## REVIEWS

EDITED BY WILLIAM E. SOUTHERN

*The following reviews express the opinions of the individual reviewers regarding the strengths, weaknesses, and value of the books they review. As such, they are subjective evaluations and do not necessarily reflect the opinions of the editors or any official policy of the A.O.U.—Eds.*

**Arctic ordeal: the journal of John Richardson, surgeon-naturalist with Franklin, 1820-1822.**—Edited by C. Stuart Houston. 1984. Kingston and Montreal, McGill-Queen's University Press. xxxiv + 349 pp., 8 maps, 9 tables. ISBN 0-7735-0418-4. $29.95.—Lieutenant John Franklin's Arctic overland expedition of 1819–1822 was one of a series of early 19th-century explorations undertaken by the British Admiralty in an effort to find the Northwest Passage. The selection of John Richardson (1787–1865) as the expedition's surgeon and naturalist was a fortunate choice for the advancement of scientific knowledge of the region. He was a skilled naval medical officer but was chosen for this and later explorations largely because of his abilities as a naturalist.

Franklin and his party arrived from England at York Factory, in present-day Manitoba. The expedition proper, complete with British sailors, voyageurs, Indians, and interpreters, began at Great Slave Lake and followed the Yellowknife and Coppermine river chains (in what is now the Mackenzie District of Canada's Northwest Territories) north to Coronation Gulf. Richardson did not make his initial journal entry until 21 August 1820, at Winter Lake. From the gulf they traveled the coastline into Bathurst Inlet. After reaching Point Turnagain they returned by way of the Hood, Burnside, and Yellowknife rivers. The journey back was marred by cold weather, hunger, death (including murder), and probably cannibalism.

Richardson's reputation as a naturalist has always been deservedly high. Later in the century Elliott Coues wrote that his work "increased our knowledge of the life-history of the northerly birds so largely that it became a fountain of facts drawn upon by nearly every writer of prominence from that day to this." The present volume shows that Richardson is entitled to even more credit than heretofore given.

The last half of the original journal contains 120 pages of descriptions of birds, mammals, and fish. The editor chose to omit most of this material in the published version. The decision to do so, although regrettable, is understandable in light of publishing costs and because most readers would find it "tedious and detailed." Also not included are similar descriptions found in the narrative portion of the journal. Those interested in reading the omitted material may consult the original journal, which is housed in the Rare Book Room at the library of the University of Illinois.

Nevertheless, the present volume offers much on ornithology. Appendix A ("Bird Observations") provides "after a century and a half of omission and oversight, a complete list of birds described by Richardson during the First Arctic Land Expedition." A total of 113 species are treated. And it is more than a mere list; many of the entries contain extracts from Richardson's writings. The editor used the following sources to compile this appendix: Joseph Sabine's Zoological Appendix to Franklin's narrative; "Fauna Boreali-Americana, II, The Birds," by William Swainson and Richardson; Richardson's Zoological Appendix to William Edward Parry's "Journal of a Second Voyage of Discovery. . . ."; and the narrative portion of Richardson's journal and that part of the journal devoted to description of specimens. From the journal's narrative portion the editor gives in full Richardson's description of the Yellow-billed Loon (*Gavia adamsii*).

Other appendices similarly treat mammals, fish, plants, lichenology, and geology. The editor's "Commentary" on the journal further discusses the significance of Richardson's contributions to natural history resulting from this expedition.

Houston explains why Richardson has not received all the credit due him for his achievements in natural history. He had to abandon many of his specimens because of the difficulties of the journey. The hardships of the return from Coronation Gulf prevented collecting almost entirely. The specimens that did survive were sent to England; there, the Earl of Bathurst turned many of them over to Joseph Sabine, who prepared from them his Zoological Appendix. Houston rightly points out that "Bathurst had no business requesting one scientist to prepare for publication the work of another, before the latter had even returned from the expedition." Sabine's list, moreover, omits several of Richardson's specimens that apparently came into his hands, including many birds. Some of them had arrived in a condition too poor to permit adequate examination. Richardson himself prevented proper recognition of his efforts by allowing Swainson's name to appear before his on the title page of the ornithological part of the monumental "Fauna Boreali-Americana." In the same work Richardson sometimes credited Franklin with observations that were actually his own. Although the editor notes that Richardson was not as knowledgeable in ornithology as in some other branches of natural history, it is clear that he was overly modest about his accomplishments in this field.

Here is a well-edited, pleasingly illustrated addition to the already rich literature of Franklin's first expedition to these regions. Editor Houston, a professor of medical imaging at the University of Saskatchewan, had previously published the journal of another of Franklin's assistants and is the co-author of a work on the birds of the Saskatchewan River. This solid background, added to his sound sense of history, makes "Arctic Ordeal" a major contribution to the history of scientific exploration. Adding to the attractiveness of the volume are 53 on-the-spot sketches by H. Albert Hochbaum. Of these, 12 treat birds in greater or lesser detail.

This work will be a desirable acquisition for the libraries of colleges, universities, and museums.—MICHAEL J. BRODHEAD.

**A guide to hawk watching in North America.**—Donald S. Heintzelman. 1982. University Park, Pennsylvania, The Pennsylvania State University Press. 256 pp., 178 illustrations and photos. ISBN 0-271-00217-4. Paper, $9.75; hardcover, $16.95.—I received the paperback version of this book, which is in its second printing. It was originally issued in 1979. It is unfortunate that a second printing rather than a second edition was undertaken, as there are some significant changes, updating, and revisions that would have made a more useful volume. The first printing was reviewed in several places (e.g. Raptor Res. 15(4); 126–127, 1981), and the virtues and faults listed remain in this printing.

