Chapter 1

Theories as Windows for Looking to See

Preview Questions

Why is it important to understand theories?
What is a theory?
How is a theory different from a model?
What are the structural components of a developmental theory?
Why do theories contain jargon?

REASONS FOR STUDYING THEORIES

Charles S. Peirce, one of the architects of American pragmatic philosophy, is credited with the saying that there is nothing more practical than a good theory (Lincourt, 1986). Theories are useful because they attempt to explain things that cannot explain themselves. Many important questions about human nature ultimately require theories rather than facts for answers (e.g., How do children learn new concepts? Why do infants form attachments with their primary caretakers? How do child-rearing practices affect personality development?). Theories are one of the hallmarks of science, and their importance is so fundamental that theories themselves are often a primary focus of the scientific enterprise.

Why should people want to study developmental theories? In my opinion, five principles provide the answer to this question and thereby help us understand why developmental psychologists spend so much time creating and testing them. Collectively, these principles imply that any systematic explanation of human nature must be preceded by an examination of its theories.

Principle 1. Theories tell us how to organize facts and interpret their meaning. Facts cannot explain themselves. They do not organize themselves for our review;
and they have no automatic force that indelibly stamps our minds with their meaning. Royce (1976) makes this point directly when he notes that theories are crucial to the conduct of science because facts can mean different things in different theoretical contexts. Theories organize and interpret facts differently, each according to its own principles.

It is a well-known fact, for example, that children around the world acquire the rudimentary grammar of their native tongue between approximately two and four years of age. While that fact is indisputable, its interpretation is not. Some theorists contend that biological maturation controls language acquisition. Others argue that language acquisition is a product of learning. While the facts of language acquisition are seldom debated, decisions about which body of facts and its theoretical interpretation are hotly contested. Facts cannot identify their own causes: that is the role of interpretation and theory.

Theories shape the collection, interpretation, and meaning of facts, but theories and facts are interdependent. Scientific advancement requires both information and theory. While bad theories are sometimes doomed through a failure to explain data, others are doomed simply because they explain facts later held to be irrelevant for new scientific interests. Moreover, the entire history of scientific ideas marks a trend away from concrete, physical concepts toward more abstract theories. This is in large part because concrete concepts explain only specific phenomena, whereas more abstract theories explain diverse and general phenomena. As researchers have collected more and more facts about human development, theories have become increasingly indispensable in organizing and interpreting them. As a general rule, theories make facts important, not the other way around.

Principle 2. Theories represent public knowledge. Virtually everyone attempts to explain human nature by inferring causes and motives for other people’s behavior. But when we do that, we invariably rely on either public or private sources of knowledge. Public knowledge is available to everyone and is often found in books and journal articles. This knowledge is easily accessed, readily transferred from one location to another or from one person to another, and openly discussed, examined, researched, criticized, and amended. Theories represent public knowledge and are thus submitted to public scrutiny and debate.

Private knowledge, on the other hand, is only available to individuals: it is inaccessible, difficult to communicate to others, and, worst of all, not subjected to public scrutiny. This type of knowledge consists of our personal experiences, ideas, habits, beliefs, and opinions. We often explain others’ motivations and actions in terms of our own experiences, attitudes, and memories, and these explanations often have a self-satisfying though unexamined quality about them. While some people still prefer the ease of conjuring up explanations about “Why Johnny can’t read” (e.g., “he comes from a poor home environment”), such explanations are generally less reliable and less valid than those that arise through theory testing, careful scrutiny, and informed debate. The absence of reliability can be found in the inconsistency of personal explanations (e.g., “Johnny can’t read because his parents don’t care, but he doesn’t know math because he hasn’t applied himself”).
Personal explanations are often invalid because they are simply untrue. I once helped a teacher conduct some simple observations on his students after hearing frequent and ardent complaints about how handicapped students were disruptive in his classroom. After several weeks of data collection, the embarrassed teacher reported back some insightful news. It turned out that nearly all the class disruptions were produced by his normal students. Because theories represent public rather than private knowledge, they tend to explain human nature in a more defensible way.

"Principle 3. Theories are in principle testable. Theories contain various claims about human nature that can, in principle, be tested separately or in combination. Testability provides an element of self-correction for theories not found in private knowledge. A single experiment may at any time disprove one or more claims, but even when a theory is disproven, something about human nature can be learned. Sir Francis Galton put it succinctly: truth arises more readily from error than from confusion. At the same time, however, a theory cannot be proven true; it is virtually impossible to design and carry out all the experiments with all the individuals under all the circumstances needed to exhaustively establish proof. Yet, testability ensures that we can approximate truth by eliminating theoretical claims shown to be false.

What is at issue here is the testability of a theory’s claims. Testability refers to the extent to which a theory’s claims can be objectively verified. A separate issue concerns the accuracy of those claims. To be sure, the issues are related in that the second depends on the first. One cannot determine a theory’s accuracy unless it is first testable.

"Principle 4. Theories are less complex than people. Since the mind cannot produce ideas that are as complex as itself, theories must logically be less complex than the human mind that produced them. Bickard (1978) makes this point directly, noting that any system can itself be known and understood only by a higher level system. Any level of organization, including the human mind, cannot be perfectly self-reflective: it cannot know its own properties. A higher level organization is needed to do that. For example, people cognize only the results of their mental processes, not the mental processes themselves. Accordingly, humans are destined never to realize fully their own true nature. However, because theories of human nature are less complex than actual humans, they can be known and understood. Readers who would skip the study of theories to move directly to the "facts" about real children and real people miss this crucial point. Theories are understandable because they are simpler than the phenomena they attempt to explain.

