

## BOOK REVIEWS

MARCY F. LAWTON, EDITOR

**Cladistic theory and methodology.**—Thomas Duncan and Tod F. Stuessy [eds.]. 1985. Van Nostrand Reinhold Co., New York. 399 p.

This compendium of significant early papers appears thirty-five years after the formal introduction of cladistics in Hennig's book "Grundzüge einer Theorie der phylogenetischen Systematik" (1950). Since this important event, cladistics has undergone many fundamental changes in methodology and philosophy of which ornithologists might not be aware. That ornithologists should be familiar with cladistic techniques is evident even from a casual perusal of recent literature in avian systematics: cladistic analyses and phylogenetic classifications are becoming the rule rather than the exception.

With the increasing frequency of cladistic investigations, the nature of avian classifications is changing. No longer can investigators assume that a genus includes all phenotypically similar taxa. In many current systematic revisions this gradistic information is discarded in favor of a more explicit statement of evolutionary relationships. It is therefore important for all ornithologists, not just systematists, to understand how current classifications are derived and what information is conveyed. Knowledge of cladistics is essential for such an understanding.

This latest volume in the *Benchmark papers in systematic and evolutionary biology* series is a collection of papers that have been important in the development of the cladistic school of systematics. As stated in the Series' Editor's Forward, the intent of the collection is to "provide busy scholars with a review of the primary and secondary literature of the field from a historical perspective and a summary of the current state of the art." The volume is reviewed here with these objectives in mind.

Given the historical intent, the choice of papers to be included is perhaps the most critical measure of the book's worth. The selection of a handful of papers to represent the breadth of cladistic philosophy and methodology is an extremely difficult task. However, Duncan and Stuessy have done an admirable job in bringing together a set of important and representative papers on early cladistic theory and methodology. Papers authored by such important figures in the development of cladistics as Estabrook, Farris, Hennig, Kluge, Nelson, and Wagner are included. Topics range from purely philosophical discussions to examples of cladistic studies of vertebrate, invertebrate, and plant relationships (no bird papers are included). In addition, three excellent critiques of cladistics are presented that illustrate how cladistics differs from previous systematic approaches. Although there is always room for disagreement concerning which papers to include or not, I believe that the papers selected provide the desired historical perspective.

In the introduction, the editors discuss the contributions of the papers that were selected for inclusion in this volume. In the process, a brief historical review is provided in which other related publications are discussed. Though by no means extensive, the bibliography accompanying the introduction should provide readers with access to additional historically noteworthy publications.

Historical shifts in cladistics are obscured, however, by the way in which the editors chose to organize the papers. Rather than a chronological arrangement, the twenty-two papers are divided into seven categories: (1) Theoretical Issues; (2) Character Analysis; (3) Hennigian Argumentation Method; (4) Parsimony Methods; (5) Character Compatibility Analysis; (6) Statistical Approaches to Phy-

logenetic Inference; (7) Critiques of Cladistic Theory and Methodology. Classifying papers into clusters based on similarity of topic makes it extremely difficult for the reader to trace historical changes in the field. Not even within the seven sections are the papers arranged chronologically.

In the process of presenting significant historical papers, this volume was intended to provide a "review of the primary and secondary literature of the field." The introduction is the only attempt to fulfil this goal and it is only seven pages long (including the references). The seven sections of "Editors' Comments" simply define each of the categories and list the contributions of the papers. A total of seven papers (other than those included in this volume) were cited in these Comments.

I feel that the limited review by the editors is a serious limitation of this volume. An important consideration in designing a collection of papers such as this is the fact that, due to space limitations, only a small fraction of papers on a particular topic may be included. If the volume is to be anything other than a set of bound reprints, it is up to the editors to provide some review of important papers not included in the volume. A discussion of the atmosphere and events occurring at the time a subset of papers was written would convey a greater understanding of the history of cladistics. The lack of this historical summary limits the reader's ability to understand why cladistics evolved in the way it did.