The nucleus of the book consists of details of flight identification of the species, accompanied, primarily, by photos of the species perched and in flight and descriptions of lookouts. Drawings have been used in some cases where photos apparently were not readily available to the author. Most of the photos are quite good and helpful. I was taken by the photo of the juvenile Golden Eagle (*Aquila chrysaetos*) in flight because of the extensive amount of white in the tail; certainly more than the average. The flight photo of the *harlani* race of the Red-tailed Hawk (*Buteo jamaicensis*) is most informative, with the underwing pattern well demonstrated. The way in which light reflects from the tail suggests that it might have been an adult rather than an immature, however. Two sections, the migration seasons and the mechanics of hawk flight, are succinct and informative. A special section on Bald Eagle (*Haliaeetus leucocephalus*) viewing areas in the United States is especially useful because of the special interest in that species. It would have been equally useful to have included areas of spectacular concentrations of other species, such as the Broad-winged Hawk (*Buteo platypterus*) and accipiters. (Accipiters are especially abundant; nearly 900 were banded in 1984 in the Goshute Mts., Nevada, a lookout location newly found since the first printing of the guide but not included in the second printing.)

I would like to have seen more balance and consistency in the types and distribution of photos. The first section on species accounts includes photos of nests and eggs for 6 of the 35 species treated. But then, why is a photo of 6–8-day-old Northern Goshawks (*Accipiter gentilis*) in a nest included in the section of photos of perched birds? For several species there is more than one shot of the bird in nearly identical postures (e.g. Broad-winged Hawk), while other species [e.g. Prairie Falcon (*Falco mexicanus*) and Merlin (*Falco columbarius*)] have only one photo.

Overall, this book has useful information for both professional ornithologists (locations of the most well-used lookout stations) and nonprofessionals who may have difficulty identifying raptors. The price of the paperback edition, considering the nature of the material and the use to which the book will be put, makes it the more attractive buy.—CLAYTON M. WHITE.

**Proceedings of the second symposium on African predatory birds.**—J. M. Mendelsohn and C. W. Sapsford (Eds.). 1984. Durban, South Africa, Natal Bird Club. v + 254 pp., numerous text figures. ISBN 0-620-07909-9. Rand 22.00.—These proceedings report the 2nd Symposium on African predatory birds; the first was held in 1977 (cf. Thurow, Raptor Res. 13: 126). The papers presented in this book represent the results of a 5-day meeting held at the Golden Gate Highlands National Park, which lies in a beautiful mountainous setting along the border of Lesotho in east-central South Africa—a fitting location when discussing the magnificent cliff-nesting Cape Vulture (*Gyps coprotheres*) and Lammergeier or Bearded Vulture (*Gypaetus barbatus*). Forty-three papers (this includes 18 abstracts or extended abstracts) make up this volume. The topics covered are broad indeed, although no papers are on gulls (*Larus* spp.) nor hornbills (*Bucorvus*), as in the previous symposium. The Cape Vulture is considered by some to be a threatened species in southern Africa. Eight papers relate specifically to it, and the better part of one day at the symposium was spent discussing the species. What may be the most current document on the status of raptors on the horribly abused island of Madagascar is contained herein. As major topics of each paper, 9 deal with falcons, 2 with accipiters and kin, 10 with vultures and relatives, 4 with eagles and relatives, 5 with kites, 2 with owls in part, and the remaining papers cover an array of topics from raptors in general, pesticides, energetics, and energy budgets to prey selection, captive breeding, and population dynamics. One rather interesting paper investigated the use of the tritium dilution technique for evaluating energy requirements by using wild, free-living raptors whose diets were well known and who drink little water.

Some of the major findings reported at the symposium were that: (1) DDE residues continue to build

up in southern African ecosystems, and several bird species now show significant eggshell thinning; (2) several species in Madagascar are seriously threatened with extinction or may in fact be extinct, including the Madagascar Serpent Eagle (*Eurtiorchis astur*), the Madagascar Sea Eagle (*Haliaeetus vociferoides*), and the Madagascar Red Owl (*Tyto soumagnii*); (3) the Obambo Sparrowhawk (*Accipiter ovampansis*), once thought to be a rather rare and elusive species with a poorly defined range, has successfully invaded timber plantations of exotic poplar and eucalyptus trees for nesting and is more abundant than originally thought; and (4) the hypothesis of the influence of calcium deficiency on poor fledging success in the Cape Vulture, presumed to be a factor in its perceived population declines, is more complex and less straightforward than previously thought, and Cape Vultures are more widespread and abundant than earlier reported.

A closing paper for the symposium on the role of captive propagation in conservation presents some timely and provocative thoughts. The paper points out that estimates from the New York Zoological Gardens indicate that to keep a population of 750 Siberian tigers in the world's zoos, the total annual maintenance would be approximately $2.4 million. Based on these and several other cost projections, the author of the paper extrapolated information to raptors. He estimated that to keep 100 species of raptors in captivity, many of them rare or endangered, at a minimum population level of only 100 birds per species would cost $10 million per year. Then comes the meat, so to speak, of this author's final statements: "To biologists and conservationists . . . who have been conditioned to think about money in small terms, this figure will sound like a staggering and impossible sum to secure. When compared against . . . other things . . . humans are willing to spend our wealth to possess, it is not much. It is less than the purchase price recently paid for one race horse in Kentucky . . . equivalent to three M-1 tanks, and the U.S. Government is paying to have these machines cranked out at the rate of about two per day. . . . It represents no more than the combined purses for one heavy-weight championship prize fight."—CLAYTON M. WHITE.

**Social behavior of female vertebrates.**—Samuel K. Wasser (Ed.). 1983. New York, Academic Press. 399 pp. ISBN 0-12-735950-8. $37.50.—Evolutionary biologists, and indeed many naturalists, often have neglected the role of female behavior in their studies of vertebrate social behavior. Implicit in many current evolutionary theories is the assumption of sexual differences in the behavior of vertebrates, often deriving from the supposed unequal investments of the sexes in gametes. Yet gamete production is only a small cost of reproductive effort, and other social constraints of both males and females affect social and mating systems. This thought-provoking volume challenges current dogma concerning the evolutionary development and maintenance of female social behavior, and the resultant coevolution of social behavior of males and females. Unfortunately, only 5 of 17 authors are females—but then I suppose it could have been worse.