"Principle 5. Theories are generalizable. Theories are powerful because they explain characteristics of human nature that are generalizable across individuals. Consider an example. A perfect theory would be one that explained everything about a particular person with complete accuracy. We could even imagine ten perfect theories that explain ten individuals, or a thousand perfect theories that perfectly explain everything about a thousand individuals. Eventually, we might imagine a theory for each living person. But there is an inherent problem with this
kind of reasoning. When a theory sacrifices generalizability (applicability to large numbers of individuals) for specificity and detail, it soon ceases to be a theory at all. Theories attempt to explain features of human nature that are common to all individuals. They are powerful and efficient because a single principle can explain a common characteristic of many individuals. In doing that, it also explains the same characteristic in each individual.

Taken together, these five principles provide strong motivation for understanding theories of human development. If psychologists shunned theories altogether and tried to fashion their images of human nature only from the nearly infinite wealth of factual details, their task would rapidly become unmanageable. In fact, some developmentalists devote more time to studying theories than they do to studying the facts of human nature.

THEORETICAL PARADIGMS: WINDOWS FOR LOOKING TO SEE

A theory is a linguistic abstraction. It is not a thing like a house or a rabbit. It is a complex set of statements with certain properties. But in order to understand what a theory is and is not, it is first necessary to introduce the notion of paradigm. Paradigm is one of those jargon-like terms that have caught on in recent years. Kuhn (1970) identifies two key features of a paradigm: a collection of beliefs shared by scientists and a set of agreements about how problems are to be investigated. Basically, a paradigm is a body of shared assumptions, beliefs, methods, and interpretations that constitute a particular vision of reality (Royce, 1976).

White (1976) provides some insight into how paradigms operate in developmental psychology, noting that different paradigms offer: (1) an orientation for viewing the world of human nature, (2) a set of "reals" observable from the orientation, (3) a club of scientists, and (4) mutual agreements among club members about what is and is not considered worthwhile research about the "reals." If one were to walk from one paradigm to another, dramatic changes in methods, jargon, concepts, and theories about the world would be encountered. In this manner, paradigms provide the implicit rules of the game by which scientists tacitly agree to conduct the business of science. A paradigm, then, is a general orientation that may entail several theories, like members of a family.

Few other disciplines put forth as many competing theories as does psychology. These multiple psychologies function like windows opening out onto the world of human nature. Some windows are close together providing similar but not identical views (shared paradigm). Other windows face different directions and provide virtually no overlap with the view from another perspective (different paradigms). Theories are like windows for looking to see, like conceptual lenses for observing, recording, and assessing human events. Windows and theories are also alike in that they both open up certain kinds of events for observation while constraining the view of other kinds of events. They give clear vision to certain phenomena of interest while occluding others that are out of sight and theoretically irrelevant.
A good example of the window metaphor can be found in von Uexkull’s (1957) idea of Umwelt. Noting that animals possess different receptor systems for perceiving their environment, von Uexkull concluded that they actually have different world views—Umwelts. Receptor systems enable an organism to view the world of relevant information while selectively screening out information with no survival value. Ticks, snakes, toads, robins, and deer perceive different kinds of worldly events because they are perceptually tuned to obtaining different types of information about the world, all this in spite of the fact that they may inhabit the same ecological habitat. Like the Umwelt of von Uexkull’s creatures, theories also function as windows to the world, but these windows do have limitations. Some selectivity always occurs; no theory, receptor system, or window is capable of collecting all the information that is available. Until scientists come to agreement among themselves about which window to peek through, windows will continue to be used to study and explain human nature.

THEORIES AND MODELS

Some people use the terms theory and model synonymously, and in doing so they tend to confuse the properties of one with those of the other. Because theories and models have unique and distinctly different properties, the terms will not be used interchangeably in this text. To understand how theories and models are different, we need to examine what each one is, how it works, what it can do, and what it cannot do.

Models

Models are useful in science because they are analogies drawn from something that is known and extended to the unknown (O’Connor, 1957, p. 90). Models come in several forms, depending on the nature and complexity of the entity they are built to represent. One of their primary functions is to aid in but not to replace theory building.

Zais (1976) identifies four kinds of models that range from concrete to abstract. Physical models have concrete substance; they exist in a tangible sense. They are often miniatures of the real thing, and to that extent they are usually designed to look or act like the thing they mimic. This type of model is generally considered to be the simplest form of model. For example, auto and airplane engineers construct scale models to test aerodynamic qualities of new products. From careful study of their models, the engineers can estimate how the actual auto or airplane will perform.

Graphic or pictorial representations are models designed to depict relationships. Graphs, like other models, often clarify and improve our understanding of theories, but their meaning is always determined by the theory they are intended to represent. In this vein, van Geert (1988) has developed a systematic approach to graphical displays of several developmental theories in terms of their develop-
mental features. He shows how different kinds of graphs can be used to display (1) temporal and logical theoretical relationships between developmental stages, (2) hierarchical relationships in the development of individual abilities, and (3) different kinds of developmental processes. Van Geert’s graphs are intended to be representations of theoretical claims and positions, but they do not attempt to explain the whys or hows of development. Rather, they depict, clarify, and exemplify how various features within a theory are related to each other. Other kinds of graphical and pictorial models include grammar diagrams of English sentences, the figures in this book, and topographical maps that condense three-dimensional elevations onto two-dimensional paper.

*Linguistic models* employ conceptual metaphors to assist our comprehension. Sociologists, for example, often use “games” metaphors to help them understand social interactions of large groups. Freud was heavily influenced by physical sciences and employed Newton’s laws of energy conservation as a model for the human mind. Piaget used the model of scientist/philosopher as a metaphor for children’s natural inclination to make sense of their experiences. Many of the tables used in this text exemplify this type of model. Such tables are not the theory: they are useful representations of theory concepts and their interrelations.