As a compendium of a sample of important early papers in cladistics, this book is a success. *Cladistic Theory and Methodology* is an appropriate companion text for a course or seminar in the history of cladistics. However, I would make the recommendation that the papers be read in chronological fashion rather than in the order in which they are presented.

As anything other than a collection of classic papers on cladistics this book would be inappropriate. If one is interested in a discussion and understanding of modern cladistic techniques I would recommend reading Eldredge and Cracraft (1980), Wiley (1981), and recent issues of the journals *Systematic Zoology* and *Cladistics*. *Cladistic Theory and Methodology*, despite the Series' Editor's Forward to the contrary, simply does not provide an adequate summary of the "current state of the art."—SCOTT M. LANYON, Division of Birds, Field Museum of Natural History, Roosevelt Rd. at Lake Shore Dr., Chicago, IL 60605.

**Modeling nature.**—Sharon E. Kingsland. 1985. Univ. of Chicago Press, Chicago. 267 p.

The use of mathematics as a tool in attempting to describe biological processes has a long and stormy history. Perhaps nowhere has this procedure engendered more controversy than in the field of population biology. What is perhaps most interesting (some might regard it as amusing) about the repeated controversies over the use of mathematical models in population biology is that almost invariably neither side turns out to be correct, and the ultimate resolution is a compromise that incorporates elements from both camps.

Perhaps the outstanding controversy in population biology was the "density dependence vs. density independence" debate that raged from the early 1950's until the late 1960's. This debate was of particular concern to ornithologists since an ornithologist, David Lack, was the leading spokesman for density-dependent regulation of

population size, and engaged in continuous debate with entomologists, who insisted that other factors, such as weather, regulated populations. This debate faded away (along with its poor stepchild, "r and K selection"), as ecologists became more sophisticated and realized that all organisms are to a degree subject to fluctuating and unpredictable environments. Also, during times of high population density, all organisms experience a high degree of intraspecific competition that limits population growth. Therefore, weather may cause major fluctuations, but intraspecific competition ultimately limits population size at the high end.

This debate is but one of several that are described by Sharon Kingsland in her thorough and readable history of theoretical population biology in the twentieth century, *Modeling Nature*. Kingsland's greatest strength in this book is that she presents a number of case histories, describes the historical background of models, and shows how intellectual progress occurs. To her credit, she manages this by relatively dispassionate analysis, and without taking sides. As a result, the reader learns a great deal about the dynamics of science and the historical bases of controversies. For example, the book ends with Robert MacArthur, the individual often treated as if he were the founder of theoretical population biology. Yet the way the book is structured, we see MacArthur as the almost inevitable successor of an extensive lineage.

The book begins with a brief description of how 19th century natural historians, stimulated by Darwinian ideas, began to move emphasis away from typological individualistic thinking and into consideration of the population as an entity worthy of study. This theme continues as an undercurrent throughout the book, e.g., in the discussion of A. J. Nicholson's ideas on the relationship between adaptation and intraspecific competition, or in the discussion of Gaussian vs. Eltonian niches. We learn about A. J. Lotka and his mentor, Raymond Pearl. These gentlemen were perhaps the progenitors of physics-envy, and continually searched for universal laws behind biology, which often led them to overstate the generality of their results. Both spent much time trying to explain human demography and to relate demography to economic systems. It is ironic to realize that the modelers associated with predator-prey and competition models, and the logistic equation, did not intend for their models to be applied to animals or to ecological systems.

Although *Modeling Nature* is in no way a book of gossip, we learn a great deal about the personal quirks and frustrations of these men. (Lotka apparently could not get funding to work in academia and ended up working for private industry, a situation with which many contemporary young Ph.D.'s may sympathize). Kingsland cogently argues that the philosophical predilections of these individuals affected the way their work was received. For example, Lotka's models were not accepted by ecologists in the way Volterra's were because Lotka did not apply them to animal systems, whereas Volterra developed his models to describe fluctuations in fish populations.