The chapters cover vertebrates from fish to humans, depending on what organism lends itself to a particular topic. Major topics covered include evolution of mating systems, factors governing mate selection, sex role reversal, female influence on male behavior, competition and cooperation among females, maternal behavior, and sex biases. The book itself is divided into three main sections: Introduction, Interactions between the sexes, and Reproductive competition and cooperation among females.

The introduction includes two chapters: behavioral biology and the double standard (by S. Blaffer Hrdy and G. G. Williams) and the establishment and maintenance of sex biases (by S. K. Wasser and M. L. Waterhouse). Hrdy and Williams discuss the myth of the passive female, sources of variation in female reproductive success, and what it is that females actually do. They present a convincing case for why biologists have been prone to ignore or denigrate female roles. They clearly delineate the fallacious, but long-standing, conviction of many biologists (including a share of sociobiologists) that if male strategies are explained, you have adequately explained the reproductive strategy of the species.

Wasser and Waterhouse's chapter on sex bias examines the function of a book on female social behavior, sex differences mediated by sexual selection, the maintenance of sex biases in science, and alternatives to the male dominance syndrome. In this chapter they establish the need for the volume, define and discuss sexual selection, and discuss why females are considered passive. A brief history of how sex biases in science were established and maintained is enlightening, perhaps more to those biologists who have not noted the disparities than to those of use (both male and female) who have long pondered the disparities between evolutionary "theory" regarding females and our own observations of behavior in nature. These two chapters should be required reading for biologists (particularly sociobiologists) studying social behavior of vertebrates.

The papers in Part II (Interactions between the sexes) examine organisms from fish to human, using diverse methods such as field observation and experiments, laboratory analysis, comparison of data with several alternative hypotheses, and comparative ethnographic studies of human breeding systems. The methods and approaches vary markedly, but all provide new paradigms for the study of the social behavior of females, and ultimately of both sexes.

I found Brown and Downhowers's chapter on mate choice in mottled sculpin particularly interesting because they examined selection as an interaction between male characteristics and timing of female reproduction. Similarly, Payne's chapter on bird song, sexual selection, and female mating strategies examines the relative importance of male-male competition and female choice of mate as the basis of sexual selection shaping avian song. Irons's chapter on human female reproductive strategies describes some breeding systems and then examines preliminary hypotheses regarding female strategies. I found Part II thought-provoking because the emphasis is on the relative evolutionary importance of alternative hypotheses in explaining female (and male) social behavior and breeding systems. Unlike some past authors who have stressed one hypothesis to the exclusion of others, these authors evaluate and synthesize.

Part III examines reproductive competition and cooperation among females in the Acorn Woodpecker, coati, African elephant, macaque, and yellow baboons. This section lays to rest the myth prevalent in so much of the past social behavior literature that females either cooperate with or are passive to males. The chapters clearly illustrate the variability within and among species in the degree of cooperation or competition. Asymmetries in behavior are apparent in some species (e.g. Acorn Woodpeckers); in others, female behavior such as altruism (coati), cooperation (elephants), and competition (baboons) are prevalent. In all cases, however, the social behavior of the females involves complex strategies based on resource exploitation (of males, food, and space) and antipredator behavior aimed at maximizing reproduction (at least for some individuals).

I found this volume novel, creative, exciting, and thought-provoking. Although aimed at understanding social behavior of females, of necessity male behavior and strategies also are discussed. Although I may not agree with all the hypotheses or syntheses, each chapter is well written, presents data or observations of vertebrates, and provides hypotheses and syntheses of evolutionary models for female behavior. The inclusion of examples from different vertebrate groups is a strength and illustrates both the differences and similarities of evolutionary constraints.

In short, I recommend this volume highly to anyone interested in social behavior, mating systems, reproductive strategies, evolutionary theory, and females.—JOANNA BURGER.

**A dictionary of birds.**—Bruce Campbell and Elizabeth Lack (Eds.). 1985. Vermillion, South Dakota, Buteo Books. xxx + 670 pp., numerous black-and-white photographs, drawings, and text figures. ISBN 0-931130-12-3. $75.00.—This remarkable book, published for The British Ornithologists' Union, is an authoritative dictionary and compendium of ornithological knowledge. Terms and topics are alphabetically arranged, starting with "abdomen" and ending with "zygomatic arch." More than 280 contributors, many of whom are well known for research on their respective subjects, have provided articles on the families and orders of birds and on major topics of study within ornithology, including extensive coverage for anatomy, applied ornithology, behavior, biogeography, conservation, ecology, evolution, migration, physiology, and systematics. The writing is clear, free of excess jargon, and understandable for nonspecialists.

As the most comprehensive treatise on contemporary ornithology in a single volume, this attractive book is for the present age fully equivalent to the previous dictionaries assembled by Newton and Gadow (1893–1896, A dictionary of birds, London, Adam and Charles Black) and Thomson (1964, A new dictionary of birds, New York, McGraw-Hill). The 1985 dictionary is distinctly new throughout. Articles on topics such as altruism, cladistics, sociobiology, and the use of DNA hybridization in systematics emphasize new areas of ornithological investigation principally developed in the 20 years since the previous dictionary. Moreover, for those topics that were covered in the 1964 dictionary the new articles include numerous recent discoveries and conceptual developments. Many articles are followed by a short list of selected references, a high percentage of which were published during the last 20 years. For controversial ideas, e.g. on the relative importance of interspecific competition in the organization of ecological communities, or on the systematics of the higher categories of birds, the different schools of thought are represented in articles by authors of differing viewpoints or by citations of studies presenting such viewpoints. The net result is perhaps as balanced a treatment of matters of major controversy as might presently be attainable.