*Logical models* consist of expressions that reduce complex phenomena to the logic of equations. Examples abound in mathematics \((a^2 + b^2 = c^2)\) and physics \((e = mc^2)\), which describe the quantitative relationship between several variables. Workflow diagrams that represent the logical steps of computer decision making are another application of logical models. Statistical formulas used by psychologists are also logical models.

Models can’t solve all our problems. Their primary function is to mimic, to represent, to simplify. They function by example rather than by explanation, a distinction that cleaves sharply the difference between a model and a theory. When our problems require explanations, such as figuring out why motivation influences human behavior or how children learn figurative meaning when they hear only literal uses of language, theories rather than models are needed.

**Theories**

In contrast to models, theories have one overriding purpose—to explain phenomena. The phenomena may be either real, like human nature, or entirely conceptual, like philosophy and mathematics. To explain phenomena, three minimal elements are required: phenomena, explanatory concepts, and principles that relate the concepts to their respective phenomena. Following Hempel (1966), I define a theory as a coherent, integrated set of statements containing: (1) internal principles, (2) bridge principles, and (3) an identifiable body of phenomena to be explained. Internal principles are primary concepts; they are the most important explanatory concepts employed by a theory. They are the basic abstractions, constructs, and processes invoked by a theory. These abstract entities exist as irreducible principles rather than as substances. Internal principles often consist of general laws
or functions to which human nature is believed to conform. Bridge principles are secondary concepts used to describe the relationship between a theory's internal principles and human phenomena. The phenomena to be explained constitute the essential problems of the theory. These phenomena may be relatively small and specific (e.g., infant perceptual acuity) or relatively large and general (e.g., personality development). All three elements may spawn a unique theoretical terminology called jargon.

STRUCTURAL COMPONENTS OF DEVELOPMENTAL THEORIES

All developmental theories have in common certain structural components. Just as certain components make a car a car (steering wheel, engine, doors, tires) so, too, do developmental theories have certain shared attributes. These attributes are a theory's structural components, and they consist of (1) assumptions about the newborn's inherent capabilities, (2) problems of study (including phenomena to be explained and the methods of collecting data), (3) internal principles, (4) bridge principles, and (5) change mechanisms believed to produce development. These components may not be clearly identified in a theorist's work; they are often implied and sometimes embedded in a number of different publications. While developmental theories differ from one another in specific content, each theory can be analyzed in terms of these common structural components.

Assumptions

Theorists seldom make their own assumptions explicit. This situation arises in part because they have grown so accustomed to looking at human development through their own theoretical window that they may be unaware of prior beliefs upon which their work is based. Moreover, they are generally motivated to place their theory in the best possible light and may not wish to unduly jeopardize its acceptance by dwelling on its assumptions. Nevertheless, all developmental theories are based on unproven beliefs about the nature of the human neonate, the nature of the environment, and the nature of organismic-environmental interactions. One often has to "read between the lines" to identify a theory's assumptions. Developmental theories typically explain human development beginning with birth rather than conception. The assumptions a theory makes about the infant's naturally endowed capacities and characteristics are its "starting blocks." They equip a theorist with presumed material from which an explanation of development can be launched. While the exact nature and number of assumptions vary from one theory to another, theorists attempt to make reasonable assumptions given the kind of phenomena they wish to explain. An important goal of this book is to identify the underlying assumptions each theory makes with regard to the neonate's capabilities.
Problems for Study

No theory can explain everything about human development. Consequently, each theory limits itself to identifying a cohesive set of problems that will occupy its attention, although these may be expanded from time to time with new discoveries or theoretical advances. These problems generally entail at least two considerations: a specific body of phenomena that needs explaining and an appropriate methodology for systematically collecting information.

The phenomena to be explained pose problems for the theory because their explanation is not given in the phenomena themselves, nor does information spontaneously organize itself for the theorist’s purposes. Theories define problems differently, in part due to the influence of the paradigm they operate within and in part due to the nature of the phenomena they address. Methods used to collect information are matched to the kind of phenomena a theory attempts to explain. Metaphorically, a theory’s methods are its “eyes”: they restrict and organize the information to be collected. Sometimes different theories will utilize the same methods. Other times, as in the case of Freud’s psychoanalysis, highly specialized methods are developed to tap highly specific phenomena that are unique to the theory’s purpose. Often the most important information contained in a research article will be the research methodology, which describes how researchers can replicate each other’s work. The most pervasive methods employed within each theory are described in the theory chapters. Conscientious readers will take special note of how well a theory’s research methods actually match the phenomena the theory attempts to explain.

Internal Principles

Each developmental theory entails a number of internal principles that comprise the theoretical architecture; these are the fundamental core concepts of the theory. Core concepts are usually described in three ways: constitutive definitions (dictionary-like statements of meaning), operational definitions (how a concept is actually measured), and examples or analogies of how the concept works. Internal principles are conceptual abstractions and are not directly visible. They are the most basic, irreducible explanatory constructs to which qualities of human nature can be reduced. Internal principles are so important that a theorist cannot afford to have them misunderstood, as often occurs when we encounter concepts already familiar and loaded with prior meanings. Consequently, these principles tend to be given unique names and definitions. This is the origin of theoretical jargon.

Bridge Principles

The concepts that connect a theory’s internal principles to the phenomena it attempts to explain are called bridge principles. Put differently, bridge principles are “show” rules. They show how the theoretical architecture (internal principles)
is extended, mapped, and projected onto the phenomena. In this way, bridge principles show how a theory's core concepts operate in specific situations to explain specific data. Theorists generally give their bridge principles specialized names to improve clarity and precision about their theory's meaning.

