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CHAPTER 1

THE STUDY OF HUMAN DEVELOPMENT

If I have seen further . . . it is by standing upon the shoulders of Giants.

—Sir Isaac Newton

Science is built up with facts, as a house is with stones. But a collection of facts is no more a science than a heap of stones is a house.

—Jules Henri Poincaré

Science is best defined as a careful, disciplined, logical search for knowledge about any and all aspects of the universe, obtained by examination of the best available evidence and always subject to correction and improvement upon discovery of better evidence. What's left is magic. And it doesn't work.

—James Randi

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WHAT IS DEVELOPMENT?

This is a book about human development, some of the different theories that have been proposed to explain how development takes place, and, perhaps most interesting, how we might apply these theories to our everyday lives. If you made a list of all the things you did and all the things you thought about in the course of one day, it would probably end up including thousands of items. Such a list of thoughts and events, recorded over a period of days or months, could be called a description of your developmental repertoire—a sort of picture of what you are like as a person.

On a grand scale, your behavioral repertoire represents the developmental process; it helps to explain how you got from point A to point B and what happened along the way. Throughout this book, you will find questions about this process. What different accounts have theorists proposed to help us understand how this developmental process happens? Why might people's behavior in adulthood be so different from their behavior when they were infants? Does individuals' behavior change from the time they are newborn infants to when they are preschoolers, middle school–age children, teenagers, and on into adulthood because of biological programming or because of environmental factors, such as the influence of parents and peers? Are the changes that we experience abrupt in nature or smooth and predictable? Do people change because of the amounts and kinds of stimulation they receive in their schooling? Are you what your environment made you, or is your behavior an expression of your biological inheritance?

On the Web

Despite its name, the National Institutes of Health (at http://www.nih.gov) does not focus exclusively on "health." In fact, the NIH includes 28 institutes, offices, and research centers devoted to many directly and indirectly health-related subjects, ranging from the National Library of Medicine (at http://www.nlm.nih.gov) to the National Institute on Aging (at http://www.nia.nih.gov) to the National Institute of Child Health and Human Development (at http://www.nichd.nih.gov). These Web sites provide access to a good deal of information about biomedical science, but they also will lead you to a vast amount of information on the social, physical, and psychological aspects of development throughout the life span.

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Regardless of the terms we use to pose these and other questions, we can think of **development** as a progressive series of changes that occur in a predictable pattern as the result of interactions between biological and environmental factors. But how is it that one set of factors predominates in certain domains (such as intelligence) and another set of factors predominates in others (such as personality)? Are the percentages of the contributions of biological and environmental influences fixed, or are they variable? How important are people's early experiences? What role does age play in development? How can we explain novel behaviors? Why are most children able to walk alone when they are somewhere between 10 and 15 months of age? Why and how does one stage of development follow another? Why do most children acquire language in the first few years of life? Why is it that some children learn quickly whereas others learn slowly? Are most aspects of development inevitable in a "normal" child? How are theories of development different from each other? How are they the same?

Development is the result of complex interactions between biological and environmental influences.

All of these questions are examples of problems addressed by the field of developmental psychology and the study of human development. Answers to these and many other questions are likely to come from the research efforts of psychologists, educators, pediatricians, linguists, sociologists, and others who use the tools and knowledge of their own disciplines to understand the developmental process. The answers to these questions (or the best answers available at this time) are valuable to scholars and practitioners in these and other groups because they lead to greater understanding of the process of development and how positive developmental outcomes might be maximized.

The different theoretical accounts of development you will read about in this book have all had significant influence on many of the answers to these questions. The theoretical perspectives discussed here are differing and sometimes complex points of view formulated by scholars who have attempted to account for the factors that control and explain the developmental process.

A DEFINITION OF SCIENCE

Whatever is known today in any given scientific discipline is the cumulative result of the efforts of people who have devoted their lives to seeking out truth, separating fact from fancy, and trying to understand what happens around them. All of these efforts, and more, are what science is about. Jacob Bronowski (1977), the well-known mathematician and writer, defines **science** as "the human activity of finding an order in nature by organizing the scattered meaningless facts under universal concepts" (p. 225). Science is the process through which we organize bits of information. This process lends meaning and significance to otherwise

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Science is the process through which humans organize information and knowledge.

unrelated and obscure particles of knowledge. Science is also a process through which ideas are generated and new directions are followed.

Science is the way in which we bond facts or knowledge together to form something different from what was there before the process began. In fact, by "doing" science, we give coherence and integrity to the fragmented events we observe in the world. It is not sufficient to study an isolated fact (such as "children walk at around 9 to 12 months of age"); one must pursue information about how this fact might be related to other events (e.g., in a child's life, the fact that a certain level of physical maturity is critical before the child can begin walking). Science is very much like the blueprint that a builder uses to understand how the many different parts of a structure fit together to form something that is more than the sum of the individual parts.

"Doing" science consists of asking a question, defining the elements of the question that will be studied, testing the question, and accepting or rejecting the assumptions on which the question is based.

In addition to its dynamic qualities (describing how things happen), science also has static qualities (describing what happens). The static and the dynamic qualities of science go hand in hand because, in part, each determines the other. When people do science, they are taking a logical approach to solving some kind of problem as well as producing a product. For example, through intensive research and experimentation (the process), scientists developed a vaccine (the product) that effectively immunizes children against polio.

