these creatures, replete with dramatic and fascinating examples.

In order to live up to the abundant praises of its jacket blurbs, however, this book would have to be flawless in all regards—and it is not, by any means. On close inspection, the book often uses confused logic, blurs important biological details, or omits crucial concepts while "simplifying" complex topics. I will provide a few examples to demonstrate this point.

In support of Wigglesworth's "gill" theory of the origin of insect wings (which may be correct, but for other reasons), Heinrich argues that since no flightless insects are now known to use wing-like structures as fluid-circulating solar energy capture panels, or as courtship pattern billboards, neither function is likely to have played a role in the earlier origin of wings themselves. This conclusion does not follow from its premise. Paleontology shows us many cases in which formerly widespread transitional morphologies have vanished and left no present representation, nor even parallel recurrence. Why are insect wings unlikely to have traced such a path in time?

The origins of uncalcified cuticular insect exoskeletons, and "mastery of the air" in powered flight by insects, are each said in the first chapter to have occurred "about 300 million years ago" (p 4). This stretches the word "about" beyond any reasonable meaning. Earliest known insects (archaeognathans) or near-insects (collembolans), with their cuticular exoskeletons, date from the lower Devonian (380–360 Mya) to the Meganeura. The giant dragonfly (with which Heinrich exemplifies powerful flight) and other early winged fossil insects are upper Carboniferous (indeed "about" 300 Mya) to lower Permian. The adaptive innovations of hard exoskeletal cuticle and wings for flight may have been separated by dozens of millions of years or longer, yet Heinrich's offhand discussion of their age leaves readers with the confusing impression that they were contemporaneous.

Despite lip service to the biophysics of insect thermal biology, there is no mention of the elegant "climate space" analyses, in the tradition of Gates, Porter, and Kingsolver, which have been central to physiological ecology and insect thermal biology for some time. Instead, the lone discussion of heat exchange between insects and their environments (in the second chapter) represents metabolic heat (measured by oxygen exchange) as the sole heat input. This discussion uses the now obsolete Newtonian-passive-cooling approximation as the sole cooling term in a wholly inadequate "balance equation" thereby neglecting radiative input or output entirely, failing to separate conduction and convection as distinct cooling modes in practice, and thereby does not describe any insect with accuracy. If a qualitative account was intended, it would have been better to omit the almost-ersatz equation, and to combine diagrams with simple but accurate text. If the intent was to teach some quantitative thermal biology, it should have been done thoroughly and with reference to actual insects.

The book exemplifies two common problems seen in this genre: it blurs or confuses what is actually known, or omits central and important ideas, while it tries to simplify a subject for general readers and thus extends its scope beyond the author's own work without the attention to detail necessary for accuracy or insight. Major parts of the book may be free of these problems, but they are mixed with parts that suffer badly, and only an already knowledgeable reader can distinguish them. Communicating the fascination of science to society at large is a difficult task, but inaccuracy and the omission of fundamentals cannot be the proper prices of the attempt. Those prices are too high, for both science and society.

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RUDDY DUCKS & OTHER STIFFTAILS: THEIR BEHAVIOR AND BIOLOGY. *Animal Natural History Series.*

By Paul A Johnsgard and Montserrat Carbonell. Norman (Oklahoma): University of Oklahoma Press. $49.95. xiv + 291 p + 8 pl; ill.; index. ISBN: 0-8061-2799-6. 1996.

Stifftail ducks are a largely Southern Hemisphere group of birds exhibiting many fascinating life history strategies. Social systems, including lek behavior and obligate brood parasitism, are just two of the more notorious stifftail traits that are unique among waterfowl. From a morphological standpoint, well-developed feet and hind limbs make stifftail ducks expert divers and one of the most anatomically specialized of all waterfowl groups. Unlike their more sought-after and palatable counterparts in the Northern Hemisphere, however, stifftail ducks have not earned a great deal of attention from sportsmen or researchers. A serious lack of basic information for all but one of the world's eight or nine species makes stifftail ducks one of the most poorly understood groups of waterfowl on the planet. Thus, it is with enthusiasm that I welcome this informative and elegantly illustrated new addition to the ranks of waterfowl literature.

Ruddy Ducks & Other Stifftails: Their Behavior and Biology is divided into two parts. The first part consists of five chapters dealing with the comparative biology of stifftails. These include topics such as Stifftail Evolution and Taxonomy; Morphology, Anatomy, and Plumages; General Behavior and Ecology; Comparative Social and Sexual Behavior; and Reproductive and Population Biology. The sec-

ond half of the book is composed of eight species accounts. The book also contains a useful glossary and a key to in-hand species identification. Scattered throughout the text are more than forty illustrations and sixteen color photographs.