Readers sometimes have difficulty learning theory jargon. They consider it nothing more than a required nuisance, just a bizarre list of new terms and phrases to be memorized and regurgitated on a quiz. I suspect that such an attitude may exist in part because there is so much jargon and in part because jargon requires much more effort and precision than everyday language. The difficulty is understandable, but it can be partially avoided if readers understand the role jargon plays in theories of development. Jargon is not just important for a theory; it is essential. Specialized vocabularies serve specific purposes. They prevent misconceptions or common biases associated with less specialized language by providing clear, explicit, unambiguous, and efficient communication between specialists. Without theoretical jargon communication would be needlessly vague, cumbersome, and subject to personal meanings habitually associated with everyday usage.

The power and importance of jargon can be placed in a more personal context. Imagine, for example, that you visit two physicians and report symptoms that include swollen glands, fatigue, and prolonged sleepiness. Each physician orders the same blood tests, for which you are charged $40. The office visit is an additional $30. Each physician asks you to return in three days to learn the results of the lab tests (another $30 office visit). On the follow-up visit, the first physician tells you that you are "sick" and that you should go home and rest for six weeks. The second physician reports that you have infectious mononucleosis and that six weeks' rest is the only cure. What is your reaction to the two physicians, each of whom charged the same, did the same blood tests, and suggested the same remedy? Which would you be more likely to visit again? Why? The difference between being told that you are "sick" and being given the name of your disease is in the technical language used, the jargon. This book has an implicit foreign language requirement—readers are expected to become at least moderately fluent in "jargon."

Change Mechanism

A unique feature of developmental theories is that they must specify some process or mechanism responsible for producing the changes that constitute development. The change mechanism constitutes a "motor" that powers development. This element is crucial. How can one explain development without identifying something that brings it about? More often than not, it sparks more discussion, debate, and criticism than any other aspect of a theory, primarily for two reasons. First, it is one of the most critical features of developmental theories, and second, it is often one of the weakest components.
Competing paradigms appeal to different mechanisms of change. For example, several theories in one paradigm posit biological maturation as the cause of development, thereby implying that individual growth is relatively fixed and mostly immune to environmental stimuli. Accordingly, maturational theories hold that the development of such domains as personality, thinking, temperament, language, and morality is the result of an innate plan that governs their timing and form and that cannot be altered very much by environmental events. In contrast, theories in a competing paradigm may argue that individuals are inherently malleable and flexible. Consequently, while these theories view maturation as setting broad limits on learning, they contend that it is specific environmental events that govern development.

LIMITATIONS OF DEVELOPMENTAL THEORIES

As noted earlier, paradigms constrain theories in certain important ways by admitting some but not other assumptions, problems, methods, and data. Since theories operate within a paradigmatic framework, they have inherent limitations. These shortcomings do not invalidate the theory; they merely require that one understand what theories cannot do.

First, a theoretical window precludes certain kinds of information. In any study of human nature, only a fraction of what actually takes place can be recorded. For example, if we are studying children's social learning, we are likely to ignore a great deal of irrelevant behavior—yawning, trips to the lavatory, scratching, and other kinds of fidgeting. A theory defines the kinds of events that are to be recorded and studied. It is necessarily accompanied by conscious, deliberate choices that certain kinds of events are deemed noteworthy and that others are not (White, 1976).

Second, human events that do get recorded will always be distorted to some extent. This distortion is a direct consequence of the methods used by the investigator. Research requires the measurement of bridge principles with certain tools (the researcher's methods) applied under replicable conditions. These methods act like filters to screen in and screen out certain kinds of information. The information obtained in research studies is always incomplete in terms of the total data available in a given situation. However, incompleteness may be relatively minor, as in the use of a sensitive scale to chart the daily growth of an infant's weight (the distortion occurs in condensing a day's worth of weight gain into a single measure). On the other hand, distortion may be extensive, as occurs when a child's weight is measured annually by a pediatrician: an entire year's growth is condensed into a single moment. Whatever the case, instruments must be used to collect information, but they always provide fractional assessments of the entire event under study. This type of distortion varies from one method to another, but the important point is that it always occurs not as the fault of a particular method but by the very fact of having to use a method at all to collect data.
Third, theories are necessarily incomplete explanations of human nature. Once again, because theories reflect limitations of the paradigm that frames them, they are constrained from encompassing the totality of human nature and experience. A new problem arises when one realizes that humans write theories and conduct research. The "facts" collected by researchers are only facts because they reflect a researcher's own interests and attention. After all, researchers could have been interested in other things and in actuality could have collected different facts. Personal choices like these influence the larger body of theory and information about human nature (Mischel, 1976). Moreover, issues about which facts are to be collected ultimately lead to different research programs and to different kinds of theories (Hanson, 1958; Toulmin, 1961). This incompleteness in the large sense is not the same as saying that they cannot provide a complete and adequate explanation of the limited problems they address.

Theories will probably never provide us with the ultimate truth about human nature (neither can our personal experiences, memories, anecdotes, and the like), though they do provide a systematic means for approaching it. While the inherent limitations of theories may imply to some that we should despair of ever fully understanding or appreciating the entirety of human nature, such a conclusion would be unwarranted. If theories are genuinely testable, then they provide a means for eliminating the mistaken ideas we hold about human nature. By removing the inaccuracies in our collective knowledge, we can gradually approximate truth. Judicious research gradually chips away at erroneous concepts, thereby leaving a portrait of humanity less tainted with errors than before.

SUMMARY POINTS

1. Five principles support the contention that there is nothing more useful than a good theory. Theories (1) give meaning to facts, not vice versa, (2) represent public rather than private knowledge, (3) are testable, (4) are less complex than people, and (5) are generalizable.

2. Paradigms contain multiple theories, a set of observable "reals," a club of scientists, and mutual agreements about reality. Paradigms are the framework within which a theory operates.