Finally, science is also a self-correcting process; advances and setbacks all contribute and help to refine researchers' subsequent efforts at answering certain questions or understanding certain issues. Through the nature of the process itself, science generates answers that provide scientists with valuable feedback. In a pure sense, scientists do not set out to prove certain ideas correct or incorrect, because they are constantly asking, answering, and reformulating questions. Instead, scientists test ideas or hypotheses. They evaluate the outcomes of their experiments and reflect on how new information might modify their original questions.

For example, we might observe a series of interactions between a parent and child and notice that the two of them are talking to each other and generally "having fun." We can further understand the developmental significance of "having fun" by examining the parent-child interchange in more detail and looking, perhaps, for a pattern of behavior. We might then look to see if there are similar behaviors between parents and their children in other groups, thereby lending more or less strength to our ideas about the dynamics of human interaction.

The scientific method is important in any field that includes among its goals the organization of knowledge and the generation of new ideas. It is important to remember that the principles involved in doing science are applicable in all scholarly disciplines, whether the focus is developmental psychology, history, biology, or some other subject. In the next section, I discuss some of these principles and how they relate to each other.

A MODEL OF SCIENTIFIC INQUIRY

Science can be seen as a four-step process:

1. Asking a question
2. Identifying the factors or elements of that question that need to be examined
3. Testing the question
4. Accepting or rejecting the premise on which the original question was based

The four steps of the scientific method help us to ask and answer questions about development systematically.

The first step, *asking a question,* involves recognizing that something of interest or potential value needs further investigation. What might be a source for such a question? These "first" questions most often do not originate in laboratories, in discussions around conference tables, or in any other highly controlled environment. Some important questions may be identified in or referred to such places, but they are not usually where the questions initially surface. Instead, everyday experiences and events are the sources of most first questions, and thus of most scientific inquiry. These experiences and events can (and do) include art, music, literature, and, of course, events in the lives of individuals. For example, the development of a smallpox vaccine was prompted by Edward Jenner's personal observation that the only people who did not seem to be vulnerable to the disease were women who tended cows. In turn, this observation led to Robert Koch's development of germ theory, a basic and important principle of immunology. Another example is the popular version of Isaac Newton's "discovery" of gravity when he was hit by an apple that fell from a tree. Even if the story about Newton is an exaggeration, it still makes the point: The personal experiences of individuals play a vital role in the development of valuable research questions.

It is impossible to overstate the importance of formulating and asking the right question—it is the first step toward getting a useful answer.

Another example, and one that is more central to the theme of this book, is the observation that children's cognitive development occurs in a series of different and distinct stages. Many developmental psychologists have made this observation informally and then studied the stages they identified systematically.

Clearly, not everyone has the skill to identify those aspects of an experience or to ask the kinds of questions that might lead to new knowledge. From what the untrained mind sees as confusion and disarray, the trained mind selects important events. As Louis Pasteur noted, chance favors the prepared mind, and the knowledge base from which most scientists operate (as a result of long and intensive training) provides this necessary advantage.

The second step in the process of scientific inquiry is *identifying what factors are important and how they will be examined.* For example, one of the theorists discussed later in this book, Robert Sears, examined the wide range

One of the ways a researcher identifies important factors is by conducting a search of the previous literature, including reports on the work of other researchers.

of differences in the ways parents raise their children. A psychologist might begin such an examination by identifying factors that could be involved in these differences, such as the number of children in the family, the children's sexes, the order of their birth, the family's social class, and the educational status of the parents. In other words, the developmental psychologist would identify the critical factors that are possibly related to the question asked. At this point, the investigator is no longer speculating ("Isn't this interesting!"); rather, he or she is beginning to ask pointed questions about the importance of certain factors and the nature of the relationships between those factors.

This is also the point at which the researcher must make decisions regarding how the questions will be answered. This part of the process involves the design and completion of the research. For example, if one is interested in the effects of environmental stimulation on intellectual development, one could design an experiment to compare the intellectual development of children who were reared in an enriched environment (perhaps beginning school at an early age) with that of children who have not experienced an enriched environment (perhaps having spent time in an institution). This is the step in the model where the scientist asks, How do I go about answering my question? At this point, he or she must operationally identify important factors (or variables), state the possible relationships among them, and determine what method he or she will use in doing the actual research. (If you are interested in an examination of the different research methods and techniques used in developmental psychology, see Overton, 2000.)

The third step, *testing the question,* is the most hands-on part of the scientific process. In this step, the scientist actually collects the data necessary to answer the question. For example, at this point a chemist conducts tests to see which of three compounds most effectively acts as a catalyst; a developmental psychologist at this point might conduct a survey of the problem-solving skills of children with learning disabilities. Once the scientist has gathered the essential information (reading scores, X-ray analyses, responses from an interview), he or she applies some kind of tool (such as a statistical test or an objective criterion) to determine an outcome, and then compares that outcome with what he or she proposed in the original question to see if the two are consistent.

For example, a teacher may be interested in knowing whether students learn to read with more comprehension when he uses programmed instruction than they do when he uses a more traditional teaching method. One way the teacher could test this question would be to compare the scores of groups of students taught using the two methods on a test of comprehension. The tool the teacher might use in making this comparison could take the form of a statistical test that assigns a probability that any difference between the groups results from either chance or exposure to one of the two reading programs.

