—develop normally. There is no evidence that early development of walking or talking leads the child to become a star athlete or public speaker.

In the nurture-empiricist tradition, the Russian physiologist Ivan Pavlov (1849–1936) published one of the first demonstrations of learning as a result of systematic environmental manipulation. Pavlov attempted to teach dogs to salivate in the presence of something other than food. He discovered that if a bell was rung every time a hungry dog was presented with food, the dog would later salivate at the sound of the bell without any food present. This process, called classical conditioning, or learning by association, is illustrated in Figure 1.1.

In the United States, John B. Watson (1878–1958) believed that children could be trained in this

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**Figure 1.1 Classical conditioning and Pavlov’s dog.**

way to do almost anything, given the right kind of conditioning. He demonstrated this by doing classical conditioning studies in which he taught small children to be afraid of cuddly animals by making loud noises whenever they touched the animals. The fear (unconditioned response) was evoked by the cuddly animals (unconditioned stimulus) that appeared whenever the loud noise (conditioned stimulus) was made. This type of research would be considered unethical today. Nevertheless, Watson’s work suggested that all our behavior, even the most basic and innocent, could possibly be controlled by outside forces. Watson left a lasting imprint on North American society. Watson’s idea that anyone could succeed regardless of past history or genetic heritage sustained the hopes of many of the newly arrived immigrants.

B. F. Skinner (1904–1990) tried to use classical conditioning for birds. Because classical conditioning theory assumes that all unconditioned responses must be related to unconditioned stimuli, Skinner faced a problem. He could not discover the unconditioned stimuli for most of the animal’s actions: it seemed to emit behavior—like pecking and singing—spontaneously without any obvious external stimulation. Skinner referred to these spontaneously emitted actions as operants. Pigeons, for example, peck (the operant) even when not eating.

Skinner discovered that the rate of emitted operants could be controlled by the consequences of the behavior; that is, by what happened in the environment immediately following the operant’s occurrence. In one experiment, a pigeon was placed in a cage with no food tray. On the side of the cage was a colored disk. As the pigeon in the cage emitted the operant of pecking, it pecked at all the parts of the cage at random. When the bird happened to peck the colored disk, a small bit of food was dropped into the cage. Over time, the bird began to narrow down its pecking to the region of the cage containing the disk, and eventually it pecked exclusively at the disk: the animal discovered the contingency between its own pecking, the disk, and the food. The process by which the frequency of an operant is controlled by its consequences is called operant conditioning.

Operant conditioning is used routinely in infant studies, especially for studies of perception. In this technique, called a response-contingent procedure, infants are conditioned to change their behavior if they can detect certain features of sounds, images, smells, or tastes. Once taught, infants will alter their behavior to hear their favorite sound or to receive their preferred taste.

DeCasper and Fifer (1980) used this technique with an automatic suck recorder, a pacifier that is connected to a pressure transducer (which converts varying degrees of pressure into electrical
impulses), which in turn is connected to recording equipment. Each infant in the study was equipped with a set of headphones and a suck recorder. After a two-minute adjustment period, the infant's sucking (the operant) was recorded for five minutes with no sounds coming through the headphones. During this period, the experimenter computed the median duration of the pauses between sucking bouts. If you make a list of the durations of all the pauses observed for the infant, the median is the duration at the midpoint of the list: half the durations are above the median and half below.

In the experimental period, infants sucked as usual, such that half of their pauses were below the median and half above. When the experimenters detected a pause that was longer or shorter than the median interval, they presented the infants with the recorded voice of either their mother (reading a segment of a Dr. Seuss story) or a stranger (reading the same segment). Five of the infants were randomly assigned to a group that could evoke their mother's voice by pausing their sucking for longer than the median pause length and evoke the stranger's voice by pausing for less than the median pause interval. The other five infants had the reverse conditions.

Because the presentation of the adult voices was made contingent upon the duration of the sucking pause, infants quickly learned that by speeding up or slowing down their sucking, they could produce one or the other voice. If the infants had a preference for one or the other voice, they could then systematically shift their pause length to “suck for” that voice. Eight of the ten infants showed a tendency to shift their pause length to produce their own mother's voice.

Consequences that increase the frequency of the preceding operant are called reinforcement. A positive reinforcer is an action or reward that follows the operant and increases its frequency. In some cases, the frequency of an operant is increased following the removal of an aversive stimulus. Thus, the absence of a consequence that increases the frequency of the operant is called a negative reinforcer.

Beyond Nature vs. Nurture: The Origins of Infant Psychology

The problem with theories that rely on either nature or nurture is that they diminish human experience. One view sees us as completely controlled by our genes or and the other view sees us as completely controlled by our environment. Very few people today think that it is one or the other, but some combination of both with room in between for free will, personal initiative, emotions, and creativity.

Part of this more integrated view of human development began with Sigmund Freud (1856–1939), who felt that psychological experience is more important in human life than the focus on outward behavior that had been common in both nature and nurture perspectives. He recognized that all infants experienced emotional highs and lows, that infants felt the need for love and possessed powerful desires. Freud's daughter, Anna, devoted most of her life to bringing her father's insights out of the adult psychoanalytic session and into the real lives of parents and children. Anna Freud taught parents to hold and cuddle babies and to be patient while babies discovered and tried to manage their own desires in appropriate ways, leaving room for the infant to have an emotional life (A. Freud, 1965). Unfortunately, the Freuds leaned a bit too far on the side of nurture, faulting parents for their children's developmental problems—in this case, for giving them too little attention and affection and for “selfishly” not understanding the situation from the child's point of view. While parenting is indeed essential, even the most understanding parent sometimes have bad days, and there are many times when infants are in fact incomprehensible and difficult to handle.

Parents simply can’t control all the outcomes of their infant’s development. In fact, infants actually control their parents’ behaviors and feelings toward them. In the mid-twentieth century, it was discovered that parents can be conditioned by their infants almost as much as infants are conditioned by their parents. As infants act naturally to preserve or enhance getting the things they like or
avoiding dislikes, their parents learn better ways to fit into their infants’ needs (Bijou & Baer, 1965). Suppose, for example, a parent reinforces the child with a response every time the child asks for help and ignores the child whenever the child whines or cries to get help. The child is likely to increase the frequency of verbal requests for help, but in addition, the child will come to expect help whenever he or she asks for help in an appropriate way. On the parent’s side, when the child asks for help verbally and without whining, the parent is more likely to provide the assistance. Thus, the increase in the child’s verbal requests will condition the parent to increase the frequency with which he or she gives help. Infants also will not learn unless they are interested in something, regardless of parental attempts to change the behavior (Bandura, 1989). Thus, even studies in the nurture-empiricist tradition using conditioning found that parents and infants were influencing each other and what got learned had to do with some desire, interest or motivation intrinsic to each baby.

Jean Piaget is known for his theoretical contributions and also for his empathetic sensitivity with young children. His many experiments with his own three infants take account of his effects on them and were embedded into the infants’ daily activities.