3. Theories, like von Uexküll's Umwelt, are windows for looking to see.

4. Theories are not models. Models are physical, linguistic, logical, or graphic/pictorial representations. Models exemplify rather than explain. Theories propose explanations rather than representations.

5. A theory is a coherent, integrated set of statements containing internal principles, bridge principles, and an identifiable body of phenomena to be explained. This definition implies that developmental theories have common structural components (assumptions, problems of study [phenomena and methods], internal principles, bridge principles, and change mechanisms) although the content of these components differs from theory to theory.

6. Developmental theories have inherent limitations: incompleteness of information, distortion of information, and subjective and personal choices by scientists about what information to collect.
SUGGESTED READINGS


Chapter 2
Evaluating Theories: Developmental Adequacy and Scientific Worthiness

Preview Questions
What characteristics are implied by the concept of development?
How can a theory's developmental adequacy be assessed?
What criteria are used to determine a theory's scientific worthiness?

The Concept of Development

The term development is used in many different fields, and its usage is accompanied by many different connotations. This state of affairs makes it difficult to derive a formal definition for the concept. In fact to do so would probably deprive the term of a certain openness and flexibility that has contributed to its appeal. Nevertheless, in a book about theories of development, some attention must be given to defining the concept. As a starting point, we can begin by noting that development is fundamentally a biological concept linked to the idea that certain relatively permanent changes occur over time in the organization of living structures and life processes (Harris, 1957, p. 3). Differing conceptions of development presuppose one of several more basic doctrines: vitalism, mechanism, and organicism.

Vitalism is a metaphysical position that holds that living organisms contain some entity that is not reducible to inanimate components (e.g., chemical substances) and that the activities of this entity produce the qualities characteristic of living beings (Beckner, 1972b, p. 254). The proposed entity is said to be the "vital essence" of life, hence vitalism. In this view "life" is seen as an autonomous, in-
reducible process that occupies no space and that somehow controls the course of organic processes (Driesch, 1914). Developmentally, vitalism holds that differences in ontogenesis (individual development) from identical origins must be explained in terms of this "vital essence" (Nagel, 1957, p. 19). Vitalism is today not a popular position among developmentalists. Historically, though, the idea that such a vital essence differentiated living from nonliving entities was a common notion. In fact, it was sufficiently powerful to suggest that one might be able to capture this essence and channel its life-giving power into a corpse and bring it back to life, a theme recognizable to those familiar with Mary Shelley’s Frankenstein.

Mechanism (Pepper, 1942) is a doctrine antithetical to vitalism. It denies the presence of any “vital essence” that alone constitutes life. It holds that individuals can best be understood in terms of the mechanical operations of lower-level physical and chemical substances that, in combination and interaction, produce a living being (Beckner, 1972a, p. 252). A mechanistic approach to development implies a reductionist orientation: that is, properties that describe the individual are believed to be decomposable into more primitive, functionally prior laws. The mechanistic orientation utilizes a machine metaphor, but this does not imply that a scientist views living organisms and all their parts as simple “machines.” Rather, the doctrine of mechanism holds that biological phenomena are simply patterns, sometimes very complex patterns, of lower-order nonbiological events that follow the law of additive composition: the whole is the sum of its parts (Nagel, 1957, p. 19).

Behavioral psychology adopts a mechanistic orientation in attempting to find causal laws to explain how behavior is changed in relation to environmental stimuli (Kendler, 1986). Ultimately, mechanism would lead researchers to investigate how human nature is produced by physiological and biochemical processes.

Organicism is a doctrine that rejects the tenets of both vitalism and mechanism. According to organicism, the individual is composed of different levels or systems that are hierarchically arranged and tightly integrated, and one of its primary goals is to explain the relationships between the systems and the whole individual. In this way, individuals are as important to the understanding of their parts as the parts are to the whole individual, but neither the whole nor parts are reducible to each other. This view stems from two beliefs about the nature of living creatures. First, organisms are composed hierarchically; that is, various systems that comprise the individual (e.g., cognitive, pulmonary, digestive, nervous) are developed and arranged in such a way that some play superordinate and others subordinate roles. In adult humans, for example, the muscular system is subordinate to the behavioral system, which is itself subordinate to the intellectual system. Second, organicism is a variant on the principle of emergence, which holds that traits displayed by a hierarchically organized system cannot be explained in terms of properties that occur on a lower rung of the hierarchy (Nagel, 1957, p. 19): This means that the various components of intellectual functioning,
for example, cannot be decomposed into or explained in terms of more primitive biochemical or biophysical processes.

Each of these three doctrines amounts to a stance taken with respect to how one should conceive of the developing individual. Concerning human development, the variation among assumptions taken up in these positions indicates that development is a complex concept whose definition will not be simple or straightforward.

**Characteristics of Development**

Not only do developmental theories have to explain something about human nature, as do other psychological theories, but also they must explain how it gets that way. To accomplish the task, most (but not all) developmental theories attempt to explain ontogenesis, the relatively permanent changes individuals undergo during their life span. But what do we mean when we claim that a person develops? An adequate answer requires that we distinguish between the concept of change and the concept of development. While the concept of development necessarily implies that some kind of change has taken place, the fact that some kind of change has occurred does not necessarily imply that something has developed. For example, filing one’s fingernails, brushing one’s hair, and waking up in the morning are all manifest changes in the individual’s state, but no developmental psychologist would contend that they represent developmental changes.

Development connotes the presence of one or more complex changes. The following characteristics are usually implicated when the term development is used. An advantage of defining development in terms of these characteristics is that they can serve as a set of criteria against which theories can be evaluated for their developmental adequacy. That is, theories may represent weak, moderate, or strong developmental explanations, depending on how well they account for these characteristics.

