Book Reviews

Early Experiences and Behavior

Infancy. Its Place in Human Development. JEROME KAGAN, RICHARD B. KEARSLEY, and PHILIP R. ZELAZO, with the assistance of Cheryl Minton. Harvard University Press, Cambridge, Mass., 1978. xviii, 462 pp., illus. $17.50.

Twenty years ago, although there were few data on early development, most psychologists were convinced that the experiences of infancy had a formative and lasting effect on human development. Today, with an avalanche of data on infant development, psychologists are less sure of this. Among those who believe that early experiences are less important than we previously thought are the authors of *Infancy: Its Place in Human Development*. Like several other books whose titles promised an integration of current knowledge about infants (T. G. R. Bower, 1974; D. G. Freedman, 1974; B. L. White, 1971), this one focuses on the work of a particular research group. However, it takes a broader view than the earlier books in several respects.

The occasion for this synthesis, aimed at readers with some knowledge of developmental research, is the report of a previously unpublished study of the effects on infants of day care away from home, a subject with important practical as well as theoretical implications. A major purpose of the book is to present this study. To this end the authors articulate the theoretical approach that guided the study and integrate within it the work of Jerome Kagan's research laboratory over the last 15 years. In addition, this work is placed within its larger sociohistorical context of American beliefs and attitudes about children and child development.

The volume is introduced with historical review of the relationship between cultural values and scientific research on development. The present work is acknowledged to derive from a cultural orientation which values intellectual skills and devalues personal relationships, which views life as a race where individuals compete and must therefore be compared with each other rather than accepted on individual merits, and in which parental goals include giving children a "head start" in the race. These values influenced the general theoretical approach as well as the design and evaluation of the day care experiment.

There have been prior studies of infant day care, which the authors review carefully in chapter 3. Like most of the previous studies, this one reports that in a center providing high-quality daytime group care development is not measurably different from that of infants from similar backgrounds reared entirely at home. This finding, that apparently massive differences in rearing conditions had little or no effect on development, is part of the evidence that convinces the authors that early experience has been overrated by developmental psychology.

One innovative feature of this study was its simultaneous assessment of the contributions of social class and ethnicity to early patterns of development. The main comparisons for ethnicity were between Chinese- and European-American infants, and the few consistent group differences were found in this domain. The authors suggest that temperament (used to mean genetically determined dispositions) and home experiences account for these differences. Since these findings were unexpected, the interpretation was speculative. If such an interpretation were to be supported by subsequent studies, it would mean that home environments can have powerful effects on infant behavior. Thus, although the authors wish to argue that early experiences do not play an important role in shaping infant behavior, their data suggest that cultural influences in early socialization have detectable consequences within the infancy period.

A second unusual feature of the study lies in the quantity of data generated, which exceeds that of most previous studies. Each infant was followed from $3\frac{1}{2}$ to 29 months of age, and eight sets of assessments, including measures of cognitive, social, and affective development, were made during that time. A data base of this magnitude would be meaningless without a theory to organize it. In the interest of coherent presentation, the authors have reserved detailed reporting of the data for a lengthy appendix, and the reader who ventures into that part of the book, even with a fair amount of psychological sophistication, will appreciate the extent and complexity of the data.

The theory presented here will not be new to those already familiar with the work of Kagan and his colleagues. Many of the main themes have been introduced in previous papers. This book represents the first synthesis of these themes with an integrated body of data including that of the day care study, previous studies by this research group, and selected research from the work of others in the field. Some of the ideas presented are widely, though not universally, accepted in developmental psychology. Others are more controversial. For example, the authors focus on cognition as the most important aspect of human behavior and hence development. Other behavioral domains such as emotional and social development are considered to be derivatives of cognitive development. This view is consonant with the main body of current American psychology, which is heavily cognitive in orientation. At the same time, infancy researchers whose primary concerns are with social or affective development are not necessarily sympathetic to this position.

A more controversial assertion is that cognitive development (with its derivatives) is primarily the consequence of maturation. This emphasis on maturation, championed by Arnold Gesell in the 1930's and '40's, is currently out of favor. A major effort of this book is directed toward returning maturation to a prominent position in the study of development. Many of the data are presented in the form of "growth functions" that show changes with age in behaviors such as visual attention and smiling to a standard set of stimuli. "Growth function" is used rather loosely to encompass changes in frequency of occurrence of the behaviors in question. The curves presented do not necessarily show uniform increases. Indeed, the number of curves that show U- or inverted U-shaped functions is frequently highlighted for theoretical purposes. Presumably the use of the term "growth function" is intended to emphasize to the reader that these changes are indicative of underlying neural maturation. Within this framework, individual differences are understood primarily as differences in rate of development. This is an idea that is widely accepted in American psy-

chology and forms the basis for standardized tests of infant development as well as the more familiar IQ tests. However, it is not a necessary feature of developmental theory, and well-articulated theories such as that of Piaget, or work such as Bowlby's on attachment, consider individual differences and rate of development relatively unimportant.