In view of the overall excellence of this book, its deficiencies are trivial. I found very few minor typographical or spelling errors and even fewer errors of other kinds. The erroneous claim on page 272 that megapodes lack an egg tooth contrasts with the correct summary on page 39 that these birds possess an embryonic egg tooth that is not used when they kick their way out of the shell at hatching. Although the illustrations in this dictionary are of high quality, in two cases features mentioned in the captions are inconspicuous in the published photographs, i.e. the egg tooth on the Whimbrel on page 178 and the parasitic fly on a House Martin on page 171.

As the most useful general ornithological reference book now available, this impressive volume should be included in any ornithological library of any size. Moreover, many general libraries having users interested in birds should also acquire a copy.

Although the dictionary is not inexpensive, it constitutes an excellent value at today's book prices. Anyone with a research or teaching interest in birds or anyone answering general inquiries about birds will want to have access to this book, and many ornithologists, both professional and amateur, will want to own a personal copy. The editors, authors, and others involved in the production of this latest dictionary are to be congratulated for a fine achievement.—GEORGE A. CLARK, JR.

**The growth and development of birds.**—Raymond J. O'Connor. 1984. Chichester, England and New York, John Wiley and Sons. x + 315 pp., 93 text figures, 46 tables. ISBN 0-471-90345-0. $39.95 (hardcover).—In and of itself, the subject of avian growth is a broad one that interfaces in many ways with various aspects of the study of birds. Add the related concepts of physiological, behavioral, and social development, and there is scarcely any aspect of modern-day ornithology that cannot be involved—particularly when such topics are approached in a strongly evolutionary context. And so it is with this book, whose chapter headings include a nearly complete coverage of the ornithological "waterfront,"with subjects ranging from mathematical anlayses of basic growth patterns through general reproductive biology, thermoregulation, instinct and learning, the development of song, and migration and dispersal, to name just a few.

While the book's title would suggest a heavy emphasis on analyses of actual growth data, such is not the case. Only 1 of the 16 chapters is devoted to this subject, and even at that, there is much new information in that subject area that has not been included. In the Preface, the author describes this field as "one which has developed with astonishing speed over the last decade." In light of this fact, it is unfortunate that of the 657 literature citations given, only 12 are from 1981 or later and only 2 from 1982–1984. Thus, the last 40% of the past decade of rapid development in this field is hardly represented in this book, if at all. In all fairness, I am sure that one of the problems must be the apparently obligatory time delays between the completion of almost any book-length manuscript and the time that the final volume becomes available to the public. However, even with a 1984 publication date, the author did manage to include at least one reference dated 1984 and one dated 1982 amongst his citations, and one can only wish that he had been able to include other citations from these more recent years. The cited references also point out another general weakness of the book, namely a tendency for inbred thinking about growth, which has developed almost entirely around what has been published in the ornithological literature—this, despite the claim on the book's dust jacket that it "synthesizes the most recent information on *animal* growth patterns and applies it systematically to . . . birds." Of all references cited in the book, for example, there is not a single one from the journal *Growth*, which is an extremely important source of papers concerning research on generalized concepts of growth.

As the author acknowledges in the Preface, his thinking concerning growth had its origins in the work of Ricklefs, and as such, the book bases its growth data analyses on determinations of the asymptotic size attained by growth curves; the rate at which growth is accomplished, as quantified by Ricklefs' growth-rate constant $k$; and the shape of the growth curve. This approach, although basically sound in a general sense, is encumbered by several technical limitations, and the book still does not offer any concrete hope for their immediate resolution. There are now, however, hopes for new breakthroughs with regard to some of these problems, but most of this progress has been made in studies of the Richards sigmoidal growth model and is not discussed in this book. One of the problems that could have been dealt with in this way is the biological interpretation of the growth-rate constant $k$ and limitations of the technique, based on $k$, to compare growth rates quantitatively between growth curves of different shapes (e.g. logistic, von Bertanlanffy, Gompertz, etc.). O'Connor himself admits that this technique is "an adequate approximation for gross comparisons of growth rates over orders of magnitude ranges but is otherwise imprecise." Most of the mathematical analyses of the book are based on the presumption that the logistic equation is the one found to most frequently fit avian growth data, an assumption that is true only if the focus is mainly on passerine species. Other curve shapes, such as the so-called "monomolecular" or negative exponential growth model, are not even considered, although raw data are depicted in a number of figures that would seem to be most preferentially fit by this particular kind of curve.

Despite the problems and limitations described above, it is still possible that much of the subsequent discussion and speculation relating growth rate to other aspects of avian biology may be valid. The vast majority of the other chapters seem to cover their respective fields in as adequate a fashion as one could expect in a book of this kind, given the constraints imposed by the paucity of recent literature citations. Chapter 11 in particular focuses attention on an often neglected phase of avian reproductive biology—namely, the decline in postfledging parental care and what causes or controls such a process. Some of the chapters, such as those dealing with nests, eggs, egg-recognition, and nest and egg mortality, depart from the scope of subject matter that one would generally expect to find in a book on "growth and development of birds." In the context of the book as a whole,

however, they are not obviously out of place, and perhaps a better question would be why an additional chapter was not added on courtship and pairing and the book then marketed as a treatise on the entire field of the breeding biology, growth, and development of birds.

Considering that O'Connor is well known as a producer of carefully reviewed research, and that the publisher likewise enjoys a credible reputation, I was surprised to find a number of glaring errors in this book. Perhaps I am overly sensitive because my own name was consistently misprinted in the listing of references, but even a casual spot-check revealed reference citations without dates or for which either an incomplete or incorrect title was given. References are cited in the text that either do not appear in the reference section or could not possibly address the subject matter attributed to them. Add to this a number of wording problems in the text, such as the use of "former" instead of "latter," a lack of agreement between statements in the text and data presented in the figures, missing words or symbols in figure legends and the text, and one begins to develop a gnawing feeling of uneasiness concerning the quality control with which the book was prepared and edited. However, the overall impact of these errors is generally more one of annoyance than discredit.