Bridging Nature and Nurture: Piaget and Constructivism

One of the first theories of human development that explicitly integrated both nature and nurture was that of Jean Piaget (1896–1980), who focused on cognitive development in infants. For Piaget, knowledge is conceived not as a static library of information but as an active process of co-construction between the knower and what is to be known. Co-construction means that what one knows depends upon how one acts on the environment and how the environment responds in return to those actions.

Piaget (1952), following Darwin, brought two principles of biological adaptation into his study of the development of intelligent action: assimilation and accommodation. Assimilation refers to the process by which individuals use their existing abilities in response to challenges from the environment. It is the application of what one already knows or does to the current situation. Accommodation is the alteration of existing abilities to better fit the requirements of the task or situation. Accommodation is more likely to occur if assimilation does not result in an effective adaptation to the environment.

Typically, most actions involve both assimilation and accommodation. Between the ages of six and twelve months, human infants must learn to eat solid foods. This is not an easy task, because the infant’s tongue is not yet coordinated enough to keep food in the mouth. While sucking on a breast or a bottle, the baby’s tongue moves in and out like a piston. When a baby is first given solid food on a spoon, the baby’s response is to move the tongue as if he or she were sucking, which has
the effect of expelling food from the mouth. Thus, the infant assimilates the tongue and mouth actions of sucking to the eating of solids. Because this simple assimilation leaves the infant hungry, the child must accommodate mouth and tongue movements so they are better adapted to the shape of the spoon and the consistency of the solid foods. The infant’s knowledge about food, therefore, is a co-construction between assimilation and accommodation, as each process influences the other to create the resulting action.

Piaget referred to the first two years of life as the sensorimotor stage because at that age infants were primarily involved in building knowledge involving their movements and senses. The main feature of sensorimotor intelligence is the growth of infants’ understanding of their bodies, how to use their bodies to solve problems and get what they need, and how their bodies relate to other things in the environment (Piaget & Inhelder, 1969). Piaget divided the sensorimotor stage into six substages. These are described in Table 1.1. Although they will not be discussed in this book, Piaget’s discoveries of stages beyond the infancy period are summarized in Table 1.2. The sensorimotor stage was thought to contain the seeds for the post-infancy development of thought, language, social skills, and morality.

Piaget’s stages are examples of a sequence of developmental change, which is characterized by the following three features:

\( \text{Developmental changes are not reversible. Developmental change is a reorganization of the entire} \)

<table>
<thead>
<tr>
<th>TABLE 1.1 Piaget’s Substages of Sensorimotor Development</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Approximate Age (Months)</strong></td>
</tr>
<tr>
<td>0–2</td>
</tr>
<tr>
<td>2–5</td>
</tr>
<tr>
<td>6–9</td>
</tr>
<tr>
<td>10–12</td>
</tr>
<tr>
<td>12–18</td>
</tr>
<tr>
<td>18–24</td>
</tr>
</tbody>
</table>
Developmental changes are stable. Developmental stages are organized patterns that emerge in development and persist over relatively long periods of months or years.

Developmental changes occur in sequence. Development occurs in an orderly sequence that is similar across infants.

In fact, there are many ways to conceptualize stages of infant development. Each culture, for example, views the stage divisions of an infant’s life differently. The Alor people of the Lesser Sundra Islands do not even count the infant’s development in days or months, but rather in terms of a series of stages of development. The first stage lasts from birth to the first smile, the second from smiling to sitting up alone or crawling, and the third from this point to the onset of walking. The Chagga of Tanganyika apply different names to infants depending upon their stage of development. A newborn is called mnangu, or “incomplete,” a mkoku is “one who fills the lap,” and a mwana is an infant before the age of three years (Mead & Newton, 1967). These linguistic labels are comparable to the terms newborn, infant, and toddler in English.

Parents and other infant caregivers may use another type of division for the first three years. They may be more concerned about the ages at which infants become capable of independent play with other infants, the age of the beginning of toilet training and the onset of bowel control, or the age at which infants become more relaxed when separated from their parents.

Three basic principles about human infants characterize Piaget’s theory:

1. Individuals play an active role in their own development. The major motivation for developmental change comes from the individual’s failure to reach an adaptation to the environment. This experience of failure, when accommodation and assimilation fall short of adaptation, is called disequilibrium. Because disequilibrium is defined in relation to what each individual wants to accomplish, it cannot be imposed from the outside: babies seek

<table>
<thead>
<tr>
<th>Approximate Age (Months)</th>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–2</td>
<td>Sensorimotor</td>
<td>Infants learn through direct experience of the senses and by handling objects and moving them around. They do not understand that things exist outside their own actions.</td>
</tr>
<tr>
<td>3–7</td>
<td>Pre-operational</td>
<td>Ability to form mental representations, language, thinking as internalized action but centered on the self’s perspective; inability to think logically.</td>
</tr>
<tr>
<td>7–11</td>
<td>Concrete operational</td>
<td>Thinking takes the perspective of others and is logical with respect to concrete actions and objects such as the rules of a game; inability to think about abstract things.</td>
</tr>
<tr>
<td>12–adult</td>
<td>Formal operational</td>
<td>Thinking about non-concrete, abstract things; ability to solve word problems, form a coherent system of thought relating many ideas, and think about future possibility.</td>
</tr>
</tbody>
</table>

knowledge about those things that they most want to figure out or accomplish.

Infants develop knowledge by means of their own actions on the environment. The accommodation process literally changes the infant’s view of the world, because, by altering his or her own actions, the child comes to “know” new uses for the same objects. Through action, individuals create knowledge. Because knowledge is an active process of creation, Piaget’s work is often referred to as constructivist theory, according to which knowledge is built up—constructed—by the child’s own action rather than being simply conditioned or imposed on the child from the outside.

Infants will learn better from experiences if those experiences can be assimilated to their current developmental level. The currently available set of skills and knowledge is known as the infant’s schemes. Schemes can be sensorimotor, that is, involving physical actions such as reaching and chewing. Schemes can also be conceptual, involving ideas, concepts, or thoughts. For accommodation to occur, the infant has to assimilate the existing set of schemes to the environment. For this to happen, the environment should present challenges that are moderate, not overly difficult or beyond the infant’s grasp. Thus, the first solid foods have to be soft in consistency (the infant does not have teeth yet) and given on a spoon that is small enough to fit in the infant’s mouth. Adults have to hold the spoon at just the right angle and move it in and out of the infant’s mouth at the appropriate time.

Piaget’s original work on infancy was based on observations of his own three children, Jacqueline, Laurent, and Lucienne, and he is known to have been empathically attuned to young children. His observations are unrivaled in their clarity, accuracy, detail, and theoretical import (see Qualitative Research, below). Piaget’s work is clearly distinguished from learning theories and from Darwinian evolutionary theories. Piaget believed that development is not imposed on the infant from the outside, nor is it guided solely by genetically based maturational change. Adaptation suggests a more active, infant-centered perspective in relation to a changing and dynamic environment.