**Temporality.** All development presumes an element of temporality, which means that changes tend to occur over time (Harris, 1957, p. 3). The duration of time is generally presumed to involve an extended rather than a short interval (Harris, 1957, p. 10), such as the several years needed to acquire secondary sex characteristics during adolescence. The process of “growing up” and “growing old” is another way of expressing the relationship between time and development, which is not to say that older necessarily means more developed. For example, when we say that interpersonal relationships take time to develop, we don’t mean that time alone develops a relationship, only that time provides the opportunity for events, decisions, and experiences that contribute to development.

**Cumulativity.** Cumulativity means that developmental changes result in the addition of some new feature(s) to the organism: first one thing, then another, is acquired. Developmental acquisitions imply a degree of permanence;
they in turn modify later acquisitions, thereby altering the shape of the individual's entire being (Anderson, 1957, p. 39). Cumulative changes may be dramatic (acquiring language) or incremental (extending grasping behavior from a spoon to a fork). Some achievements may ultimately be diminished after having served a transitional function for later achievements, as when, for example, crawling gives way to walking.

An important element of cumulativeness is that of causal recession (Anderson, 1957, p. 40), wherein developing individuals will tend to retain some of the effects of past changes. For example, it may be difficult to explain certain behaviors in a given situation (e.g., bad habits) without appealing to some earlier origins in the individual's life history.

Cumulativeness is necessary but not sufficient to claim that a developmental change has occurred. After all, hair growth, piling up hours watching television, and learning who is buried in Grant's tomb are all cumulative processes, but they are not particularly developmental in nature.

**Directionality.** Russell (1945) has argued that organic development must on logical grounds implicate a sense of "directedness." The direction may be from the general to the specific (Hamburger, 1957), toward increased maturity (Gesell & Ilg, 1949), toward greater differentiation and hierarchic integration (Werner, 1957), toward increased efficiency and specificity (Anderson, 1957), or toward increased distance from some initial state (Chapman, 1988).

Directional orientation implies that developmental changes are progressive, relatively durable, and irreversible. The progressive element means that individuals change in ways that are in some respect better or more advanced than previous states. We do not necessarily have to know what the developmental terminus is, nor do we have to specify the precise point of origin (although theories in developmental psychology use birth as their starting point, there is no necessary reason that requires them to do so). What we do have to account for is the direction of development in terms that imply progressive accumulations between two points in time.

The element of durability implies that development results in improvements that facilitate relatively long-lasting, though not necessarily permanent, change. Most developmentalists would argue, for example, that crawling represents a progressive developmental change for infants (though not for adults), even though it eventually gives way to walking. In cases like that, the durability element is preserved in the sense that crawling facilitates the acquisition of balance and coordination needed to walk.

Directionality also implies that developmental changes are relatively irreversible in that they cannot easily be undone. While individuals change in many ways over their lifetimes, only a portion of these changes are irreversible and thus constitute development. Growing bald, learning to read, and forming a personality all reflect directional changes (progress, durability, irreversibility). In contrast, joining a political party (reversible), memorizing the definition of *vitalism* for
EVALUATING THEORIES

New Mode of Organization. Strong claims of development describe changes that result in new modes of organization (Anderson, 1957, p. 40; Meredith, 1957, p. 115; Nagel, 1957, p. 1). This characteristic is different from cumulativity and directionality; it implies the emergence of new phenomena and new properties not manifest in previous states (Harris, 1957, p. 5).

It takes more than the addition of a new behavior or other element (these are included in the cumulativity characteristic) to comprise a new mode of organization. This characteristic requires a radical alteration or reorganization in the arrangement, constitution, or structure of the individual. In short, the rules of the system change. Caterpillars that change into butterflies, maggots that become flies, and children who learn to walk and talk all represent examples of new modes of organization. Theories that explain the development of new modes of organization are more adequate developmental theories than those that do not, because they account for these kinds of developmental changes.

Several issues are related to this characteristic. One concerns whether or not development should be conceptualized in terms of stages. Without prejudging material presented later, it must suffice here to note that not all developmentalists see human nature in terms of stages. Even those who do propose a set of stages to describe human development may have in mind quite different kinds of properties. For example, Gesell and Ilg (1949, p. 60) define developmental stages as a “level of maturity,” simply a “passing moment” in the life cycle. This notion implies temporality, cumulativity, and directionality, but it does not imply that later stages represent new modes of organization vis-à-vis earlier stages. Rather, stages of this sort reflect incremental, bit-by-bit improvements continuously linked together along a relatively linear developmental path. In contrast, other theorists may view development in terms of radical transformations and reorganizations of earlier stages into qualitatively different later stages. This latter conception clearly implies that later stages are new modes of organization.

A related issue concerns whether or not development is best construed as a continuous or discontinuous process. This is the continuity-discontinuity debate, a controversy that has occupied some attention in the annals of developmental psychology. The two poles of the continuity-discontinuity debate can be described as follows. On the continuity side are those theorists like B. F. Skinner (Chapter 7) and Albert Bandura (Chapter 8) who maintain that development is fundamentally quantitative. In their view, development is viewed as a uniform, linear progression from relatively few behaviors to quantitatively more behaviors that comprise an individual’s repertoire. At the other extreme are theorists like Jean Piaget (Chapter 9) and Lawrence Kohlberg (Chapter 10) who cast development primarily in terms of a sequence of qualitatively distinct stages. Others (e.g., Pinard & Laurendeau, 1969; Wohlwill, 1966) believe that the issue is essentially a false dichotomy, a conceptual artifact determined by a theorist’s level of analysis. As
Preliminary Considerations

Werner (1957) has noted, the issue is theoretical (a matter of interpretation) rather than empirical (a matter of fact).