The last step in the scientific process is *accepting or rejecting the premise on which the original question was based* (and perhaps questioning the accompanying theoretical rationale). Regardless of the outcome, however, the scientific process does not stop here. If the original question the scientist asked (for example, Does early enrichment influence a child's intellectual development?) is answered yes, the scientist continues asking additional questions and pursuing each question through the four steps just outlined. If the results do not support the predicted outcome, the scientist returns to the premise of the original question and reformulates the research accordingly. This may not result in a change to the question itself, but it will perhaps have some effect on the scientist's approach to the question and the meaning of the results. For example, the first method the scientist chose may not have been appropriate to the question asked. It is the scientist's responsibility to decide which parts of the process he or she may need to reconsider. This is why scientific research is an always ongoing process. Scientists are continually redesigning their experiments to accommodate new information, new technologies, and, of course, new findings.

The four steps involved in scientific inquiry discussed above are summarized in Table 1.1, which also provides an example that illustrates the progressive and focusing nature of the scientific process. As you can see, the scientist begins with a personal observation and works toward a specific test of a clearly defined question that results in a decision as to what the next question should be.

TABLE 1.1 A Model of Scientific Inquiry

Step	***Example***
1. Asking the question	Do children who are raised in different types of homes develop different levels of intelligence?
2. Determining what factors are important and how they will be examined	The important factors are parents' child-rearing style, home environment, and child's intellectual ability. Differences in children's intellectual ability will be examined through comparisons of groups of children from different homes.
3. Testing the original question	A test will be done to determine whether any differences exist between the two groups and whether any differences found are the results of parenting styles or some other factors (such as chance).
4. Accepting or rejecting the premise	Depending on the outcome of Step 3, the original question will be reconsidered, and, if necessary, more specific questions will be asked.

TOOLS OF SCIENCE

The model of scientific inquiry discussed above and illustrated in Table 1.1 requires a set of tools or concepts to make it work. In the following subsections, I discuss the different tools or mechanisms of science: theory and its elements, hypotheses, constructs, and variables.

Theory: Definition, Function, and Criteria

A **theory** can be defined as a group of logically related statements (for example, formulas, ideas, or rules) that explains events that happened in the past as well as predicts events that will occur in the future. A theory has three general purposes:

A theory is a group of related statements that explains what happened in the past and helps to predict what the future might bring.

- It provides a guide that scientists can use in collecting the kinds of information they need to describe some aspect of a phenomenon (e.g., development). For example, a theory of language acquisition might allow a researcher to describe the process of babbling and then the use of one-word sentences (or holophrases) in great detail.
- It serves to help scientists in integrating a set of facts into general categories. A theory of decline in aging, for example, might aid a researcher in organizing and better understanding otherwise unrelated occurrences of falls and loss of balance in older adults.
- It helps scientists to present material and information in an organized and coherent way, so that subsequent efforts at answering the same or related questions are not just random, groundless efforts.

—— On the Web ——

The *Skeptical Inquirer* bills itself as “the magazine for science and reason,” and many people believe that is an accurate description. You can access *Skeptical Inquirer* articles online at http://www.csicop.or/si. The magazine’s entertaining and informative content, written for the most part by scientists, includes reviews of research into scientific phenomena and discussions of important issues in various fields (such as the “nature versus nature” debate in developmental psychology).

TABLE 1.2 Sidman's Six Criteria for Judging a Theory

Criterion	***Question***
Inclusiveness	How many different phenomena does the theory address?
Consistency	How well can the theory explain new things without having its basic assumptions changed?
Accuracy	How well can the theory predict future outcomes and explain past ones?
Relevance	How closely is the theory related to the information collected within that theory? That is, how well does it reflect the facts?
Fruitfulness	How well does the theory generate new ideas and directions for inquiry?
Simplicity	How simple or unencumbered is the theory? That is, how easy is it to understand?

Evaluating Theories

To evaluate the utility of a theory, we need to apply suitable criteria, asking questions about the theory so that we can understand its usefulness. Murray Sidman (1960) identifies six such criteria: inclusiveness, consistency, accuracy, relevance, fruitfulness, and simplicity (see Table 1.2). Although some of the definitions and uses of these criteria may overlap, each is an important indicator of how well a theory measures up. I address Sidman's criteria in more detail in Chapter 11, where I present a comparison of the different theoretical perspectives discussed in this book and how they compare to one another on each of the criteria. I describe each criterion only briefly below.

The criterion of **inclusiveness** concerns "the number and type of phenomena [a theory] encompass[es]" (Sidman, 1960, p. 13). For example, Einstein's theory of relativity deals with many different types of events, including the relationship between time and space, the nature of light, and the speed of objects. In the study of human development, some theories (such as general theories of development) attempt to explain a great number of different events, whereas others attempt to explain only relatively small segments of particular phenomena (such as theories of play).

The criterion of **consistency** concerns whether a theory can explain new discoveries without the need for any changes in the assumptions on which it is based. A theory tends to become more consistent the more it is tested, because it is

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constantly being refined—over time, the assumptions become more consistent with new findings. Newton's theory of gravitation is highly consistent: It is applicable to many different situations, all of which illustrate the basic principle that all bodies in nature have a mutual degree of attraction to one another. When a theory is highly consistent, new discoveries tend to be consistent with its basic assumptions.

The **accuracy** of a theory is the degree to which it correctly predicts future events or explains past ones. This criterion is all about how "good" a theory is—how well it does what it says it can do. In a given situation, one theory may be so accurate that it predicts almost every outcome, whereas another theory may be so inaccurate as to be almost useless. The accuracy of any theory depends, of course, on the question being asked. In other words, some theories are better suited to addressing concerns (and answering certain questions) in one area of development than in others.