One problem for Piaget’s theory is that he failed to take account of the effects of adults on infants. Although he is given credit for helping us understand that infants are active learners, he did not attend to the facilitating and supportive environment that parents often provide and in which infants may exercise their curiosity. For infants to assimilate their eating to spoon feeding, for example, it requires an adult who can choose the right kind of food and spoon, an adult who is actively and constructively engaged with the infant. The role of adults is more explicit in systems theories (discussed in the next section), which offer the possibility for adult-infant co-construction.

Piaget, however, led the growth of research in the 1970s that emphasized infant learning and cognitive development. Parents strove to train their infants to achieve the maximum mental potential at the earliest possible age. This was based on the belief that education (nurture), rather than natural endowment (nature), was the best guarantee of child success (Clarke-Stewart, 1998). Many parents placed their infants into tightly structured study programs to teach them reading, word learning, music, and mathematics before they reached the age of three years. As mentioned at the beginning of this chapter, we now know that too much of this early stimulation actually delays infant learning.

The emphasis on intelligence and mental development led to a steady decline in a balanced view of the whole child as needing education not only for mind but for body, emotions, and social connections. According to one historian, “as the individual child and adolescent with bodies faded from view, many of the humanistic ties which bound scientist, teacher, family, and child faded with them” (Friedrich-Cofer, 1986, p. 133). Children’s progress began to be reported in the form of standardized test scores, rather than individualized assessment of mental and physical health. Physical education, music, and art programs that had been created for all children declined or disappeared entirely from schools, replaced by competi-
This focus on the early structuring of the infant’s intellectual growth was followed in the 1980s by an interest in targeting infants who were at risk for developmental difficulties, such as those who were premature, handicapped, or victims of abuse. The focus on risk was associated with a belief in nurture: the idea that all humans could become perfect if given the right kind of child rearing. For healthy and wealthy infants, this meant a quest for developing a “superbaby” and giving children a “head start” (Clarke-Stewart, 1998). It also brought the ideal of a “supermom,” who could be employed outside the home and at the same time be a great mother and a wonderful and loving wife, which created a lot of stress for young families. The 1980s also saw a rise in the amount of time fathers spent with their babies.

More recently, however, romantic ideas have returned to scientific studies in psychology and in infant development (Schneider, 1998). Perhaps in reaction to what was seen as an overemphasis on intellectual achievement, since the 1990s we have seen a rise in studies of parent-child relationships, emotional development and attachment, the role of the body and touch, and communication and language. The more rational approaches to infant development continue to grow in such fields as cognitive neuroscience and behavior genetics. On the other hand, some of the trends of the 1970s and 1980s, which focused on babies growing up and getting smart as quickly as possible, were replaced by ideas about having a secure and loving attachment, slowing down and appreciating the beauty of each phase of a baby’s life, and the specialness of being a baby.

SYSTEMS PERSPECTIVES ON INFANT DEVELOPMENT

Even though Piaget’s work emphasized the integration and co-construction of nature and nurture, the above review makes it clear that most people continue to think of nature and nurture as separate and opposing forces: genes or environments, cognition or emotion, parent or child. Life, unfortunately, is not so simple that we can easily put it into neat little categorical boxes. The real story of human development is about the relationships between these different elements. Systems theories—such as that of Piaget—share the view that all facets of the child and the environment are important, and that development is a complex process in which outcomes are determined through the active interaction of these facets. Systems theories attempt to understand developmental change by considering the relationships between the components. It is only recently that systems thinking has begun to have an visible effect on how we think about infants.

A system is a relationship between interdependent components, each of which affects the others in reciprocal fashion. The process by which systems components affect each other in a bidirectional and reciprocal way is known as transaction (Sameroff & MacKenzie, 2003). In the parent-infant interaction system, for example, the behavior of a parent is likely to depend on the temperament of the infant. Infants who smile more and cry less are likely to have parents who are more relaxed and socially attentive to the infant. This parental social attentiveness, in turn, will affect the infant’s continued sociability.

Feedback is a process by which components of a system have an effect on each other’s behavior during transactions such as these. If the parent, for example, has had a bad day and is not so relaxed or socially attentive, it is likely that the sociability of the infant will help the parent to calm down. Feedback that maintains a system’s characteristics over time despite small deviations is called deviation-correcting feedback (or negative feedback).

In other cases, however, the deviation from the normal state of affairs is larger than the system can tolerate and still maintain itself. Suppose, for example, the infant becomes ill and fussy or has a mental or physical handicap. Under normal conditions, the parent would remain cheerful and attentive. If the parent too is under stress, however, the infant’s fussiness could lead to an increase in the parent’s level of stress, which then leads to
the infant’s feeling even more distress and crying more, which may lead to parental despair or anger. Feedback that drastically changes a system is called deviation-amplifying feedback (or positive feedback).

Deviation-amplifying feedback (like accommodation) generally works to change a system, while deviation-correcting feedback (like assimilation) works to maintain it. Deviation amplification could also change a system for the better. The infant’s initial shyness in social situations may, with the support of the parent’s attentiveness to the infant’s need to feel safe, lead to the enhancement of the infant’s social skills with peers and other partners and to the growth of a wider range of shared communication between parent and infant.

This last example shows that systems can have multiple levels. A parent-child relationship system, for example, is embedded within a larger family system. In addition to the feedback between parent and child, a parent’s relationship to the infant may also be affected by the parent’s marital satisfaction, his or her relationship with other family members, the financial well-being of the family, his or her own job satisfaction, and even society’s attitudes about the parenting role. To take this a step further, the family is embedded in a neighborhood with schools, clinics and other services while the neighborhood is contained in a culture and society.

Bio-Ecological Systems Theory

Bio-ecological systems theory is a way to understand the relationships between and within multiple system levels—from person to society—that shape the development of infants into adulthood (Bronfenbrenner, 1979; Bronfenbrenner & Ceci, 1994).

The child. These are the relationships occurring within the individual. These include the relations between genes and their cellular environments, between different body systems such as neurological and cardiovascular, between mind and body, cognition and emotion, assimilation and accommodation, and the coordination of different body parts as in learning to walk or crawl.

Microsystem. The microsystem is made up of the relationships between the infant and the environments with which the infant comes in contact. This may include the child and the physical and social environment of the family, or the child in schools, camps, hospitals, play groups, and places of worship. Children are affected by many aspects of their immediate microsystem environment, including social interactions, housing, and nutrition (Melson, 1980).

Mesosystem. The mesosystem includes the relationships between the major settings in which children are found, such as the interaction between the family and the day care center. A child who is experiencing many difficulties in day care is likely to force the family to have more interactions with the center’s teachers and administrators, and those family-school interactions should, in turn, have an effect on the child’s functioning.