Finally, one can legitimately ask what the role is of a book such as this, and what type of readership should consider its purchase. Like many ornithologists of my generation, I confess to being a disciple of J. C. Welty when it comes to selecting a basic text for a general course in ornithology. In many ways, O'Connor's book reminds me of Welty's book, with the exception of having its subject matter narrowed to cover only reproductive biology, growth, and development—thereby permitting a more thorough and in-depth coverage of research in these fields. In our university system, as in many others, ornithology is offered as a course available to both undergraduates and graduates. To earn graduate-level credit, however, some supplementary study generally is required. I would suggest that in addition to readings and study from a good basic ornithology text for all of the class, O'Connor's book could serve as an excellent source of supplementary chapter reading assignments that would not only permit graduate students to gain more knowledge of the subjects covered, but would also provide them with a good introduction to the processes of designing research, collecting data, and interpreting results, on the basis of extensive descriptions of some of the more classic and important experiments in several ornithological fields.

Thus, I feel that this book can indeed fill a unique and important niche in ornithological teaching and study, and perhaps if some day future editions should be forthcoming, a more effective updating of the coverage of the published literature may even further enhance its role in this regard.—I. Lehr Brisbin, Jr.

**The herons handbook.**—James Hancock and James Kushlan; paintings by Robert Gillmor and Peter Hayman. 1984. New York, Harper and Row. 288 pp., 65 color plates, 21 text figures, 60 distribution maps. ISBN 0-06-015331-8. $24.95.—This rewrite of the larger coffee-table volume, "The Herons of the World" (J. Hancock and H. Elliot, 1978, New York, Harper and Row), is intended to be "an easy reference to identification, behavior, and classification" of herons and to provide the global traveler with ready access to comprehensive information on the Ardeidae while visiting unfamiliar areas. It could be described as a hybrid between a field guide and an introduction to heron literature.

The first 35 pages are devoted primarily to introductory remarks on classification, identification, courtship behavior, and feeding. Classification, which relies heavily on taxonomic suggestions of Payne and Risley, is well documented and explained.

The chapter on identification places considerable emphasis on "soft-part" colors, which in the separation of very similar species are complicated by intraspecific, seasonal variations that may be greater than color differences between closely related sympatric species. In this chapter the authors also present 4 color plates of 11 white-plumed species to "illustrate the complexity of identification."

Behavior chapters may be too short for the devout heron student and too long for most "birders." For example, courtship is discussed on only 3 pages: advertisement for mates, pair formation, and pair bonding, with brief descriptions of their probable functions and evolution. Information on feeding behavior is not nearly as sketchy (6 pages), but again suffers slightly from attempting to mention everything, while discussing little in detail. Although brief, these chapters are a good starting point for heron lovers desiring more information.

The remaining 253 pages are devoted to individual accounts of the 60 recognized species. Each is composed of sections on Identification, Distribution and population, Habit, and Behavior, with one or more additional sections on Taxonomy, Migration, and Nest, eggs, and young in many accounts. Most of this information is identical to that in "Herons of the World," but some additional post-1977 studies—plus a few missed in that earlier publication—have been included. A color plate and a global distribution map accompany each species account. The plates, which are the same as those used in "The Herons of the World," are generally of good quality, although in my copy they looked a little pale compared to the earlier printing. The complete set of distribution maps—perhaps the largest addition of new information to "The Herons Handbook" (only 25 species were represented on maps in the earlier volume)—is disappointing. There are at least three different types of maps, none with explanations of terms. Different cross-hatching patterns are used to represent

various combinations of range, breeding areas, and wintering areas, and several kinds of arrows indicate migration directions and areas of periodic irruptions (e.g. Grey Heron, Swinhoe's Egret, and Squacco Heron). On most maps the exact meaning of "range" eluded me, as it is used in different contexts to indicate areas of breeding, wintering, or postbreeding dispersal, and occasionally (e.g. Yellow-crowned Night-Heron and Great Blue Heron) to represent two or more of these different types of areas on the same map. The clearest maps are for species in which the distribution is only poorly known, because they indicate range in a general sense without the added confusion of separately delimited breeding and wintering areas. Finally, definitions of "casual" and "accidental" (denoted by stars on some maps) should have accompanied the maps.

Because of similarities between "The Herons Handbook" and the book on which it is based, it is not possible to review one without comparing it to the other. One of the strong points of "The Herons of the World" was an extensive bibliography of heron literature. The "Handbook" continues this tradition; although the bibliography is not nearly so extensive, it does include a number of more recent works. "The Herons Handbook" is a smaller version of "The Herons of the World," with a revised text and range maps added to all species accounts. The result is a compromise between short syntheses of current knowledge on classification, courtship, and feeding and the resulting format, which is too large to be considered a field guide (6.25 × 9.5 inches). If you want a guide to identification of herons but do not travel much, your money might be better spent on a regional field guide, but if you regularly circle the globe in search of herons, this volume is made for you. Finally, if you are a fancier of herons and always wanted, but could not afford, a copy of the large and costly earlier edition, you will find "The Herons Handbook" a desirable addition to your personal library.—TIMOTHY C. LAMEY.

**Seabird energetics.**—G. Causey Whittow and Hermann Rahn (Eds.). 1984. New York, Plenum Press. xii + 328 pp., 60 text figures. ISBN 0-306-41819-3. $55.00.—This book is mainly for biologists interested in seabird development. The editors wished to treat each stage of seabird life history from egg formation to adult energetics. Covering all the family Joules is ambitious, and the result is uneven. Half the book deals with development, with chapters on egg formation, energy cost of incubation, parent-egg interactions for temperature and water economy, embryonic growth, embryonic temperature responses, and the energetics of breeding in Dark-rumped Petrels. The other half has chapters on adult thermoregulation, energetics of free-ranging birds, walking in penguins, population energetics, and effects on krill. The disparity reflects the advantages and disadvantages of studying seabirds. Their nests and young are accessible and easy to study; the adults are not, except in special cases. The editors wished to draw attention to this unevenness. An alternative would have been a book organized to more fully exploit the strengths that study of these birds offers for understanding development.