The criterion of **relevance** concerns the directness of the link between the theory itself and the data collected within that theory. For example, if you are interested in the influence of mother's prenatal nutrition on a child's later intellectual development, you would examine variables such as mother's eating habits and developmental quotient (DQ), not the weight of the baby at birth.

We can evaluate any developmental theory by measuring it against the criteria of inclusiveness, consistency, accuracy, relevance, fruitfulness, and simplicity.

The criterion of **fruitfulness** concerns how productive a theory is in generating new ideas and directions for future research. Many developmental theorists have produced work that is known not for its immediate application, but for its generative qualities. Such theories serve to stimulate further research. Perhaps the best example of this is the profound influence of Sigmund Freud's ideas on the generation of subsequent ideas about the developmental process (even if Freud acknowledged that he was not successful in convincing his peers to accept his theory of psychosexual development).

Sidman's final criterion addresses a general goal of all science: simplicity. The **simplicity** criterion is concerned with whether the degree of detail in a theory makes the best use of the information available. An ideal theory is simple (or *parsimonious*); that is, it is both prudent and efficient. In science it is generally true that the simpler a theory, the more parsimonious it is. Some theories are simple and straightforward in their presentation, whereas others are so encumbered with assumptions that their usefulness is restricted. In general, these latter theories are very difficult to use in anything other than highly specific situations. One generally accepted theorem of science is Occam's razor (a principle put forth by the philosopher William of Occam during the Middle Ages), which states that one should not make more assumptions than the minimum needed. In other words, given two explanations for an outcome, usually the simplest one is correct. This rule is called a razor because it "shaves off" ideas and such that are not really needed to explain outcomes.

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It is doubtful that any theory meets all of Sidman's criteria, although a theory that meets some of them might almost certainly meet others. It would be surprising, for example, if a theory that is highly inclusive (applicable in many settings) is not also fruitful, given its wide range of applicability and its generation of new directions for study. Perhaps it is best if we view each criterion as a separate goal, something worthy of consideration but not absolutely necessary, as we evaluate how well various theories increase our understanding of development.

Theories both explain and predict. In addition to organizing already established bodies of information, they serve as road maps for future inquiries. In many ways, tables of contents and indexes in books serve a purpose similar to that of theory in that they organize information. Imagine how difficult it would be to locate specific information in a book without a table of contents or index. Theories make phenomena more intelligible, make the existing knowledge about phenomena easier to assimilate, and provide frameworks within which questions can be asked.

Although a theory is often the final product of an effort to organize information, a theory can be a responsive and changing tool. According to the model of scientific inquiry presented above and in Table 1.1 (page 9), new information stimulates a theory's evolution, either by supporting its basic assumptions or by triggering reconsideration and refinement of those assumptions. A theory is as much a changing tool used by scientists as it is an end unto itself.

Elements of a Theory: Variables, Constructs, and Hypotheses

As discussed above, the first two steps in "doing science" are asking a question and deciding what factors the investigation will focus on. In other words, what "things" does the scientist need to measure, assess, or examine to increase the likelihood that the answer reflects the real world?

For example, if a psychologist wishes to study the interaction between a mother and her child, she must decide what to study about this interaction. The "whats" that she decides to study are called *variables.* In this context, a **variable** is anything that can take on more than one label or value; it usually represents a class of things. Examples of variables that are often of interest to researchers are College Board test scores (which can range from 200 to 800), biological sex (male or female), and occupation (lawyer, construction worker, home economist, and so on). In the example of the psychologist studying mother-child interactions, the number of times the mother makes contact with the child per minute is an operational measure of a variable the psychologist might call parent-child interaction.

A variable is anything that can take on more than one value, such as height, weight, or intelligence.

Constructs, or groups of variables that are related to each other, are important elements of theories. In some developmental theories, for example, a construct called "attachment" consists of a number of different behavioral variables, including eye contact, physical touching, and verbal interaction between parent and child. It is important to note that a construct's name can determine its usefulness. The same set of behaviors that make up the construct of attachment could be arbitrarily called many different things, such as "affection," "familial interaction," or "visual contact." If the terminology used to define a construct is so narrow that it defines a very limited set of behaviors (such as "visual contact"), the construct may become no more descriptive than a variable and so may be severely limited in its usefulness.

A construct is a group of variables that are related to one another.

Using a construct is more efficient (or parsimonious) than dealing individually with each of the variables that make up the construct. For example, it is more efficient to discuss the construct of intelligence than it is to discuss the individual components of intelligence, such as memory, comprehension, and problem solving.

In developing constructs, scientists must consider many different variables, some of which may eventually be included in constructs and some of which may not. Constructs, then, are made up of variables that are related to one another on some theoretical level. Scientists often disagree with one another regarding which variables should or should not be included as part of particular constructs and what various constructs should be called.

The last component of theory development is the **hypothesis,** an "educated guess" that posits an "if . . . then" relationship between variables or constructs. Hypotheses are statements that represent the questions scientists ask when they want to gain a better understanding of the influences that variables have on other variables (or constructs). For example, a developmental psychologist might be interested in understanding the factors that influence moral development in young children. Through some informal contact with children, he has noticed that children at different developmental levels approach moral dilemmas in different ways. The psychologist might then formulate the following statement as a hypothesis: "There is a significant relationship between the developmental level of the child and the method the child uses to solve a moral dilemma." Implicit in this statement is an "if . . . then" proposition: If the developmental level of the child changes, then the way the child approaches moral dilemmas will change as well. The hypothesis becomes a direct test of a question.