Exosystem. The exosystem includes other social systems that do not directly contain the developing child but have some effect on him or her. The world of work, neighborhood institutions, the media, the government, the economy, and transportation affect the functioning of the family, school, and other microsystems in which children are found.

Macrosystem. The macrosystem contains all of the above subsystems. It includes the beliefs, laws, and values of the culture or subculture and is made up of the written and unwritten principles that regulate everyone’s behavior. These principles—whether legal, economic, political, religious, or educational—endow individual life with meaning and regulate the nature and scope of the interactions between the various levels of the total social system. The relationships among these various subsystems are shown in Figure 1.2.

According to bio-ecological systems theory, infants may be influenced by and influence others either by direct transactions or by mediated
transactions. A **direct transaction** occurs as part of a social relationship in which the child is an active participant: the infant-parent, infant-peer, or infant-sibling relationship. A **mediated transaction** occurs when the infant affects or is affected by people with whom the infant may or may not share an active relationship.

An example of a mediated transaction concerns the child’s relationship with grandparents. Though children in North American society often spend little time with their grandparents, visiting perhaps only once or twice a year, they nevertheless seem to develop special relationships with them. This can be accounted for by parental mediation. Because the parent’s relationship to his or her own parents is so important, this importance is transmitted to the child, who then comes to think of Grandma and Grandpa as special people (Lewis & Feiring, 1978; Lewis, 2005).

With mediated effects, the acts of one individual affect another, who then affects a third person (see Figure 1.3; Belsky, 1981). This figure includes the effects of one individual (for example, the infant) on the relationship between the parents and, conversely, the effects of the marital relationship on the infant directly and indirectly as it affects each spouse’s ability to parent. One other notable aspect of this diagram is that it includes feedback transactions. For example, the marriage may affect a spouse’s ability to parent, which may affect the infant, whose subsequent behavior may affect the marital relationship. Each component is capable of affecting every other component in a mutually influential manner.

**Dynamic Systems Theory**

Some of the pioneers in the study of human development such as Darwin and Piaget were interested in the problem of how new forms arise during development. At different times in evolutionary history, for example, new species emerged
that had never been seen before. Similarly, during the life span of a person, new abilities, emotions, and experiences arise as new developmental stages unfold in time. **Dynamic systems theory** takes account of the process of change in human development by understanding the ways in which the interactions between components of the system can change the very nature of the system itself while at the same time preserving the integrity of the system. According to dynamic systems theory, the generation of novelty, the creation of something new that was not there before, is the primary feature of all living creatures. Everything that is alive has to grow, and as it grows it not only changes but at the same time preserves itself as a unique being (van Geert, 1998). In the most dramatic example, the cocoon, caterpillar, and butterfly are all manifestations of the same individual insect. How does this happen?

Dynamic systems theory takes its current form from the work of the physicist Ilya Prigogine (Prigogine & Stengers, 1984). Most of the matter in the universe slowly expends its energy and then burns out. But Prigogine was interested in phenomena that make their own energy, preserve themselves across time, and become increasingly complex by generating novel forms. This is the process that characterizes all living systems, from single-celled organisms to human beings. The ability of systems to maintain themselves and to develop new forms is called **self-organization**. The “self” in self-organization means that the maintenance and development of the system arises from the mutual transactions and feedback processes between the components of the system, and the system with the environment, rather than being imposed on the system by some preexisting genetic plan.

Prigogine began his research by studying some nonliving physical systems that had the capacity to create their own energy and become more complex in form. One example is the weather, in which the forms—such as seasons or hurricanes—develop and maintain themselves over time. Despite its dynamic complexity, the weather has patterns that repeat. Every year you can expect it to be cold in the winter and warm in the summer. Every winter is different from every previous winter in particular ways, however, and it is not possible to predict in advance what each new winter will be like.

Many dynamic systems display the following two properties:

1. They form predictable and stable patterns in their macroscopic behavior. The seasons in the weather system are one example; the stages of human development are another. All infants go through the same Piagetian six substages in the same sequence during the first three years.
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of life, just as each year the earth goes through
the same four seasons.

2. *They are relatively unpredictable in their microscopic behavior.* One may be able to predict the weather over the coming week or two within a range of possibilities depending upon the season, but the complexity of the weather system always leaves room for something novel to emerge. Similarly, we can describe what ten-month-old infants are likely to do in general, but an individual infant’s precise behavior on a given day and how that infant discovers how to walk, for example, cannot be predicted. Something novel happens every day that cannot be anticipated.

This microscopic unpredictability in the context of macroscopic stability is known as **chaos**. Chaos is a mathematical concept that expresses the property of complex systems to have some general structure that repeats over time but never in exactly the same way. The drawing in Figure 1.4 represents chaos. It is the trajectory of a mathematical equation that traces a path in three-dimensional space that is similar on each cycle, but is never exactly the same as any previous cycle. Each person’s life course is similar in the transitions between developmental stages, but no two lives are exactly the same. The concept of chaos suggests that dynamic systems display some forms of determinism (predictability) and some forms of **indeterminism** (Fogel, Lyra, & Valsiner, 1997; Prigogine & Stengers, 1984).

Scientists use the following example. Imagine a butterfly is flapping its wings somewhere in South Asia. This movement is just enough to change the flow of a tiny bit of warm air. This tiny change in airflow may happen at just the right moment to

![Figure 1.4 A Trajectory of Chaos](image_url)

A mathematical equation generates a curve that repeats a similar shape in three-dimensional space. Each time the curve repeats the shape, however, it is in a slightly different place from where it has passed through before.

trigger a much larger change in airflow because of deviation-amplifying feedback, which then causes a change in the temperature distribution at higher elevations. At some point and without a specific cause, the conditions are created for a thunderstorm to emerge in the United States. Because of complex feedback processes and emergent novelty, it is impossible to trace the cause of the thunderstorm back to a single source (even the flight path of the butterfly depends in part on wind and weather conditions in that very moment!).

A so-called butterfly effect occurs when a very small perturbation creates unpredictable novelty in a system, which then results in macroscopic developmental change in the system. Self-organization, chaos, and the butterfly effect have been used to explain why all snowflakes are similar but no two are exactly alike, the unpredictability of heart rhythms during a heart attack, the development of differences and similarities between living cells, and how even two twins with the same genetic makeup can turn out differently in their personality and behavior (Capra, 1996; Hopkins & Butterworth, 1997).

By the same logic, infant and human development is not fixed to a genetic or maturational timetable (nature), nor is it entirely predictable from adult guidance or infant learning (nurture). While nature and nurture provide the basic components of the system, their relationship produces indeterministic effects: new abilities emerge through the feedback transactions and dynamic fluctuations of self-organization (Fogel & Thelen, 1987; Thelen & Fogel, 1989).

