Amphibians

Michael J. Ryan

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areas as spherical atmospheres and chromospheres. Steenbock contributes an important comment on the role of departures from local thermodynamic equilibrium in the iron ionization equilibrium in late type stars. Catchpole and Feast survey the distribution of peculiar stars in different astrophysical environments. In a review of the chemical composition of the barium stars, Lambert points to the need for a careful and thorough search for spectral peculiarities among main sequence stars that may be precursors to the peculiar red giants. McClure summarizes recent observations of the frequency of binary stars among the different types of peculiar red giants. He concludes that stars with excesses of heavy elements are probably all binaries, while peculiar red giants with normal abundances of heavy elements show a normal frequency of binary stars. This result has important consequences for theories of the origins of peculiar red giants, the subject of the final review by Wood. He discusses the dredge-up of carbon produced by the triple-α process in stars undergoing double shell burning. Stellar evolution models lead to a qualitative sequence of M-S-C stars, but the quantitative agreement is still not good. Wood suggests that the early carbon stars (R stars) may instead result from the helium-core flash, which may also play a role in the formation of barium stars and CH stars.

This comprehensive review of red giant stars with excesses of heavy metals succeeds in conveying not only the wealth of observational data now available on the characteristics of cool stars but also the extraordinary progress of the last 65 years in understanding the complex process of stellar evolution. Yet we are still only speculating on the origins of many of the peculiar red giants, particularly the barium stars. The book serves as an important milestone on the way to a more complete understanding of the evolution of stars.

CATHERINE A. PILACHOWSKI
Kitt Peak National Observatory,
Tucson, AZ 85726

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Biology of Amphibians. WILLIAM E. DUELLMAN and LINDA TRUEB. Illustrated by Linda Trueb. McGraw-Hill, New York, 1986. xx, 670 pp., illus. $40.

The class Amphibia consists of three orders, two of which, the Anura (frogs) and the Caudata (salamanders), are familiar to many and the third of which, Gymnophiona, containing the fossorial and rather bizarre caecilians, remains relatively little known even to those who study their biology. Studies of amphibians have made essential contributions to our understanding of a number of biological subjects, especially development, ecological competition, functional morphology, molecular evolution, sensory physiology and neuroethology, and social behavior. Although these studies encompass a diversity of scientific interests, researchers must take into account the fact that the animal is an integrated whole. For those of us working with amphibians the quickest, most reliable source of information about the biology of our study organisms has since 1931 been G. Kingsley Noble's monumental *The Biology of the Amphibia*, reprinted by Dover in 1954. I am not urging by any means that researchers retire their copies of Noble; I predict, however, that Duellman and Trueb's *Biology of Amphibians* will soon become the key reference for details of amphibian biology.

Duellman and Trueb truly review the biology of amphibians, covering most conceivable topics from cytogenetics and development to biogeography and phylogeny. They do this in 19 chapters in four sections: Life History, Ecology, Morphology, and Evolution. The outstanding feature of this work is its extensive and up-to-date (as of about 1983) documentation. The book lists more than 2500 references in 12 languages, and more than a third of these appeared between 1980 and 1983. Duellman and Trueb have, moreover, collated large quantities of data (or added to such collections by others). These collections, especially those in the section on life history, are sure to provide a catalyst for inquisitive minds. Although at times the authors' own presentation becomes a mere litany of facts, for the most part there is an attempt to summarize and synthesize. Of course, in a work of this breadth a thorough consideration of all aspects of amphibian biology is not possible. For example, about 15 pages are devoted to the amphibian ear, a subject to which E. Wever recently (1985) devoted a 500-page book. However, the authors usually provide accurate and concise summaries, along with key references, especially to review articles. Another welcome feature of this book is the abundant, clear, and well-labeled illustrations. Most that have been taken from the primary literature have been redrawn, and some are works of art. The illustrations especially add to the chapters on morphology, which I found the most comprehensive and rewarding. The index is thorough and easy to use—not a trivial point for a book of this nature.

There are some mistakes and misconceptions. For example, attenuation of sound pressure level with distance does not follow the inverse square law (it changes linearly), and the authors seem to imply that low-frequency sounds (<1000 Hz) reach the papilla amphibiorum of the inner ear only through the opercularis system, whereas data presented by Lombard and Straughan in the paper cited for this conclusion clearly show that perturbation of the tympanic-columella system influences thresholds of low-frequency hearing and Wever, in a paper also cited, questions the mechanism implicating the opercularis in low-frequency hearing. There is occasionally uncritical acceptance of studies in the literature; but it is not clear how any two authors could be expected to assess accurately all studies contributing to a work of this breadth. Even though the book is fairly current, the reader should be aware that there have been significant new developments since it went to press, for example with respect to energetic costs of reproductive behavior.

There is no recent textbook on amphibian biology that is worthy of comparison with Duellman and Trueb's. This work also compares favorably with analogous books on other vertebrate taxa, such as Vaughan's *Mammalogy*, Welty's *The Life of Birds*, Pettingill's *Ornithology*, and Bond's *Biology of Fishes*. If only there were a counterpart of this quality for reptile biology.

MICHAEL J. RYAN
Department of Zoology,
University of Texas,
Austin, TX 78712

Measuring Selection

The Statistics of Natural Selection on Animal Populations. BRYAN F. J. MANLY. Chapman and Hall (Methuen), New York, 1985. xvi, 484 pp., illus. $55. Population and Community Biology.

Field biologists these days are succeeding at the difficult task of measuring selection in natural populations. Much of the current effort is directed at large organisms (for example, deer, birds, lizards, dragonflies, flowering plants). Such organisms can be individually marked, observed, and recaptured in the field so that statistical relations between phenotypic traits and reproductive success can be determined. The focus is on traits with direct relevance to ecological interactions and evolutionary history (for example, body size, feeding structures, running ability). The challenge is to adapt censusing techniques, developed to answer simpler demographic questions, to the task of estimating selection and addressing unanswered questions in evolutionary biology.