A hypothesis is a statement that posits an "if . . . then" relationship between variables or constructs.

How does a scientist know whether a proposed hypothesis can be accepted as true or must be rejected as false? By collecting relevant data and applying some external criterion (such as a statistical test), the scientist can assign some level of confidence to the outcome. That is, the scientist can determine how confident he or she can be that the outcome of the research is a result of the variables that were examined (or manipulated) and not some other, extraneous influence. For

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example, a child's moral development might be a function of the society in which he or she grows up as well as of the child's level of development. For the psychologist in the example above to have confidence in the outcome of his experiment, he must not only take such factors into account, he must control for them.

The Relationship Between Science and Theory

The four-step model of scientific inquiry presented earlier in this chapter conveys the essence of how the scientific process operates. The development of a theory operates in a parallel way. Although the natural phenomena that theories represent (such as gravity or learning) may have been operating for eons, theories themselves are artificial, developed by scientists through a series of systematic steps that involve variables, constructs, and hypotheses. Theory development is a microcosm of the scientific process itself, and any progress that developmental psychologists might make in advancing specific theories is progress in the general science of developmental psychology as well.

In many ways, science and theory follow parallel courses of development and serve the same purposes.

Theory is the backbone of science; without it, scientific advancement could not be possible. Theories provide the frameworks within which scientists become aware of what questions are important to ask and what methods they should use to answer those questions. Without a theoretical context within which to operate, new information is nothing more than a quantitative addition to an already existing body of knowledge. However, when scientists are aware of where new data may or may not fit within a given framework, the premise under which they operate becomes infinitely more useful and moves closer to that abstract goal of truth, and the relevance of the new findings to applied settings can increase dramatically.

THEORIES OF DEVELOPMENT: AN OVERVIEW

All of the theories of development discussed in this book have different contributions to make to our understanding of the developmental process. Different theories are in agreement on some points and differ on others. Before I present these theories in detail in the following chapters, I want to summarize the characteristics that differentiate them from one another. In the following overview, I answer five important questions about each theory:

1. What are the basic assumptions of the theory?
2. What is the philosophical rationale for the theory?
3. What are the important variables most often studied in relation to the theory?

4. What is the primary method that proponents of the theory use to study development?
5. In what areas has the theory had its greatest impact?

The answers to these questions should prepare you for the in-depth discussions that begin in Chapter 3 and also provide you with a framework that you can use in comparing and contrasting the different viewpoints presented. Table 1.3 presents a summary of important points across the four different theoretical perspectives that this book covers: maturational, psychodynamic, behavioral, and cognitive-developmental.

Maturational and Biological Models

The maturational model stresses the importance of biological influences on development and has had its greatest impact on child-rearing practices.

The work of Arnold Gesell, the foremost maturationist in developmental psychology, represents a unique approach to the study of human development. As a physician, Gesell believed that the sequence of development is determined by the biological and evolutionary history of the species. In other words, development of the organism is essentially under the control of biological systems and the process of maturation. Although the environment is of some importance, it acts only in a supportive role and does not provide any impetus for change.

While working with G. Stanley Hall within the tradition of Darwinian influence that was very popular during the 1920s, Gesell applied the tenets of recapitulation theory to the study of individual development (or ontogenesis). Recapitulation theory states that the development of the species is reflected in the development of the individual. In other words, the child progresses through a series of stages that recount the developmental sequence that characterizes the species.

Gesell believed that the most important influences on the growth and development of the human organism are biological directives. He summarized this theory in five distinct principles of development, which he later applied to behavior. All these principles assume that the formation of structures is necessary before any event outside the organism can have an influence on development. It is interesting to note that Gesell was not alone in pursuing the notion that "function follows structure"; designers, architects, and engineers have also found a great deal of truth in this idea.

Gesell also believed that behavior at different stages of development has different degrees of balance or stability. For example, at 2 years of age, the child engages in behavior that might be characterized by a groping for some type of stability (the so-called terrible twos). Shortly thereafter, however, the child's behavior becomes smooth and consolidated. Gesell believed that development is cyclical in nature, swinging from one extreme to another, and that by means of these swings, the child develops and uses new structures.

TABLE 1.3 An Overview of Major Theories of Development

	Maturational and Biological	***Psychodynamic***	***Behavioral***	***Cognitive-Developmental***
What are the basic assumptions of the theory?	The sequence and content of development is determined mostly by biological factors and the evolutionary history of the species.	Humans are conflicted beings, and individual differences as well as normal growth result from the resolution of those conflicts.	Development is a function of the laws of learning, and environment has important influences on growth and development.	Development is the result of the individual's active participation in the developmental process in interaction with important environmental influences.
What is the philosophical rationale for the theory?	Recapitulation theory, preformation, and predeterminism	Embryological	Tabula rasa (blank slate)	Predeterminism
What are the important variables most often studied in the theory?	Growth of biological systems	Effects of instincts on needs and the ways instincts are satisfied	Frequency of behaviors	Stage-related transformations and qualitative changes from one stage to another
What is the primary method used in the theory to study development?	Use of cinematic records, anthropological data, normative investigations, and animal studies	Case studies and the indirect examination of unconscious processes	Conditioning and modeling paradigms	Observation of social and cognitive problem solving during transitions from stage to stage
In what areas has the theory had its greatest impact?	Child rearing, the importance of biological determinants, aspects of cultural and historical development	Personality development and the relationship between culture and behavior	Systematic analysis and treatment of behavior and educational applications	Understanding of how thinking and cognition develop in light of cultural conditions and demands

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Because he placed such a strong emphasis on the importance of biological processes, Gesell focused in the majority of his work (as did his colleagues, most notably Frances Ilg and Louise B. Ames) on biological systems as a beginning point for understanding development. Through Gesell's use of cinematic (moving picture) records, stop-action analysis provided the foundation for his extensive descriptions of "normal" development. This technique allowed Gesell to examine the frame-by-frame progression of certain motor tasks, from their earliest reflex stage at birth through a system of fully developed and integrated behaviors. For example, his detailed analysis of walking provided the first graphic record of the sequence this complex behavior follows.