Human development has many examples of butterfly effects; small and unexpected events that can change the course of a life (Fogel, 1990a; Thelen, 1990). A simple word for this is creativity. During conversation, for example, people form their sentences and stories to express something they have in mind. People have to make up their sentences as they speak, and no two sentences are ever exactly alike. In addition, as we hear the responses of others to our words, that feedback sometimes makes us work to clarify our meaning or even to change it according to the other’s perspective. In this sense, communication is creatively self-organized because it emerges in the process of transaction. We can call this type of communication “alive” (Fogel & Garvey, 2007). When babies begin to acquire language, they can create novel sentences never spoken before. Piaget’s concept of constructivism also suggests that infants develop via opportunities for playful creativity which allow novelty to enter the system and to enhance growth and development.

**RESEARCH METHODS IN DEVELOPMENTAL SCIENCE**

As we’ve seen so far in this chapter, there are many theories of human development, each having a different take on nature or nurture or both together. Each culture, in addition, has its own theory of the formation of individual differences. The ancient Greeks and Romans believed that exposing an infant to a variety of fearful and stressful events early in life would make the child less fearful and more emotionally balanced later. Nineteenth-century Europeans believed just the opposite—that protecting the child from fear-producing experiences was the best way to create an outgoing child (Kagan, Kearsley, & Zelazo, 1978). Which one of these many theories is more correct? How could you decide?

Scientific research on infant development can help us answer this question. Scientists rely on many sources of evidence, they try to separate what is repeatable and stable from what is coincidental, and they attempt to rid observations of bias. Piaget’s work is a good example. He made extensive written notes, often on a daily basis, about the behavior of his three infant children. Piaget not only observed natural behavior, but tried out little experiments to test alternate interpretations of what the children could do. At one point, Piaget tried to determine whether his eight-month-old daughter Jacqueline (J.) was capable of imitating mouth movements and sounds. In the
following example, Jacqueline seemed to imitate her father’s biting movements. Or did she? Piaget was not sure whether Jacqueline only appeared to imitate him because he had started out by imitating movements she could already make.

J. was moving her lips as she bit on her jaws. I did the same thing, and she stopped and watched me attentively… J. began to imitate me an hour later… In order to understand this new development, two circumstances must be noted. Firstly, for some days she had not merely imitated sounds for their own sake but had watched the mouth of the model with great attention. Secondly, as she moved her lips, J. began by making a slight noise with her saliva… and I had imitated this sound at the outset. Her interest in the movements of the mouth was thus clearly due to interest in the production of sound. [Three days later] I resumed the experiment without making any sound and without J. herself having made the movement beforehand. She watched my lips moving and then distinctly imitated me three times, keeping her eyes fixed on my mouth. (Piaget, 1962, pp. 30–31)

Experimental Research Methods

In this example, Piaget used written narrative descriptions that combined observational research with an experiment. An experiment is a research study in which one aspect of the situation is manipulated while all other aspects are held constant or controlled. In this case, to discover Jacqueline’s ability to imitate mouth movements on her own, Piaget waited for a time when Jacqueline had not made the movement spontaneously for some time, and he did not produce any sound when he made the movements himself. The prior condition (the child makes no similar spontaneous movement and the adult does not imitate the child) and the presentation of the adult model (absence of sound) were controlled. The experimental manipulation is the presence or absence of a movement-only adult model.

In modern versions of Piaget’s famous imitation experiment, many other aspects of the situation are controlled: the position in which the child is sitting, the behavior of the adult model, the familiarity of the infant with the adult, and the observation procedures. The following are some standard experimental procedures.

**Control groups** that do not receive any manipulation are compared to a group of infants who receive the experimental manipulation. Alternatively, different groups can be compared if each receives a different type of manipulation. These are called **contrast groups**. In imitation research, for example, different contrast groups of infants are presented with a different model (tongue protrusion, mouth movement, or a facial expression). If imitation occurs, the frequency of tongue protrusion following the model should be highest in the group that has seen the tongue-protrusion model. This procedure controls for the fact that most babies produce tongue protrusion spontaneously, so that some tongue protrusion would be seen in all the groups.

**Random assignment** is used to determine which subjects belong to each experimental group. A flip of a coin or some other random process is used to assign subjects to groups. In some cases, it is unethical to use random assignment in a study. For example, suppose we want to compare the effects on language development of differences between mothers in their speech to infants. We obviously cannot randomly assign mothers to infants.

Experiments generally have two important measures, also called variables. The **independent variable** is that which is controlled or manipulated by the experimenter. In the case of imitation studies, the independent variable is the type of model given to the infant. The independent variable is the presumed cause of the phenomenon; that is, different types of models are presumed to cause the infant to imitate different movements. The **dependent variable** is the presumed effect or outcome behavior that is observed in response to the changes in the independent variable. In the case of the imitation study, the dependent variable is the frequency of different actions of the infant,
such as the frequency of mouth movements or tongue protrusions. The dependent variable is presumed to be affected by the causal independent variable such that manipulations of the independent variable should lead to systematic changes in the dependent variable.

Observational Research Methods

Many of the important questions in infancy research—such as the effects of prematurity and variations in parental styles of child care—cannot be studied experimentally. We cannot randomly assign infants to be premature, and we cannot randomly assign particular types of parents to particular types of infants. We use, instead, observational research methods that rely on the natural variations within the existing population of infants and families.

The obvious advantage of observational research is that we can study many issues of grave importance to our understanding of early human development that would be unethical or impossible to study experimentally. The problem with observational studies is that the variable on which the groups are assigned (the style of parental child rearing) may also correlate with other factors (such as the mother’s social skills and general expressiveness). If this occurs, it is difficult to determine which factor—child rearing, social skills, or expressiveness—is the cause of differences in infant behavior.

Observational studies can be either longitudinal or cross-sectional. In a longitudinal study, researchers follow the same group of children as they get older. Longitudinal studies are important for determining how particular early experiences of individuals affect their later development and also for revealing patterns of change over time. Change is measured against the individual’s own record of growth. The disadvantage is that the researcher must wait for the child to grow, although this takes less time for infants than for older children because infants grow at a faster rate; few researchers can find the research funding to support such long-term efforts. Another problem is attrition, which occurs when subjects of a longitudinal study drop out of the study before they complete the entire period of observation. Not only does attrition lower the number of subjects in a study, but researchers worry whether the subjects who remain are different from those who drop out, making the study less representative of the larger population.

One of the methods most commonly used today to study developmental change is a cross-sectional study, in which the researcher selects a different group of children at each age period of interest. Cross-sectional studies have the advantage of giving us a sense of age change in development without having to wait for the children to grow up. An additional advantage is that researchers who observe children from only two or three different age groups have more time to collect data from a large number of children and thus may find patterns of between-individual variation in behavioral characteristics and age of attainment of developmental milestones. Thus, while cross-sectional studies allow us to make generalizations about groups of infants, they cannot tell us how individual infants develop over time.