The most provocative position taken by the authors emphasizes the lack of intra-individual continuity (that is, consistency in rate of development) from one time period to the next, especially when the assessments are separated by more than a few months. In many recent studies and reviews, characteristics of the environment that are stable over time (for example social class) are found to be better predictors of long-term developmental outcomes than earlier behavior of the child or specific early events (for example premature birth). The bulk of previous research, including Kagan's earlier work, was based on a linear model of development in which behavior measured at one time was expected to predict similar behaviors at a later time. It is only recently that researchers have begun to realize that such a model assumes that intervening experiences have little effect on the behavior in question or that they have the same effect on all individuals. Not surprisingly, it has been virtually impossible to demonstrate behavioral consistency of this kind, and these assumptions are increasingly recognized as untenable. The study of behavioral consistency in development must now be approached in a different fashion. One solution, typified in this volume, is to conclude that continuity in development is rare and can be found only under highly stable environmental conditions. An alternative is to construct more complex models of development. Current efforts to do the latter appear to be moving in two directions. One is toward a focus on the organization of behavior rather than on single behaviors. Rather than assuming that many behaviors are separate indicators of a unifying underlying disposition, skill, or cognitive structure, such an approach considers the functional relationship of behaviors to each other and to environmental demands. The other trend in recent theorizing is toward elaboration of the role of transactions with the environment in developmental change. In this framework, predictions are made from one transaction to the next and long-term outcomes are predicted only on the basis of repeated and cumulative assessments. Although such attempts are under way, they have yet to come to fruition, and a synthesis comparable to that presented here is still in the distant future. It is always far easier to see what is problematic about an articulate model than to construct a new one of greater complexity.

Those who already find the views expressed congenial will find this book persuasive. Those who hold alternative positions will easily find occasions to quibble. A work of this type can serve an important heuristic function by provoking its antagonists to articulate and defend alternative theories. It is incumbent on those who believe that early experiences are more important than later ones, that maturation is of minimal importance, or that behavioral continuity is a major feature of development to take up the challenge posed by Kagan, Kearsley, and Zelazo.

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Anaerobic Plants

Plant Life in Anaerobic Environments. DONAL D. HOOK and R. M. M. CRAWFORD, Eds. Ann Arbor Science, Ann Arbor, Mich., 1978. x, 564 pp., illus. $28.

Since Pasteur's discovery of anaerobiosis in the 19th century, bacteriologists have accepted the notion that the oxygen requirements of bacteria are discrete and variable according to species and circumstances. Terms such as "obligate anaerobe," "facultative aerobe," and "microaerophilic" came to be taken for granted as representing facts of bacterial life and were in time transferred to microbiota generally. Nevertheless, the dicta of Priestley and Lavoisier have deeply imprinted higher-plant and animal physiologists with the notion that the life processes of complex organisms need oxygen—and lots of it.

Certainly the traditional viewpoint shared by most higher-plant physiologists is that the oxygen-rich condition of the atmosphere and of well-aerated soils is a requisite for healthy plants and that flooding, poor drainage, and standing waters lead to unfavorable hypoxic or anoxic conditions. Such was the viewpoint encountered by this reviewer when his research turned toward the study of higher-plant behavior under experimental hypoxia. And such has been the viewpoint expressed in countless botany classes throughout the years.

Therefore it was refreshing, even exciting, to receive this volume, an outgrowth of the first symposium on anaerobiosis and related plant adaptation, which took place at the 12th International Botanical Congress in Leningrad in 1975.

The 18 chapters in the book are diverse in subject, but the main viewpoint is clearly embodied in concluding statements from two of them: "Plants resistant to oxygen deficiency are adapted to utilize the energy of glycolysis and at the same time to render its toxic products harmless," from chapter 5, by T. V. Chirkova, and "The anaerobic effect on plant metabolism is not equal to the inhibition of respiration," from chapter 8, by A. A. Zemlianukhin and B. F. Ivanov.

There is a unity of theme in chapters 2 through 8, all of which are concerned with energetics and the materials and material transformations associated with energy. A substantial portion of this section consists of a single chapter by B. B. Vartapetian, I. N. Andreeva, and N. Nuritdinov that deals skillfully and comprehensively with oxygen stress at the cellular level. Using rice as their principal test object, these authors develop a body of information—both ultrastructural and biochemical—that leads to the conclusion that the rice seedling is a facultative anaerobe. Appropriately, A. Pradet and J. L. Bomsel follow with a sophisticated treatment of adenylate metabolism, energy charge, and glycolysis. There follow, then, contributions concerned with such particulars as ethanol, pyruvate, organic acid, and lipid metabolism and with alcohol and lactate dehydrogenases. These papers are generally of good quality, but one tires of encountering similar metabolic flow sheets on so many pages—and these essentially reproduced from the handiest textbook. This only serves to detract from the real point, namely that successful adaptation of the plant to anoxia requires innovations not in metabolic chemistry but rather in regulation—in utilization of existing proton sinks, in coupling of existing pathways for higher energy yield, and in control of activity in specific enzymes.

There remain a group of papers concerned with ecological or ecophysiological aspects of flooded, anoxic environments. W. Armstrong develops the concept of the "wetland plant," emphasizing ventilation and gas exchange problems; Hook and J. R. Scholtens discuss the adaptation of trees to flood. Finally, B. D. Meet and L. H. Stolzy and R. P. Gambrell and W. H. Patrick, Jr., deal with the oxygen status and redox chemistry of the soil itself.