In the Foreword J. B. Nelson hopes physiology can be used to critically evaluate hypotheses on the evolution of seabird breeding. This is a fond hope, but the efforts in this volume provide only the first hesitant steps. Most of the information is in the form of data; there is little in the way of hypothesis testing.

The Introduction, by H. Rahn and G. C. Whittow, is a synopsis. C. R. Grau's chapter on egg formation is based on species other than seabirds and seems included for the sake of completeness. G. S. Grant's review of energy costs for incubation suggests that they are minimal. R. A. Ackerman and R. C. Seagrave give an energy and mass balance model for egg temperature and water loss. They point to the potential importance of substrate thermal conductivity, embryo metabolism, and nest air temperature. H. Rahn, R. A. Ackerman, and C. V. Paganelli give detailed regression equations for eggs, yolk, and embryonic growth rates. "In-shore" vs. "off-shore" feeding are suggested to influence clutch size, egg size, and development rate between species (as suggested by David Lack in 1968). T. N. Pettit, G. C. Whittow, and G. S. Grant provide data to suggest yolk and caloric density of eggs are related to chick maturity, with precocial chicks having twice the yolk of altricial (except for Procellariiformes). W. R. Dawson gives an admittedly anecdotal account of responses of seabird embryos to temperature. T. R. Simons and G. C. Whittow provide a progress report on breeding energetics in Dark-rumped Petrels. Reduced metabolism between feedings and energy value of stomach oil are described as adaptations to dispersed and unpredictable food.

Although rich in facts, these chapters are often short on analysis and interpretation of function. Data at face value often are used to describe adaptations rather than to test between alternatives. An example is Table 6 in the chapter on Dark-rumped Petrels, which is used to describe the rate and amount of food delivered in sequence to young. These data can be used to ask how feeding may be controlled. The adult could either adjust time away from the nest depending on the amount of food just delivered or adjust the amount of food in a meal to the length of time just spent away from the nest. I found a significant correlation between food delivered and time since the last feeding ($r = 0.76$, $P < 0.01$) but no significant correlation between amount of food and time to the next feeding ($r = 0.33$, $P > 0.1$). Thus, the behavior of the adult suggests sensitivity to the demands of the young. This type of analysis would help to focus future work

on experiments designed to understand control over development.

The rest of the book is less cohesive, with the exception of the chapter on modeling energy demands of seabird populations by J. A. Wiens. The models help to suggest where information is needed, and Wiens gives a brief discussion of alternative strategies for growth of young.

Although research on seabirds is not advanced, the problems reflected in this book are typical of more commonly studied areas of comparative physiology. Most researchers are concerned with comparing "species," and individual variation is ignored or averaged. Does individual variation make a difference that translates into an outcome for survival or reproduction? To answer this, investigators must design experiments using organisms where variation and consequences can be measured easily. No one set of organisms provides the opportunity for this at each stage of life history. The future of seabird research lies mainly in understanding developmental functions, not the totality of seabird energetics.—F. REED HAINSWORTH.

**The puffin.**—M. P. Harris. 1984. Vermillion, South Dakota, Buteo Books. 224 pp., 24 black-and-white plates, 47 text figures. ISBN 0-85661-038-0. $32.50.—I am not in the habit of reading bird books for pleasure. For a professional ornithologist, it seems too much like work. I therefore approached Mike Harris's volume on the puffin with trepidation. I need not have worried. It is a perfectly splendid book, and no one interested in birds could possibly find it hard going. It is the type of book that every scientist should write to make the substance of their research available to nonspecialists.

I read it in bits, in bus stations and airports and during commercials on TV. It is custom-made for such treatment, being broken up by so many subheadings that there are scarcely two consecutive pages of text without one. It is also commendably short. Harris outlines the context of each chapter briefly at the outset, then proceeds to convey the essentials of the material clearly and concisely. There is no purple prose. The approach is clinical, scientific, almost laconic, but not dull. You want to know about puffins? Look no further.

Seen from North America, "The Puffin" might appear slightly parochial. The title, incorporating the exclusive British usage that brooks of no puffins other than that which graces the North Atlantic, hints as much. The book is devoted exclusively to *Fratercula arctica* with only passing reference to the Pacific puffins, and it deals mainly with studies in Europe, particularly Britain. Twelve pages are devoted to the species' distribution in the British Isles and another 9 to monitoring population changes in Scotland. The rest of its world range gets 15 pages, with only 1 devoted to Iceland, which, with 8–10 million puffins, supports two thirds of the world population (at a rough guess). This presumably reflects current British knowledge of Icelandic puffins.

Mike Harris has been involved with puffin studies in Britain since 1972 and is clearly the leading authority on the species. Those familiar with his journal publications might have anticipated a larger book, for he has published prodigiously. It is greatly to his credit that the book succeeds in summarizing and updating the previous work in such a way that we do not immediately recognize that we have seen it before. It is a great boon to have it all compressed under a single cover, particularly one so delightfully embellished by Keith Brockie. The production is excellent.

The book begins with chapters on morphology and taxonomy, which Harris makes surprisingly entertaining, and distribution. Then breeding biology, food, development, pirates and predators, human impact, migration, and nonbreeding range are dealt with. A short chapter by K. Taylor, which fits the style of the book well, deals with behavior. Finally, the current status of the species and the general outlook for puffin populations are discussed.