Gesell also made a significant contribution with his development of the co-twin method for comparing the relative effects of heredity (nature) and environment (nurture) on development. In this method, one child in a pair of identical twins would receive specific training in some skill (such as stair climbing) and the other would receive no training in the skill. The rationale for this strategy was that, because identical twins have identical genetic makeup, any difference found in the two children's abilities in the skill that was taught to one and not the other must be the result of the training. This is the basic paradigm that Gesell used to question some very interesting and controversial statements about the nature of intelligence.

Unquestionably, Gesell's greatest contribution has been to the understanding of the development of the "normal" child. His detailed cinematic records, their analyses, and their translation into books for the popular press have influenced child-rearing patterns in the United States as much as have the books of the famous Dr. Spock (who incorporated many of Gesell's principles into his philosophy).

Gesell's ideas and theoretical approach never entered the mainstream of current thought about developmental psychology. Perhaps this is because many observers saw much of his work as too biological in nature and not sufficiently theoretical. From both historical and applied perspectives, however, Gesell's contribution was and still is an outstanding one.

Over the past few years, developmental psychologists have demonstrated heightened interest in other maturational approaches, most notably ethology and sociobiology (both of which I discuss in Chapter 4). These approaches, even more than Gesell's, emphasize the importance of biological and evolutionary principles as determinants of behavior.

The Psychodynamic Model

The psychodynamic (or psychoanalytic) model, developed initially by Sigmund Freud, presents a view of development that is revolutionary in both its content and its implications for the nature of development. The basic assumption of this model is that development consists of dynamic, structural, and sequential components, each of which is influenced by a continuously renewed need for the gratification of basic instincts. How psychic energy (or the energy of life, as it is sometimes called) is channeled through these different components constitutes the basis of the developmental process and individual differences.

The psychodynamic model assumes that development is the result of a continuing need for the satisfaction of instincts.

The dynamic or economic component of Freud's tripartite system characterizes the human mind (or psyche) as a fluid, energized system that can transfer energy from one part to another where and when needed. The structural or topographical component of the theory describes three separate, yet interdependent, psychological structures—the id, the ego, and the superego—and the ways in which they regulate behavior. Finally, the sequential or stage component emphasizes a progression from one stage of development to the next, focusing on different zones of bodily sensitivity (such as the mouth) and accompanying psychological and social conflicts.

It is difficult to identify the philosophical roots of psychoanalytic theory, because most psychoanalytic theorists would consider their roots to be in embryology, the biological study of the embryo from conception until the organism can survive on its own. This identification with a biological model has a great deal to do with Freud's training as a physician, his work in neuroanatomy, and his belief that biological needs play a paramount role in development. Some people believe that the philosophical tradition of preformation (which in its extreme form holds that all attitudes and characteristics are present at birth and only expand in size) is basic to the psychoanalytic model, but this may be untrue. Preformationists stress the lack of malleability of the developing individual, whereas the psychoanalytic model describes a flexible character for the individual and the potential for change.

Freudian theory places important emphasis on the resolution of conflicts that have their origins at an unconscious level. It states that the origins of these conflicts are biological and passed on from generation to generation. Development (and the development of individual differences) is an ongoing process of resolving these conflicts.

If the roots of behavior are located in the unconscious, how can they be accessible to study? Through a series of historical accidents, Freud was introduced to hypnotism as a method of treatment. This technique, in turn, gave birth to his now famous method called free association, in which individuals are encouraged to say freely anything that comes to mind in response to certain words or phrases. Freud believed that such exposition of underlying needs and fears is the key to understanding typical behavior. Free association is a highly subjective method of collecting information, and a large part of the criticism leveled against Freud and many of his followers has been directed at this practice. The theory itself, however, is based on abstract and subjective judgments, and the fact that the behaviors under study are not easily amenable to scientific verification has caused controversy for years.

However, the richness and diversity that Freud brought to a previously stagnant conception of development started a tradition that is healthy and strong even today. Perhaps Freud's most significant accomplishment was the first documentation and systematic organization of a theory of development.

The psychoanalytic model and the work of such theorists as Freud and Erik Erikson have undoubtedly had their greatest impacts in the study of personality and the treatment of emotional and social disorders. Erikson focused mainly on the social dimension of behavior, unlike Freud, who focused on the sexual dimension. The impact and significance of both men's contributions cannot be overstated.

The Behavioral Model

The behavioral model contends that development is the result of different types of learning as well as imitation and modeling.

The behavioral model characterizes a movement that is peculiar to American psychology and distinct from any other theoretical model. The behavioral perspective views development as a function of learning and as something that proceeds according to certain laws or principles of learning. Most important, it places the major impetus for growth and development outside of the individual—in the environment, rather than within the organism itself.