Observational research, like experimental research, can be quantitative. Quantitative research means that observations are transformed into numerical indices called variables. The variable that is the presumed cause—such as child-rearing styles—is called the predictor variable. The presumed effect—child behavior—is called the outcome variable. There is an analogy between independent variables and predictor variables, and between dependent variables and outcome variables.

Reducing Bias in Research

Regardless of whether one does observational or experimental research, caution must be taken to assure that variables reflect accurate and unbiased measures of the phenomenon. Reliability and validity procedures are ways of attempting to reduce bias in quantitative research. Reliability is a measure of the consistency with which an
assessments procedure is applied. If one is trying to measure an infant's preference for looking at her mother compared to an unfamiliar woman, observers may be asked to record the duration of time the infant spends looking at each adult. If two people, working independently, are asked to judge the duration of the same event, the measurement of duration is reliable to the extent that the two observers agree with each other.

Validity is the degree to which the procedure accurately measures what it is intended to measure. For example, one might ask if the duration of time the infant spends looking at the mother versus that spent looking at the stranger is a valid measure of the infant's preference for one or the other. A baby may look longer at an unfamiliar face because it is new and the baby is curious about it, not because the baby prefers to look at that face. In this case, the duration of time the infant looks at the stranger would not be a valid measure of preference for the stranger. To test whether the duration of the infant's looking is a valid measure of preference or of curiosity, one would have to compare this measure with other measures of preference and curiosity. An additional measure of preference might be the duration of time the infant smiles at and vocalizes to each adult. An additional measure of curiosity might be the duration of time the infant looks at pictures of novel compared to familiar objects.

Another means of lowering research bias is by assuring that both the subjects and the experimenters are blind to the specific purpose of the research and to the group assignment of the subjects. Blindness in quantitative research refers to limiting the access of researchers and participants to knowledge that may bias the outcomes of the study. In a study on the relationship between infant language and mother's speech, for instance, researchers who administer the tests of infant language should not be the same as those who observe the mother's speech, and they should not know anything about the mother's speech score. The mothers should not be aware of the precise measures and relationships being tested, although they might be told that they are participating in a study on infant language development.

Finally, bias in research can be reduced by assuring that the group of infants and parents who participate in a research study is representative of the larger population of infants (representative research). A study is representative if its conclusions can be applied to infants who were not direct participants in the study. Most infancy research is done with white, middle-class North American and European infants. It is important to ask whether these findings apply equally to infants from other ethnic groups, cultures, and socioeconomic groups. Research grants from the National Institutes of Health in the United States, which funds both medical and behavioral research on human subjects, cannot be obtained unless the subjects of the study represent both genders and a cross-section of ethnic groups.

Research Ethics and Informed Consent

Research ethics adopted by most institutions in North America require that human subjects give their informed consent to participate in research. Informed consent is a voluntary agreement to participate in a research study. Informed consent must be based on accurate information about the purpose, procedures, risks, and benefits of the research study (Keith-Spiegel, 1983). Each researcher must write a proposal describing the details of their research, its risks and benefits, and provide a sample consent form. These documents are reviewed by the institution's Institutional Research Board (IRB), whose mission it is to protect the welfare of humans who participate in research studies.

Special provisions are required by the IRB for research subjects who cannot give consent for themselves, specifically infants and small children. In these cases, one or both parents must sign the consent to participate. Parents are told about the possible risks and benefits of the research, both for themselves and for their infants.

Researchers must pledge to keep the subjects' identity confidential and to limit access to their data only to those persons directly involved with the research. There are several situations, how-
ever, in which confidentiality cannot be assured. In the event that the researchers observe behavior constituting child abuse, they are required by law to report it to the appropriate community agency. Also, researchers cannot protect their data if they are subpoenaed in a child-custody dispute. Parents need to be informed about these limits to confidentiality before they agree to participate. Fortunately, these situations rarely occur. In the past thirty-five years of doing infancy research with many hundreds of families, I have never had to violate a subject’s confidentiality for these or any other reasons.

Qualitative Research Methods

The previous sections covered quantitative research using experimental and observational methods. In quantitative studies, the phenomenon is measured as a number or category. The number could be an onset time, a duration, a frequency, or a score on a rating scale. Qualitative research, on the other hand, does not use quantity or number. It is characterized by one or both of the following features.

1. The observers focus on the meaning of the situation for the participants.
2. The role of the researcher in the situation is taken explicitly into account.

To infer the meaning and to take account of the observer, qualitative research needs to examine the research situation in its broader context. The child is observed in relation to the setting, the actors, the sequences of behavior, the history of previous encounters in similar situations, and the presence of the observer. If the researcher is part of the observation as a participant observer,
he or she has a direct effect on the people being studied and they have an effect on the researcher. If the observer is watching a video or some other recorded data, the researcher’s interpretations play a role in deciding what the participant’s behaviors mean.

The study done by Piaget on Jacqueline’s imitation that was described earlier is an example of qualitative research, because he used a verbal narrative—in his own words—of the whole situation to highlight the broader meaning to Jacqueline of the imitative behavior. Piaget, as the parent, was also a participant observer, taking account of his own role in the outcome. Having recognized the effects of his own behavior on his daughter, he was better able to sort out the possible causes and effects, which led him to design a better experiment.

The earliest known systematic observation and recording of infant behavior, done by educated European and North American parents during the eighteenth and nineteenth centuries, used a similar qualitative approach. Some of these parents kept a daily diary about their baby’s life, a baby biography. These diaries satisfied the first characteristic of qualitative research: they were narratives intended to understand the meaning of infant behavior rather than to measure it. The German philosopher Dietrich Tiedemann (1748–1803), for example, recorded the development of motor skills, language, thinking abilities, and social behavior in his infant son. Tiedemann described what we now call the Moro reflex as follows:

If he was held in arms and then suddenly lowered from a considerable height, he strove to hold himself with his hands, to save himself from falling; and he did not like to be lifted very high. Since he could not possibly have any conception of falling, his fear was unquestionably a purely mechanical sensation, such as older persons feel at a steep and unaccustomed height, something akin to dizziness. (Tiedemann, 1927, p. 216)

Notice that Tiedemann not only described his son’s behavior in the manner of observational research, but also interpreted the meaning of the behavior for the infant when he speculated that the infant’s experience was “purely mechanical.” Tiedemann may have been an accurate observer of the outward behavior of the baby, but he would not be considered a good qualitative researcher by today’s standards. Although we readers can see that his interpretations of the meaning of the child’s behavior is based on his own point of view as an adult, Tiedemann—unlike Piaget—did not take explicit account of his role in the interpretive process. He was not, in other words, aware of his own biases. Those biases seem to reflect his view that babies of this age are not capable of feeling emotions, which today we know to be inaccurate.

Charles Darwin was also a baby biographer. Darwin was very aware of his role in the interpretive process. When his son, William, was only a few months old, Darwin was a relatively objective observer. But as William became more active and expressive, Darwin added more references to himself and his affections for William. Because Darwin thought these references to himself were unscientific, however, they were deleted in the versions of his diary that he published (Conrad, 1998). Darwin also made explicit mention of his own point of view in a memorial he wrote at the time of the death of his daughter, Anne, when she was 10 years old (Conrad, 2004).