I have a few minor corrections to make, less criticisms than footnotes. Harris awards the prize for largest extant alcid to the Thick-billed Murre (*Uria lomvia*), whereas several populations of Common Murres (*U. aalge*) exceed all populations of *U. lomvia* in body size. Puffins do not breed on Hantzsch Island, off eastern Baffin Island, although they may do so somewhere nearby. Breeding has now been proved on two islets off northern Ungava. There is an inconsistency on page 74, where Harris lists 8–10 million puffins for Iceland and 2–5 million pairs elsewhere and then estimates the total world population at 5 million breeding pairs, suggesting that 8–10 million Icelandic puffins translate into 2.5 million breeding pairs. P. G. H. Evans, in a recent review of seabirds in northwest Europe, gives much broader limits for the Icelandic population (1–10 million pairs). Harris himself describes his numbers as "reckless speculation" and presumably tried to make his figures as round as possible.

If the book has a single unifying theme, apart from the bird itself, it is Harris's interpretation of the "puffin problem." The decline of several large puffin colonies on the southern edge of the species' range in Europe raised the specter of an imminent disaster for puffins. Boffins were baffled and, like an ornithological Sherlock Holmes, special agent Harris was summoned to solve the "problem." Hypotheses were rampant: oil, chlorinated hydrocarbons, habitat destruction, increased piracy by gulls, overfishing, and that last resort of a frustrated biologist, "climatic (or oceanographic) change." Gently, with an equal measure of inquiry and scepticism, Harris probes each theory. More importantly, he identifies the real evi-

dence for puffin declines, reducing the problem to a more manageable size.

It seems, as is usual with biological problems, that there is no single answer, because there is no single problem. Different colonies declined at different times and for different reasons. Some are still contracting, while others are expanding. The decline perceived 20 years ago at places like St. Kilda was real, but the situation seems to have improved since. We may never again see great colonies of puffins in the English Channel or the Irish Sea, just as we no longer see kites and ravens in the streets of London. But for those prepared to travel a little further afield, the spectacle of large, healthy puffin colonies is still available, and perhaps more accessible now that birds have become a big tourist attraction. While warning of the dangers that industrial fisheries aimed at the puffins' prey species might pose in the future, Harris concludes on an optimistic note, declaring, "the general state of Puffindom is far better than at any time this century." Long may it continue, and thank you, Dr. Harris, for documenting it so faithfully.—ANTHONY J. GASTON.

**The starling.**—Christopher Feare. 1984. New York, Oxford University Press. xiv + 315 pp., 16 black-and-white plates, 70 figures, 20 tables. ISBN 0-19-217705-2. $27.95.—The European Starling (*Sturnus vulgaris*) itself needs no introduction. To those of us in North America, it represents one of the most remarkable "success" stories in avian colonization. From a handful of birds introduced into New York City's Central Park about 100 years ago, we now have in North America a starling population estimated at 200,000,000 birds and growing. The expansion on this continent has been explosive, and the current range extends from the Atlantic to the Pacific and from subarctic Canada to tropical Mexico. This is a species we "love to hate," but to many biologists the starling has proven to be an intriguing and exciting research animal. Feare confesses at the outset that he has been fascinated since boyhood with the mysteries of this "beautiful bird."

In the first chapter Feare surveys the family Sturnidae, and speculates that the evolution of a ground-feeding habit may have preadapted the European Starling for its remarkable success. The 11 remaining chapters, entitled The Successful Starling, A Place to Live, The Calendar, Ostentation, A New Generation, The Hungry Hordes, A Time to Die, A Balanced Diet, Gatherings, A Route to Success, and Relations with Man, concentrate on other attributes of this starling. Many of the chapters contain a mini-review on selected aspects of avian biology, followed by examples of how starling studies have contributed to these areas. Examples include energy budgets (Chapter 3), pituitary hormones, circadian and annual rhythms (Chapter 4), and evolution of clutch sizes (Chapter 6).

In each chapter, recent research is discussed and evaluated. About 400 papers are cited; roughly ⅙ of those are from 1980 through 1982, and most are from the 1960's and 1970's. Feare typically concludes his discussions with a statement to the effect that further research must be done or that we simply don't know the answers to some particular questions. I find that approach commendable, but I felt very uneasy about accepting Feare's discussions as an authoritative treatise on the biology of the starling or of birds in general.

In areas where I am most knowledgeable, I found that Feare did a rather inadequate job of evaluating the literature. He states, for example, that "Studies on . . . Chaffinches *Fringilla coelebs* have shown that song is learned by chicks while they are still in the nest . . ." (p. 106). This is not true. Pioneering efforts of Thorpe (1958, Ibis 100: 535) demonstrated that Chaffinches learn their songs later during their hatching year and during the following spring. The related comment that song "dialects . . . seem to indicate restricted gene flow . . ." (p. 32) reveals no appreciation for the extensive and highly controversial literature on this subject. On pp. 115–116 Feare discusses high- and low-frequency calls, stating that these types of calls have evolved for long- and short-distance communication, respectively. Yet, there must be more involved than Feare reveals, because, all other things being equal, low frequencies actually attenuate less over distance than do high frequencies. Feare also uncritically presents the auditory sensitivity of starlings originally reported in 1939 and 1964 publications, but a familiarity with literature on other songbirds and other literature on starlings should have cautioned him that those data were highly suspect.

In a final example, Feare cites Kramer's early work (1951, 1952) on orientation with starlings. Kramer found that starlings clearly use the sun as a compass, but the orientation of his starlings was unaffected by altered magnetic fields around the cages. Feare parenthetically suggests that perhaps this work should be repeated "in light of more recent findings, using very weak magnetic fields that do influence orientation in pigeons . . ." (p. 86). But Feare neither hints at the growing literature on the use of geomagnetism by songbirds nor suggests that Kramer did not appreciate the redundancies in the navigational system of birds and as a result tested his starlings in outdoor aviaries while they were still able to use the sun.

Perhaps I dwell excessively on these negative comments, but I fear that other specialists would find similar problems with other topics. While this book is a useful introduction to the literature on starlings, discussions are often neither up-to-date nor accurately presented. The author quite simply does not inspire confidence.