Increased Capacity for Self-Control. The concept of development implies that as people develop, they become more proactive and less reactive, thereby increasing their capacity for self-control (Harris, 1957, p. 5). Self-control entails the use of feedback so that one's activities can be continuously monitored and adjusted. While a person does not have to be completely self-controlling at any time, some aspect or function must display an increase in this property.

Biologists refer to self-control as autoregulation, an organism's ability to regulate itself within its ecology. But self-control as autoregulation is more than just conscious control, willpower, and deliberate action. It implies some mechanism that anticipates the consequences of a particular activity, adjusts the activity to the expected outcome, initiates the activity, monitors the consequences as they unfold, and continuously readjusts the activity to achieve planned consequences. Moreover, higher forms of self-regulation may also involve an ability to anticipate environmental events before they occur (e.g., weather prediction, flood control). The increased capacity to think out solutions to problems and to experiment mentally with ideas before tackling them on a concrete level are examples of increased capacity for self-control in comparison to, for example, the directed gropings of an infant.

Along with an increased capacity for self-control comes a simultaneous increase in independence from environmental fluctuations. The two achievements go hand in hand. Increasing independence from environmental changes occurs with the ability to foresee, plan, forecast, and anticipate events in the proximal (nearby) and distal (far away) ecology that may have important consequences. Through anticipation, individuals can better adjust themselves to avoid any foreseeable adversities and to take advantage of fortuitous events. For example, as children develop they gradually acquire the capacity to predict the path of a baseball and to spot and avoid hazardous traffic or other situations.

In this book, the five characteristics just described are used as a set of criteria for judging how "developmental" a developmental theory is. Not every developmental theory accounts for each characteristic. To that extent, the number of characteristics a theory accounts for is an important measure of its developmental adequacy.

The use of these characteristics as criteria of developmental adequacy presumes a certain degree of fairness and neutrality to the theories presented in this book. In this regard, Kendler (1986, p. 87) has argued that these characteristics, exemplified in Nagel's (1957) conception of development, are a good example of the doctrine of mechanism. Two important points should be made here. First, there is nothing that requires a theory to ignore or to include one or another of these characteristics in its account of development. Neither vitalistic nor organismic theories are precluded from accounting in their own way and through their own analysis for these characteristics. Second, if there is a systematic bias implicit in the use of this set of developmental characteristics, it should result in higher ratings
for the developmental adequacy of mechanistic theories. Whether such a bias manifests itself will be left up to the reader to judge.

**SCIENTIFIC WORTHINESS**

Most scientists and philosophers hold certain beliefs about the relationship between theory and data. Collectively, these beliefs help define the enterprise of science and guide expectations about what constitutes an adequate scientific explanation of reality. According to Hempel (1966, p. 1), science attempts to explore, describe, explain, and predict worldly events. Science depends on empirical evidence to verify its claims, but theories are also necessary because they propose themes for organizing and explaining evidence.

In the following section, several of the most important values of science are described. These values are in one sense arbitrary and in another sense pragmatic. They are arbitrary in the sense that they represent tacit agreements about how to pursue science; in a different time and place these principles could have been (and historically have been) different. However, the same values are also pragmatic, since they define the goals of scientific theorizing and the rationale for its pursuit.

Evaluations of a theory’s scientific worthiness throughout the book provide a second basis (in addition to developmental adequacy) of comparison among the developmental theories. The following discussion derives in part from treatments of logic and scientific explanation given by Hempel (1966), Hurley (1982), and Quine and Ullian (1978). This material, like the characteristics of development, should be learned because it will be used throughout the book. A synopsis of evaluative criteria is shown in Table 2-1.

**Testability.** A theory should in principle be testable in order to verify the claims it makes about developmental phenomena. To be testable, a theory must provide a degree of clarity for its concepts, because only then can its proposals be checked against the actuality of human nature. Testability is probably the most important measure of a theory’s scientific worthiness. A theory that is testable can be objectively verified. We may learn in testing a theory that one or more of its claims are wrong. But if a theory is untestable, we have no way of finding out if it

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is wrong. In this sense, a theory that is testable but false makes a greater scientific contribution than a theory that is untestable (even though it may be right, no one would ever know).

Two requirements must be met for a theory to be testable. First, its constructs and claims must be measurable. The measurement need not be quantitative, but it must derive from observable events. Science relies on measurement for precision and accuracy. Second, a theory's claims must be specific enough to allow us to make predictions. "If I do A, then B will happen." A theory may be testable but wrong, but its testability must be established before its accuracy can be determined. Testability and accuracy are separate issues. Accuracy is taken up later under the criteria of external validity and predictive validity.

It is important to recognize that sometimes theoretical claims are not testable simply because they are definitions. Definitions are accepted by any scientist who uses the theory. So long as a theorist is consistent in the employment of a definition, it need not be testable. One may agree or disagree with theorists' definitions, but they are usually granted flexibility in defining concepts in almost any way that is reasonable. Other theoretical claims may not be testable because they are circular. For example, a theory might define an angry person as one who fights rather than talks through conflict. Such a claim cannot be tested because an angry person could not, by definition, choose to talk through a conflict. There would be no way to find angry negotiators since they have been defined out of existence.

**External Validity.** External validity refers to a theory's accuracy; it means that a theory provides accurate descriptions of what we already know about human nature. Because a theory is limited, it need only account for the phenomena it attempts to explain. Two or more theories may rate high on this criteria because they may explain with equal accuracy different kinds of human phenomena. Most research with human subjects (infants, children, adolescents, or adults) attempts to test the external validity of a theory—does the theory explain the facts of human development?