Qualitative researchers today do not think it is unscientific for observers to take account of their own reactions. They suggest that a deeper understanding of the meaning of behavior for the subject can only come from a deeper self-awareness of the researchers about their own reactions and biases (Moustakas, 1994). Perhaps the only way to get to know another person meaningfully is to share a long-term relationship full of emotions, opinions, and attachments.

Researchers always have some kind of relationship with their subjects. In the quantitative approach, the relationship is one of keeping a distance and remaining objective as an observer. In qualitative research, observers allow themselves to experience some of the feelings of participa-
tion that might be present in any interpersonal relationship (Aureli, 1997). Their training and self-awareness, however, allow them to use their own feelings to enhance their understanding of the subject's perspective. On the other hand, quantitative researchers also have biases, which they hope to control by means of reliability and validity measures. Each type of research has its advantages and disadvantages.

The assessment of a student’s performance in school, for example, can occur through either a distant or a close teacher-student relationship. In large classes, a quantitative approach is most typically used. Instructors use primarily numerical and presumably objective indices of student performance, based on exams and other graded assignments. In small classes, on the other hand, evaluations are based not only on grades but also on a more in-depth interpersonal relationship between teachers and students. In this situation, the teacher has an opportunity to get to know each student. Experienced teachers are able to develop meaningful interpersonal relationships with their students while maintaining the ability to judge the student’s performance and guide her or his learning. Experienced clinicians, such as psychotherapists, also have this skill of being able to evaluate their client’s progress while maintaining a strong interpersonal relationship.

The concept of credibility in qualitative research is similar to that of validity in quantitative research. A researcher has more credibility if the researcher is highly trained, has spent many hours doing comparable observations, and/or has had a prolonged engagement with the particular subjects of the study (Denzin & Lincoln, 1994). This is true for Piaget, because he was a trained scientist and he obviously had prolonged contact with his own children. In the example of teaching, more experienced teachers tend to be more credible.

### Research for the Real World

In this chapter, we learned that past 200 years has been a period of increased public awareness about the development of infants. In the United States, this has been accompanied by a rise in federal assistance programs to benefit infants and children. Some of these are shown in Table 1.3. It was not always this way. The United States was founded on basic principles of self-reliance and upon the idea that parents had both the responsibility and the right to raise their children without undue intervention from the government. Legally,

<table>
<thead>
<tr>
<th>Program</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicaid (for Low-Income Families)</td>
<td>Covers costs of prenatal care for mothers and postnatal care for infants but not their parents.</td>
</tr>
<tr>
<td>Supplemental Nutrition for Women, Infants, and Children (WIC, for Low-Income Families)</td>
<td>Provides food vouchers up to 5 years old.</td>
</tr>
<tr>
<td>Temporary Assistance to Needy Families (TANF)</td>
<td>Provides some financial support to families of children under 3 years old.</td>
</tr>
<tr>
<td>Earned Income Tax Credit</td>
<td>Provides tax relief for working but poor families.</td>
</tr>
<tr>
<td>State programs of child welfare</td>
<td>Prevents or protects children from abuse and neglect.</td>
</tr>
<tr>
<td>Early Head Start</td>
<td>Promotes early child development for poor children under 3 years old.</td>
</tr>
<tr>
<td>Parental Leave</td>
<td>In firms of 50 employees or more, parents can take up to 12 weeks off work without penalty but usually without pay.</td>
</tr>
</tbody>
</table>

children are viewed as the possessions of their parents, and the government may only interfere with families in extreme circumstances of abuse and neglect. This legal concept, called *parens patriae*, was part of English common law originating in the fifteenth century.

The effects of *parens patriae* can be seen in the history of public welfare in the United States. The first nursery schools, day care centers, and public health programs in the United States were established in the nineteenth century. The state Boards of Charity, begun in 1863, were the first government welfare institutions. They provided protection from abuse for children living in orphanages and working in factories, but not for those living at home with parents. Two White House conferences on children, in 1909 and 1930, led to the creation of the Social Security Acts of the 1930s, which established a retirement pension for older people, a welfare system, aid to dependent children, and financial and rehabilitation services for needy children and their families. Because of the ideals of self-reliance and *parens patriae*, the government confined its protective activities to the most needy segments of society.

In contrast, there are very few government programs to guarantee high quality health care and education for the majority of children under 3 years (Lippit, 2001). Few states have such standards for day care, and there is no national day care policy. In the later twentieth century, national and state legislatures passed laws to provide, as a basic right, parental leave policies so that parents (men and women) with young infants may take up to six weeks of unpaid time off from work after their baby is born without fear of losing their jobs.

Although few programs provide direct benefits to families with infants, tax money is used to benefit families in some indirect ways. Corporations receive income tax deductions for providing on-site day care centers. Parents can deduct the cost of child care from their incomes, thereby reducing their overall income tax burden. This, however, is not much of a help to families in which both parents have to work just to get by. They often cannot afford child care of good quality, and the lack of legal standards encourages the proliferation of poor-quality day care.

In many ways, the United States is unique among the developed countries of the world in its reluctance to support infant development as a national policy. Infant health care, proper nutrition, clean and well-managed child care that is affordable, and paid parental leave policies have all been publicly supported by law with tax funds for many years in such countries as France, Sweden, China, and Japan.

In those countries, there is no argument that all infants and children are in the national trust, that they are the most valuable resources a society has, and that all families with infants and children deserve encouragement and government support. In the United States, these issues are controversial because of the fear that government will impinge on the rights of individuals and families. In the United States, it seems that the damage done daily to the mental and physical health of millions of poor and homeless and even some middle-income infants and children is the price we are willing to pay for our frontier-day notions of personal freedom and self-reliance.

In the absence of a set of nationally recognized values in support of infants and children, private-sector advocacy groups that speak out for children’s rights have formed at the local, state, and national level. Most of their members are volunteers, and they are supported entirely by private funds. Child and family advocacy has become an important part of the social and political fabric of the United States. Professional advocates—whose salaries are paid by the organizations—work with volunteers, parents, child care professionals, and researchers to make phone calls, prepare position papers, and contact lawmakers. Not all these advocacy groups have similar positions. Some want more funds for day care centers, while others want tax breaks to allow parents to stay home and raise their own children.

While some advocacy groups are founded on religious or cultural values, other groups seek the support of scientific findings that speak directly to the need of infants. Although there are many
thousands of research studies on infants, it is rare to find studies of infants in the real world, taking account of the complex interdependent relationships between family income and cultural background, parental work, community resources, the growth of brain and behavior, and children’s special needs. More research is needed that takes a biocultural ecological systems perspective in which all these factors in the family ecology are taken into account (Phillips & McCartney, 2005; Yoshikawa & Hsueh, 2001). Research on intervention programs becomes especially difficult and costly because there are a vast range of individual, community, religious, and cultural factors that may influence how an intervention program can be implemented with success or failure (see Chapter 12; McCall, 2009).