Kingsland's book does not follow a straight time line, but links similar philosophical points of view that occur decades apart. This adds to the book once one realizes that the author is not following a strict chronology. It also helps to place the careers of individuals in perspective. For example, I had always linked Gause with Lotka, Pearl, and Volterra, and did not realize that he is actually younger than G. E. Hutchinson (and still alive). It is instructive to be reminded that Gause's experiments led directly to Hutchinson's concept of the niche.

Kingsland does a good job of placing Robert MacArthur and modern population modelers in perspective. This is a major reason why this book should be of interest to avian ecologists. Kingsland emphasizes the development of theory about the niche, weaving together Gause's par-

amecia, lack's Galapagos finch work, and Hutchinson's paradox of the plankton to show how MacArthur came to think about warblers. Kingsland is fair in assigning MacArthur his proper place as a major force in getting ecologists to think about evolutionary and population phenomena in a mathematical way, but she is also correct in pointing out that the attitude promulgated by MacArthur and his followers created a large amount of counterproductive controversy.

Two problems apparently interfere with the general acceptance of mathematical models in ecology. First, many individuals are confused by, or even afraid of math, and second, there is an often justified fear of losing sight of reality. Kingsland shows that these arguments were as common 40 or 50 years ago as they are today. The irony is that some of the best known theoreticians were not strong in math or rarely used math. W. R. Thompson, A. J. Nicholson and David Lack never published original equations. *Modeling Nature* demonstrates that population biology and ecology have benefitted from the efforts of mathematical modelers, through their demonstration that insights can be gained into apparently complex processes through the use of simple models. The best of these models, i.e., Lotka-Volterra, island biogeography, can be readily understood by anyone with a small effort.

The ultimate solution to these controversies would seem to be an increase in tolerance by both theoreticians and natural historians. Perhaps our model should be G. E. Hutchinson, a scientist fascinated by theory, but with an excellent sense of both history and natural history. Kingsland demonstrates that controversy in population biology is nothing new, and reading this book may teach all of us to be more tolerant of scientists with opposing philosophies.—RAYMOND PIEROTTI, Department of Psychology, University of California, Berkeley, CA 94720.

**Nest building and bird behavior.**—Nicholas E. Collias and Elsie C. Collias. 1984. Princeton Univ. Press, Princeton. xix + 336 p. (\$45.00 cloth, \$16.50 paper).

For many of us, knowledge of nest-building behavior is limited to Dilger's (1962) discovery that if you cross a Peach-faced Lovebird (*Agapornis rosicollis*) with a Fischer's Lovebird (*A. personata*) you get a confused hybrid that can't decide whether to tuck nesting materials into its feathers or whether to carry them in its beak. Most of us have even forgotten that eventually (three years later) these hybrids finally did learn to build nests.

The Colliases haven't forgotten. In their remarkably comprehensive treatment of avian nesting behavior, Nicholas and Elsie Collias have presented a definitive collection of how, why, when, and where birds build their nests. The result of nearly 40 years of scholarship and original research, *Nest Building and Bird Behavior* is an always fascinating, sometimes frustrating treasure. The authors provide a comprehensive treatment of the literature on everything from nest-site selection, parasites, predators and the physical environment, to the development of nest-building ability and the hormonal control of nesting behavior. However, the volume is more than a source book because the authors augment their enormous knowledge of the literature by presenting the results of original research, wonderful anecdotes of the sort that so frequently die with investigators, and, occasionally, provocative speculation.

For instance, in their chapter on the development of nest-building ability, the authors complement Dilger's early work with their own experimental studies of Village Weavers. Their findings suggest not only that experience is an important factor in nest-building behavior, but also that there may be a critical period in the acquisition of nest-building behavior similar to that described for the acquisition of song in White-crowned Sparrows.