The importance placed on the environment varies among the specific theories within this general model, but in all cases the organism is seen as reactive instead of active. Almost every behavioral theory incorporates the assumption that behavior is a function of its consequences. If the consequences of a behavior (such as studying) are good (such as high grades), that behavior is likely to continue in the future. If the consequences of a behavior (such as staying out past curfew) are not good (such as loss of privileges), the behavior will change (perhaps the person will come home at an earlier hour or not go out at all on weeknights).

In the behavioral model of development, the laws of learning and the influence of the environment are paramount. Through such processes as classical conditioning and imitation, individuals learn what behaviors are most appropriate and lead to adaptive outcomes. Given that this model views development as a learned phenomenon, it allows for the breaking down of behaviors into their basic elements. This has led some people to view the behavioral model as "reductionistic."

The behavioral perspective views the newborn child as naive and unlearned. John Locke's notion of tabula rasa best exemplifies the philosophical roots of the behavioral tradition. Literally, *tabula rasa* means "blank slate." From this perspective, the newborn child is seen as a blank page waiting to be written on, with only the most fundamental biological reflexes (such as sucking) operative at birth. The organism is malleable, and behavior develops and changes as a result of events or experiences. This is a more open view than that of the maturational model or the psychodynamic model, because it sees human potential as unlimited by internal factors. The behavioral model does acknowledge that sometimes biological endowment (an internal factor) can limit developmental outcomes, as in the case of genetic disease or familial retardation, but it holds that even in the case of severe retardation, a restructuring of the child's environment can greatly affect his or her basic competencies and ability to perform such self-care functions as eating and using the toilet.

Given that the behavioral perspective emphasizes events that originate in the environment and their effects on the organism, it is no surprise that the variable of primary interest to behaviorists is the frequency with which (or number of times) a behavior occurs. For example, if a researcher is interested in studying an aspect of sibling interaction, he or she must make sure that the behaviors of interest are explicitly defined (or operationalized) and objective enough to be measured reliably. A construct such as "nice feelings" would not meet such criteria, but the construct "number of times brother touches friend" would.

Using frequency of behavior, the traditional way of studying development is to examine what effects certain environmental events have on behavior. Researchers most often do this by identifying and observing those events in the environment that control behavior and then, if necessary, manipulating the events to see if the behavior under observation changes. For example, if a child's speech is delayed, a psychologist might want to observe what the events are that surround the child's verbalizations when left to run their course. The psychologist might then suggest some intervention—for example, encouraging the child's parents to respond more directly to the child—and then conduct additional observation to see if there is any change. This type of research design, which behavior analysts use frequently, illustrates one way in which researchers can isolate and identify the effects of certain contingencies.

Most interesting, however, given behaviorists' lack of emphasis on biological age or stages of development, is the behavioral model's viewpoint that the sequence of experiences is the critical factor in development. In other words, when behaviorists discuss developmental status, experience—not age—is the important factor. Although age and experience are somewhat related, from a behavioral perspective age is not thought of as a determinant (or cause) of behavior; rather, it is only a correlate (a simultaneous outcome).

A more recently popular approach to understanding development (within the past 50 years or so) involves social learning theory and the work of such people as Robert Sears and Albert Bandura. The social learning theory approach to development is based very much on the same assumptions as the more traditional behavioral approach. A major difference, however, is that the social learning theory model incorporates ideas not found in the behavioral model, such as vicarious (or indirect) reinforcement (i.e., the individual does not need to experience something directly to learn it). This approach reflects the importance of the environment

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while at the same time suggesting that individual differences contribute something as well.

The most significant impacts of the behavioral model can be seen in advances in the systematic analysis of behavior, in changes in the treatment and management of deviant behaviors, and in educational applications such as programmed instruction.

The Cognitive-Developmental Model

The cognitive-developmental model focuses on the transitions between different stages of development and views the human being as an active participant in the developmental process.

The cognitive-developmental model of human development stresses the individual's active rather than reactive role in the developmental process and the individual's role in the social and cultural context within which he or she develops. The basic assumptions of the model are as follows:

1. Development occurs in a series of qualitatively distinct stages.
2. These stages always follow the same sequence, but they do not necessarily occur at the same times for all individuals.
3. These stages are hierarchically organized, such that later stages subsume the characteristics of earlier ones.

Another characteristic of the cognitive-developmental model that sets it apart from other theoretical models is the presence of psychological structures and the ways in which changes in these underlying structures are reflected in overt changes in behavior. The forms these changes take depend on the individual's developmental level. Many people categorize the cognitive-developmental model as "interactionist" because it encourages the view that development is an interaction between the organism and the environment.

The philosophical roots of this perspective are found in the predeterminist approach, which views development as a "process of qualitative differentiation or evolution of form" (Ausubel & Sullivan, 1970). Jean-Jacques Rousseau, the noted 18th-century French philosopher, wrote that development consists of a sequence of orderly stages that are internally regulated, and that the individual is transformed from one into the other. Although Rousseau believed that the child is innately good (and most of the early predeterminists believed that the environment plays a very limited role), modern cognitive-developmental theorists would not tacitly accept such a broad assumption.

Although the environment is decisive in determining the content of the stages of development, the important biological or organismic contribution is the development of structures within which this content can operate. For example, all

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human beings are born with some innate capacity to develop language and to imitate behavior. Human beings are not born with a capacity to speak a specific language, however, or even to imitate particular behavior. Children born in the United States of French-speaking parents would certainly not be expected to speak French (or any other language) without exposure to that language. Within the organismic model, the capacity for development emerges as part of the developmental process. Although the environment is an important and influential factor, the biological contribution is far more important, because it is the impetus for further growth and development. The sequence and process of development are predetermined, but the actual content of behavior within these stages is not.