Advocates and other policy makers in the public and private sectors, however, have different priorities than researchers. These are shown in Table 1.4. This means that researchers must learn to become more “political” about promoting their work for policy makers, and that policy makers need to better appreciate the usefulness of the knowledge gained from scientists. Most scientific professional organizations whose members study infant development, such as the Society for Research in Child Development (www.srcd.org) and the American Psychological Association (www.apa.org), have their own advocates who work with lawmakers to help translate the findings of research into working public policies.

There are advantages and disadvantages when political and economic agendas affect the types of research being done and the types of services provided to communities. Much of the funding for research and intervention on infant development comes from the government and from private foundations, both of which may have political agendas depending on who is in charge. Sometimes politics can promote research in areas that have been neglected, such as the National Institute of Health (www.nih.gov) guidelines for researchers to be inclusive across racial, ethnic and gender categories.

Sometimes political agendas can obscure and direct attention away from pressing needs. The United Nations has been a strong promoter of taking a global perspective on human development, with special emphasis on poor countries that lack clean water, proper infant nutrition, and health care, and may be suffering from the post-traumatic stresses of years of warfare, genocide, and deprivation. The United Nations takes the view that health and welfare of developing infants and children are the best measures of a nation’s wealth (Thérien, 2012; http://www.un.org/cyberschoolbus/humanrights/resources/plainchild.asp). The United Nations, however, has relatively little money to implement intervention and research in these areas. Within a wealthy country, taxpayers influence politicians to spend their money on local and national causes. Although some wealthy

<table>
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<th>TABLE 1.4 Differences Between Policy Makers and Scientists</th>
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<tr>
<td><strong>Policy Makers</strong></td>
</tr>
<tr>
<td>Serve their constituencies</td>
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<tr>
<td>Act and decide</td>
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<tr>
<td>Based on relationships between key players</td>
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<tr>
<td>Based on power and influence</td>
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<tr>
<td>Immediate actions</td>
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<td>Mistakes are punished</td>
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<td>Communication is oral</td>
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nations do contribute to alleviating the effects of poverty on a global scale, the gap between rich and poor continues to widen. Private foundations—such as the Bill and Melinda Gates Foundation, dedicated to improving health in poor countries www.gatesfoundation.org—may arise to fill some of these needs, but in the short term the economics of private enterprise tend to win out over the reality of human suffering.

**SUMMARY**

The Importance of Infancy

- Prenatal and infant development are frequent topics in the news, on television, and in the movies today.
- The more a parent knows about infants and children, the lower his or her anxiety will be, and the better the outcomes will be for the child.
- Infancy is a unique stage in the life course. This is not only because it is the earliest stage of life, but because all life’s stages are unique.
- The preverbal experience of the body is uniquely human. After infancy, many physical and mental disorders of children and adults can be traced to a person’s losing touch with his or her own body.
- Because of the vulnerability of infants, many social and medical problems could be prevented by making sure that infants receive proper care and that young parents receive all the support necessary to provide the best environment for their children.
- Many differences between people during the prenatal and infancy periods have a lasting impact on later individual differences.

A Brief History of Babies

- During all periods of recorded history, some infants and children have received love and care while others have been abused or neglected.
- Beginning in the Middle Ages, urbanization brought about changes in the family and in the health and safety of infants.
- In the eighteenth century, the ideas of romanticism and empiricism marked the beginning of philosophical and educational efforts directed toward infants.
- In the nineteenth century, the development of the nuclear family, along with advances in infant medical care, led to the discovery of infancy as an important period in the life course.

The Scientific Perspective on Infancy

- In the nineteenth and twentieth centuries, infants became the subjects of scientific study sparked by the debate over whether nature or nurture has the most influence on behavioral development.
- On the nature side, species evolve by natural selection in which the individuals who are best adapted to their environment can reproduce and pass their genes onto the next generation.
- Critical periods are times in early development when the fetus or infant is particularly susceptible to environmental influence, and on which all later learning and development depend.
- On the nurture side two types of learning processes were studied by scientists in the twentieth century.
- Classical conditioning is learning by association that occurs when unconditioned and conditioned stimuli are paired during training.
- Operant conditioning occurs when the frequency of behavior is controlled by its consequences: reinforcement, punishment, and extinction.
- Freud introduced the idea that infants have an emotional life.
- The Piagetian constructivist approach suggests that infants are intelligent by means of their own explorations in the world. Infant intelligence is of a sensorimotor rather than a verbal-symbolic form.
- Developmental changes are nonreversible and permanent, and they occur in a sequence.
- The division of infancy into stages of development is somewhat arbitrary and depends on the purposes of the culture or group.

Systems Perspectives on Infant Development

- A system is a set of interdependent components, each of which affects the others in reciprocal fashion. The process by which systems components affect each other is known as transaction.
- Bio-ecological systems theory suggests that infant development is related in direct and indirect ways to the family and to society, and vice versa.
- Dynamic systems theory introduces elements of self-organization and indeterminacy into the process of
development. Individual differences are not always predictable as a direct result of particular causes, but rather emerge creatively as part of the complex dynamics of action.

**Research Methods in Developmental Science**

- Scientists rely on many sources of evidence, try to separate what is repeatable and stable from what is coincidental, and attempt to rid observations of bias.
- An experiment is a research study in which one aspect of the situation is manipulated while all other aspects are held constant or controlled.
- The independent variable is that which is controlled or manipulated by the experimenter. The independent variable is the presumed cause of the phenomenon. The dependent variable is the outcome behavior that is observed in response to the changes in the independent variable.
- Methods that rely on natural variations rather than random assignment to create contrast groups are called observational research methods.
- Longitudinal studies follow the same children at different ages, while cross-sectional studies use different children at different ages.
- In observational studies, the variable that is the presumed cause is called the predictor variable. The presumed effect is called the outcome variable. There is an analogy between independent variables and predictor variables, and between dependent variables and outcome variables.
- Bias is reduced in research by attention to reliability, validity, observer bias, and representativeness.
- Because infants cannot provide informed consent to participate in research, their parents must do so. Researchers need to observe ethical guidelines when using human subjects in research.
- Qualitative research does not use quantity or number. It is characterized by one or both of the following features: (1) the observers focus on the meaning of the situation for the participants; and (2) the role of the researcher in the situation is explicitly taken into account.
- Qualitative researchers’ credibility depends upon their skill, experience, and rigor.
- Societies differ in how much of their public funds go to the welfare of children and their families.
- Advocates in a democratic society must participate in the process of changing local, state, and federal programs and policies regarding infant and family development.
- Researchers and policy makers need to better understand their differences to work together for the benefit of children and their families.