The first half of the book is particularly appealing. Johnsgard and Carbonell present a complete account of the history of stifftail taxonomy and classification ranging from the very first efforts to classify waterfowl in the early nineteenth century to the most recent cladistic analyses. The authors further highlight the central issues and major points of controversy surrounding stifftail phylogeny: Are stifftail ducks the descendants of an ancient lineage or did they evolve more recently, contemporaneously with other diving groups like sea ducks? How do aberrant stifftails like musk ducks (*Biziura lobata*) and black-headed ducks (*Heteronetta atricapilla*) relate to the other members of the group? Should they be regarded as "typical" stifftails? What are the relationships of extant *Oxyura* species to each other, and how do they reflect the dispersal and speciation events that occurred?

All in all, Johnsgard and Carbonell demonstrate unusual insight into the potential pathways by which the various members of the group might have diverged. The authors also display an excellent grasp of comparative anatomy and social behavior. The eight species accounts in the second half of the book are thoroughly researched, up to date, and contain an overabundant supply of life history and comparative behavioral information. The only evident drawback of the book is its strong reliance on data from captive birds. This does not reflect so much on the merit of the book as on the almost complete lack of information about wild stifftail populations.

In summary, the book is generally well written and handsomely illustrated. By bringing to light the life history traits of this relatively unknown group of Southern Hemisphere ducks, the book is also in a position to inspire future research, particularly in younger generations. It would serve as a fine addition to the libraries of professionals and seasoned amateurs alike—a necessity for anyone interested in the evolution of social behavior and life history strategies in waterfowl.

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AVIAN MOLECULAR EVOLUTION AND SYSTEMATICS. *Edited by David P Mindell. San Diego (California): Academic Press.* $84.95. xx + 382 p; ill.; index. ISBN: 0-12-498315-4. 1997.

This book is the most important synthesis on the evolution of birds since Sibley and Ahlquist's monumental treatise. It synthesizes the current state of understanding of theory and practice of molecular evolution and systematics of birds. Moreover, the examples of methodology and the advances of knowledge of tempo and mode of DNA evolution also hold for taxa other than birds; therefore, this compilation of papers should make important reading for other students of evolution as well.

Some of the exciting and unexpected ideas in this book about the evolution of birds are going to raise feathers, just like some of those of Sibley and Ahlquist did. The most contentious and interesting is the new hypothesis advanced by Mindell et al. that the passeriform birds, long believed to be one of the most derived groups of birds, may actually be basal to all other orders of birds. This finding seems to fly in the face of previous ideas on the placement of this seemingly derived and sophisticated group of birds, and also seems at odds with the very young (only about 25-million-year) fossil record of passeriform birds. This radical suggestion, although it is based on the largest molecular data set so far, will surely result in the collection of more data from more taxa to test this idea. If it does not turn out to be a phylogenetic artifact caused merely by a rooting problem, a radical rethinking of ideas of relationships among orders of birds and the associated evolution of conspicuous characters such as song will result. Other important issues that are revisited in this book are the placement of the hoatzin, flamingos, and other enigmatic and strange birds.

The book's 13 chapters are organized into two parts. Molecular Sequences and the Evolutionary History in Birds consists of eight chapters that cover general topics that go beyond bird-specific considerations: (1) the evolution of the surprisingly variable mitochondrial gene order in birds that differs among often closely related birds, much more so than in any other class of vertebrates (Quinn); (2) the utility of microsatellite markers (McDonald and Potts); (3) the control region (Baker and Marshall); and (4) cytochrome b (Moore and DeFilippis). The first part of the book also includes chapters that deal with the application of molecular methods to inclusive phylogenetic problems such as (5) the application of 12S rDNA sequences to the evolution of Gruiformes (Houde et al.), (6) the phylogeny of Pelicaniformes (Siegel-Causey), (7) the phylogeny of ratites (Lee et al.), and (8) the phylogeny among several avian orders (Mindell et al.).

The second part of the book, Applying Phylogeny and Population Genetics to Broader Issues, is in my opinion not all that different from the first chapters, but includes exceptional contributions by Edwards on the relevance of microevolutionary processes to higher level systematics, by Sheldon and Whittingham on the use of the comparative