A second definition of external validity is sometimes used. Hurley (1982, p. 416), for example, notes that a theory reflects external validity when it agrees with other well-established hypotheses. Hultsch and Hickey (1978) extend this point in noting that external validity implies more than just a correspondence between a theory and the real world. They argue that because different theories and paradigms actually view different worlds, external validity can only be assessed within the context of a particular framework. That is, different paradigms will require different kinds of information and hence different methods to establish external validity. For example, two theories may correspond with a specific set of facts (first kind of external validity). However, they may propose entirely different explanations for the same phenomena because they emphasize different facts. Hultsch and Hickey's point is that external validity requires more than fact matching. It requires an attention to the paradigm in which a theory operates. Newton
may well explain falling bodies as a function of mass, distance, and force, but Einstein does the same thing in terms of space, time, energy, and frames of reference. Each explanation, while different, has external validity in terms of its paradigmatic world view.

Predictive Validity. Predictive validity reflects a second kind of accuracy, the accuracy of foretelling new phenomena that are not already known. Where external validity refers to how well a theory explains what we already know, predictive validity is a measure of a theory's capacity to generate new facts and new knowledge. According to Baldwin (1967) this kind of foretelling is really just an accurate empirical statement about a future event. Scientific predictions consist of "if...then" statements: if certain conditions are established, then some predicted phenomenon will occur. The more specific the prediction, the greater the predictive validity (all other things being equal) of a theory. Moreover, Baldwin notes that it is not the human scientist, but the theory that makes the prediction—any scientist can make an accurate prediction, but if the prediction cannot be clearly derived from the theory in question, its predictive validity has not been strengthened.

Another element of predictive validity is sometimes referred to as fruitfulness. Fruitfulness is not explicitly an index of a theory's accuracy; rather, it denotes the amount of research a theory generates. A theory is said to be fruitful if it suggests new ideas for future research and if it leads to the discovery of new facts (Hurley, 1982, p. 416).

Internal Consistency. Internal consistency is sometimes referred to as the principle of noncontradiction. It holds that a theory should not be self-contradictory. In other words, various parts of a theory (assumptions, internal principles, bridge principles, change mechanism) should be rationally interconnected in such a way that they are logically compatible (Hurley, 1982, p. 415). The purpose of a theory is to unify and thereby explain a body of data. Consequently, if theoretical concepts are not rationally interconnected, there would be no way to interconnect the data to which they apply. This quality of interconnectedness is sometimes called integration (Quine & Ullian, 1978, p. 11), which implies that each part of a theory should be related to all other parts.

There are at least three general indicators that flag a theory's internal consistency: (1) the number of exceptions acknowledged, (2) relative simplicity (more complex theories increase the probability of inconsistency), and (3) adherence to a central theme or line of reasoning (the more identifiable this central theme, the more likely it is that deviations from it will not tend to contradict one another). In other words, internal consistency requires that the theoretical "rules of the game" do not change without good reason. Inconsistency would result if a theory proposes one kind of change mechanism for a certain type of human conduct and an entirely different mechanism for a very similar type of behavior. For example, a hypothetical theory that proposes that all personality traits are formed by the
same underlying mechanism, say maturation, would rate high on internal consistency. In contrast, one that proposed that introversion is caused by maturation, while claiming extroversion is learned, would probably rate low.

**Theoretical Economy.** Theoretical economy is a measure of efficiency as determined by the relationship between the phenomena explained by a theory and its underlying assumptions. Theoretical economy can be figured in two ways. First, two theories may explain exactly the same phenomena but make different assumptions. In that case, the one with fewer assumptions or with less complex assumptions would have greater theoretical economy (as an analogy, imagine that two cars travel the same distance, but one began with less gas). Second, two theories may make exactly the same assumptions, but one may explain more phenomena than the other. In that case, the one that explains more phenomena reflects greater theoretical economy (analogously, of two cars beginning with the same amount of gas, one travels farther than the other). Morgan's Canon expresses the idea differently: if two explanations of phenomena fit all the facts equally well, then the more economical explanation is to be preferred. In other words, science constitutes the most complete explanation of facts with the least expenditure of effort. Sometimes the term *simplicity* or *parsimony* is used to express the idea.

Theoretical economy is relative, not absolute. It requires a certain degree of balance between theoretical assumptions and principles and the number, kind, and complexity of phenomena explained. Moreover, assessments of theoretical economy are probably more subjective, reflecting elements of aesthetic and personal impression, than the other criteria of scientific worthiness. Nevertheless, this criterion is widely used under one rubric or another in science.

The five criteria just described provide one means for answering the question “How good is this theory?” The reader is encouraged to form an independent opinion about how well each theory meets these criteria. In addition, readers should also identify a set of personally meaningful criteria for evaluating theories. For example, I have found a personal interest in evaluating important theories in terms of their aesthetic appeal. I look for qualities of texture (richness, depth), novelty (imagination, creativity), interest (attention holding), and revolutionary impact (breaks new frontiers, shows a new way of viewing something). I don't expect others to judge theories on the basis of their aesthetic appeal, nor do I necessarily expect them to understand what I mean when I do it.

Professionals who plan to use theories in their work might formulate their own set of criteria. These could include, for example, relevance to one's needs, translatability of theory concepts into personally meaningful situations, ease of using a theory's principles, availability of literature about applications of the theory, and adequacy of practical applications (how well the theory works). However, one should expect that whatever criteria are used to evaluate theories, they will be used consistently.
SUMMARY POINTS

1. Development always implies some kind of complex change, whereas change does not necessarily imply development.
2. Development connotes five characteristics: temporality, cumulativity, directionality, new mode of organization, and increased capacity for self-control.
3. A theory’s scientific worthiness is determined by its testability, external validity, predictive validity, internal consistency, and theoretical economy.

SUGGESTED READINGS

## Structural Components of Developmental Theories

### ENDOGENOUS PARADIGM

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Theories of Human Development
A Comparative Approach

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