

# Book Review

*Perspectives in Ethology. Volume 5: Ontogeny.* P. P. G. Bateson and Peter H. Klopfer (editors). Plenum Press, New York, 1982, viii + 520 pp. Cloth, \$39.50.

*Ontogeny*, the fifth and largest volume in the *Perspectives in Ethology* series edited by Bateson and Klopfer, is not at all what one might expect. Its twelve chapters, the majority significant contributions to the literature, address a variety of topics (play, motivation, learning theory, perception, foraging theory, mating strategies, altruism, kin selection, etc.), many quite distant from the traditional concerns of students of behavioral development. My first reaction to the collection was to wonder what had led the editors to put such disparate papers together in a volume entitled *Ontogeny*; my second was to be stimulated by the challenge posed by the very broad perspective on developmental issues adopted by Bateson and Klopfer in selecting material for inclusion in the collection.

In recent years, studies of behavioral development have become increasingly focussed on a relatively small number of research paradigms. It is easy to forget that every behavioral phenomenon poses ontogenetic questions, that the course of development has consequences as well as causes, and that understanding of behavioral development is as central to issues in behavioral ecology and sociobiology as to more traditional areas of developmental investigation.

Much is demanded of the reader of *Ontogeny* in making important connections among the various chapters. There is almost no cross-referencing by authors and the editors' preface is only modestly helpful in synthesizing the material; but the chapters are very well ordered. In consequence, the book develops into a logical and satisfying whole, making clear how much psychologists and biologists (perhaps more accurately, field and laboratory workers) have yet to gain from increased communication and collaboration.

As is always the case in reviewing an edited volume, especially one over 500 pages in length, one can focus on only a few of the high points. Most of the twelve chapters comprising *Ontogeny* seemed to me to be of very considerable interest and I will therefore mention all below, while discussing in somewhat greater detail those I felt were outstanding, even in such excellent company.

The volume opens with an exceptional chapter by Ron Oppenheim on the implications of the history of embryology and cell biology for the understanding of behavioral development. Scholarly, insightful, integrative, and very readable, this discussion of the nature-nurture controversy as an echo of earlier debates between preformationists and epigeneticists should be read, probably more than once, by anyone interested in theories of development. My only disappointment was that the ethological and sociobiological positions on genetic determinism were not addressed as directly and extensively as I

would have wished. It is, however, an indication of just how good this chapter is that, after reading its 100 pages, I wanted more.

Susan Oyama's subsequent discussion of maturation as process, reflecting species-typical developmental pathways modifiable by both environmental and genetic variation, will also be of very great interest to all readers of this journal. By focussing on the importance of the joint effects of species-typical environments and species-typical genotypes in producing species-typical phenotypes, Oyama succeeds in providing a framework for discussion of maturation without the residual genetic determinism too frequently associated with the term. Oyama's chapter both complements Oppenheim's contribution and offers a compelling framework for discussion of developmental issues. These first two chapters should be required reading in any future graduate seminars or higher-level undergraduate courses on development.

Following these discussions of central theoretical issues in the history of developmental science are a series of six chapters concerned with the proximal causation of behavior. Hailman uses information theory as the basis for providing a formal general theoretical framework for discussing the interaction of internal state and external input in determining the probability of overt behavioral outputs. Within this metatheory, ontogeny is treated as a recursive mapping function with the characteristics of the fertilized ovum providing the starting point of an ontogenetic vector describing the sequence of behavioral phenotypes that constitute the animal's life. While I doubt that many of the empirically oriented will reject their current approaches to the study of behavior in favour of Hailman's mathematical conceptualizations, this "metaethology" is a challenging first step in the integration of ontogenetic, causal, and functional analysis into a single, integrated approach to the study of behavioral phenomena.

Toates and Birke present a cognitive model of motivation in which changes in internal state are presumed to alter the power of incentive stimuli to elicit and direct behavior. Incentive stimuli, as represented within the animal in spatial maps, are seen as goal objects in a negative feedback system, permitting behavioral flexibility in their attainment. During development, changes in the motor skills, sensory capabilities, and knowledge of the world of the growing individual result in changes in the incentive value of stimuli and consequent changes in the animal's behavior with respect to those stimuli. The chapter provides an interesting integration of cognitive and control theories in the discussion of motivational problems.

Green discusses problems in both complex pattern recognition and the acquisition and organization of representations in relation to filial imprinting. Zolman succinctly and expertly reviews challenges to traditional general process learning theory and discusses the implications of recent approaches to animal learning for both the study of the ontogeny of learning and the comparative study of learning processes. Fagan presents a highly speculative argument in support of the contention that play functions to increase individual behavioral flexibility rather than to train species-typical motor skills. The argument, though possibly correct, is based largely on the enriched-environment literature and the unsupported supposition that social play is more complex in physically enriched environments. In a volume generally characterized by sophistication and success in the integration both of information from laboratory and field and of causal and functional analyses, this chapter serves as a warning as to how easy it is to go too far with too little, using one poorly understood phenomenon to interpret another.

Kamil and Yoerg provide a particularly useful discussion of the conceptual and methodological advantages that might result from the integration of psychological and ecological approaches to the study of behavior. Although the presentation is developed in terms of examples from research on animal learning and foraging, the issues raised are

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sufficiently broad to interest any student of behavior. The exposition parallels my own prejudices closely enough that I can only describe it as very balanced and constructive—surely a salutary response to the negativism and one-sidedness of several recent discussions of the interaction of ecology and psychology. I recommend it highly.

The final four chapters of the volume, on variations in mating strategy (Dunbar), helpers and reproductive restraint in carnivores (Macdonald and Moehlman), the influence of reproductive value on behavioral strategies (Rubenstein), and the effects of age on social strategy (Gadgil), give the volume its unique flavor. Here we are concerned, not with the causes of development, but rather with the effects of developmental process and events on strategies for enhancing reproductive success. Rubenstein, whose chapter, of the four, is most extensively committed to developmental questions, discusses ways in which the age and developmental history of individuals might affect their respective competitive abilities, and consequent social strategies. The application of functional analysis to developmental issues is successfully carried out and the relevant mathematics is made accessible to even the quantitatively illiterate, like myself. I recommend it highly to those interested in the interface between functional and developmental levels of analysis.

Happily, this interesting and challenging volume has been priced by Plenum Press at a not unreasonable \$39.50. Several of its chapters should be made readily available to anyone pursuing an education in animal behavior, animal learning, behavioral ecology, or developmental psychobiology. It should surely be ordered for university libraries and, at the least, selectively read by anyone with an interest in the study of development and behavior.

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