Of primary interest to the cognitive-developmental psychologist is the sequence of stages and the process of transition from one stage to the next. It is for this reason that researchers have focused on the set of stage-related behaviors and their correlates across such dimensions as cognitive or social development. For example, a psychologist might be interested in examining how children of different ages (and presumably different developmental stages) solve a similar type of problem. After observing many children of different ages, the psychologist can postulate the existence of different types of underlying structures that are responsible for the strategies children use.

A great deal of Jean Piaget's work has been directed toward reaching a better understanding of the thinking processes that children at different developmental levels use to solve problems. In fact, much of the Piagetian tradition emphasizes that these different ways of solving problems reflect, in general, different ways of seeing the world. Another cognitive-developmental theorist, Lev Vygotsky, also placed a great deal of importance on the accomplishments of the individual in his or her own actions, but unlike Piaget, Vygotsky emphasized the role that culture and outside influences play in leading the individual toward the next level of development.

Considering cognitive-developmental psychologists' interest in the concept and use of stages, it is not surprising that the primary method these scholars use to study behavior is the presentation of problems that emphasize differences in structural organization. An infant might depend on purely sensory information (such as touch or smell) to distinguish among different classes of objects, whereas an older child might place the items in a group of objects into categories based on more abstract criteria (such as "these are all toys, and these are food"). The "how" of development is seen to be reflected in the strategies that children use at qualitatively different developmental levels to solve certain types of problems. More important for cognitive-developmental psychologists, however, is *why* these differences are present. Studies examining this issue have resulted in a model that hypothesizes that different underlying structures are operative at different stages.

Undoubtedly, the greatest impacts of the cognitive-developmental approach have been in different areas of education. Given that much of the research conducted over the past 50 years by cognitive-developmental theorists has focused on the general area of "thinking," this may come as no surprise. The educational philosophy and practices that have arisen out of this theoretical perspective emphasize the unique contributions that children make to their own learning through discovery and experience. Children are allowed to explore within environments that are challenging enough and interesting enough to facilitate the children's growth within their individual current stages of development.

WEB SITES OF INTEREST

- "Internet History and Philosophy of Science," at http://www.humbul.ac.uk/tutorial/hps: You can't really have a good understanding of science and its important role in humankind's understanding of the process of human development without knowing something about the philosophy of science. This Web site will provide you with an introduction.
- "The Scientific Method," by Paul Johnson, at http://paedpsych.jk.uni-linz.ac.at/internet/arbeitsblaetterord/wissenschaftord/faqsscience.html: Johnson provides an excellent introduction to the scientific method, discussing, among other things, what the method is; the distinctions between a fact, a theory, and a hypothesis; and Occam's razor. This Web site is very informative and even a bit fun.
- "Thomas Kuhn," at http://www.emory.edu/EDUCATION/mfp/Kuhnsnap.html: Thomas Kuhn's *The Structure of Scientific Revolutions,* published in 1962, continues to have profound effects on the definition and study of science. It should be on any scientist's reading list. This Web site provides some information about Kuhn and his influence.

FURTHER READINGS ABOUT HUMAN DEVELOPMENT

Ciarrochi, Joseph, Forgas, Joseph P., & Mayer, John D. (Eds.). (2001). *Emotional intelligence in everyday life: A scientific inquiry.* Philadelphia: Psychology Press.

Emotional intelligence (EI) is defined here as the ability to perceive, understand, and manage emotions, and this book is a good example of how theory is developed and can be applied to everyday situations. It provides an informative and interesting review of scientific research in the field and the ways in which EI is important to everyday life.

Hatfield, Gary. (2002). Psychology, philosophy, and cognitive science: Reflections on the history and philosophy of experimental psychology. *Mind and Language, 17,* 207–232.

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This article presents some history of psychology with which any psychology student should be familiar. Hatfield discusses psychology's birth as a discipline and the relationship between psychology and philosophy.

Meltzoff, Andrew N. (2002). Elements of a developmental theory of imitation. In Andrew N. Meltzoff & Wolfgang Prinz (Eds.), *The imitative mind: Development, evolution, and brain bases* (pp. 19–41). New York: Cambridge University Press.

For years, scientists have examined the phenomenon of imitation during infancy. In this chapter, Meltzoff describes his work on imitation in human infants and proposes that infant imitation precedes the development of empathy toward others and theory of mind, a relatively new and important construct that psychologists are now studying. (In Chapter 8, I discuss the importance of imitation in social learning theory.)

White, Sheldon H. (2002). Notes toward a philosophy of science for developmental science. In Willard Hartup & Richard A. Weinberg (Eds.), *Minnesota Symposium on Child Psychology: Vol. 32. Child psychology in retrospect and prospect: In celebration of the 75th anniversary of the Institute of Child Development* (pp. 207–225). Mahwah, NJ: Lawrence Erlbaum.

In this chapter, White, a well-known developmental psychologist, discusses the contributions of three important periods during the establishment of what he calls "developmental science." The first, around 1895, created a cooperative naturalistic study of children. The second, the child development movement, which began in the 1920s, was based in a number of child development institutes and centers. The final period that White discusses began in the 1960s and continues today. Read this chapter along with the article by Hatfield described above, and you'll be both a philosopher and a historian.

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