Feare seems most at home and excels, I think, in Chapter 12, Relations with Man. He summarizes much of his own work here, and offers some innovative ideas of how a little insight can go a long way in trying to minimize starling damage to farm crops. Overall, figures, tables, and plates are nicely done, and the book is well produced. Occasional typos or grammatical errors are to be expected, but I have a hunch that the "star" of the book would not have appreciated the hyphenation "starl-ing" at line endings (all my dictionaries indicate that "star-ling" is correct).

Feare nicely demonstrates that the starling has served as an exemplary research animal in many areas, and one important message is that we, especially in North America, should perhaps loathe this beast less and study it more. This book will be a useful reference to those who do and also to those interested in bird damage to agricultural crops. As indicated above, though, this book should be used with caution, and consequently I cannot enthusiastically recommend it for other audiences.—DONALD E. KROODSMA.

**Ecogeographical variation in size and proportions of Song Sparrows (*Melospiza melodia*).**—John W. Aldrich. 1984. Amer. Ornithol. Union, Ornithol. Monogr. No. 35. x + 134 pp. ISBN 0-943610-44-5. $10.50 ($8.50 to A.O.U. members) + $1.00 postage and handling.—Ornithologists have long been intrigued by the phenomenon of geographic variation. Numerous studies have described the geography of intraspecific character variation, and most authors note that this variation seems associated with environmental features such as temperature, rainfall, or isophanes. Character-environmental associations are interpreted as evidence that natural selection causes the adaptation of local populations to geographically varying environmental conditions. Thus, a cline in tarsus length could derive from environmental modification of within-population genetic variation, resulting in genetic as well as phenotypic differentiation. The process of local adaptation leading to geographic differentiation is also viewed as a model of the speciation process, often defined as the conversion of genetic variation from within to between populations, concomitant with the origin of reproductive isolation.

Geographic variation may have a significant environmental, or nongenetic, component (James 1983, Science 221: 184). Therefore, classical inferences that patterns of geographic variation have a genetic basis and reflect long periods of gradual "microevolution" driven by natural selection may need modification. If the genetic contribution to spatial variation in phenotypes is relatively low, then geographic variation might not represent a stage in the speciation process. Determination of the relative contribution of genetic and environmental components of phenotypic differentiation in birds is critical to assessing the evolutionary significance of geographic variation.

In this ecogeographical study, I anticipated an (indirect) analysis of the degree to which phenotypic variation is mediated geographically by differences in natal environments. However, ecogeographic here refers to a description of phenotypic variation in "ecological space." Aldrich assembled 828 male and 406 female specimens taken between May and August (inclusive) from throughout the breeding range. He measured the lengths of wing, wing-tip, tail, tarsus, culmen, and middle toe, and the depth and width of the maxilla. Ratios of characters were used to assess "shape," assuming, for example, that wing length/tarsus length represents shape. Specimens were grouped in north-south and east-west transects, and by ecogeographic units (from most to least inclusive): Life Areas ($n = 17$), Ecoregion Provinces ($n = 23$), and combinations of Life Areas and Ecoregion sections ($n = 79$). Specimens in some ecogeographical groupings came from sites as distant as Newfoundland and Alaska, whereas other groupings were more restricted in area. Aldrich assumes that these ecogeographic groupings, based on climax vegetation, reflect the totality of environmental factors that delineate major biotic communities. Environmental effects that produce biotic communities are assumed to impinge on Song Sparrows and their nonclimax habitats, because ". . . Song Sparrows do not use climax vegetation extensively, at least during the breeding season, in any part of their geographical range . . . ."

The statistical analysis was poorly executed. The proper design of the statistical analysis would have first required obtaining point samples from within each ecogeographic unit to determine if samples within a unit were statistically homogeneous irrespective of distance. This preliminary analysis is necessary to exclude historical effects of isolation. However, samples were pooled within regions, and $t$-tests were used to compare each character between geographically adjacent ecogeographic groupings. Characters (and their ratios) are usually intercorrelated; thus in effect the same phenomenon probably was examined multiple times. Also, multiple $t$-tests yield some significant values by chance alone, but one doesn't know which are spurious. Because $t$-tests are unsatisfactory means of testing for geographic patterns, the data should have been analyzed with the SS-STP procedure or one of various ordination or clustering methods (Power 1970, Univ. Kansas Mus. Nat. Hist. Publ. 90: 1). Procedures such as Mantel's test reveal whether phenotypic patterns are random or congruent with a particular pattern of habitat variation (e.g. Sokal 1979, Syst. Zool. 28: 232).

Statistical problems aside, a useful contribution to the study of Song Sparrow variation is the presentation of character means and standard deviations, and maps of character variation, for various ecogeo-

graphic groupings (raw data are available from the National Museum of Natural History). Sample sizes, however, were often small (samples of 5 or fewer males were used for 39 of 79 groupings by Ecoregion Section/Life Area). If the proposed patterns are robust to sampling problems, one could discern general patterns of geographic variation and note their consistency with predictions of the various ecogeographic "rules." Although correlations are weak bases for the author's speculations on the adaptive significance of variation, such as dietary influences on bills, they might indicate relationships for ecological study.

The inferred mechanisms of phenotypic divergence are not convincing. Aldrich concludes that "ecological forces selecting adaptive genetic differences have a greater effect on morphological change or microevolution than do geographical separation or isolation." Why? According to Aldrich, "significant morphological variation is noted between populations with no apparent impediment to exchange of genes other than marked ecological differences in their habitats, whereas little or no morphological change is noted between some populations with ecologically similar habitats that are separated by long stretches of inhospitable environment." In contrast, I didn't think that all characters were consistent with this interpretation. Geographical isolation could be a determinant of at least some (e.g. culmen length) patterns of variation.

Descriptions of patterns aside, the design of Aldrich's analysis confounds inferences of "ecogeographic" causes of variation, because it is not standardized for either genotype or environment. For example, thinner bills were found in Pacific rain forest, Rocky Mountain forests, southwestern deserts, and Mexican mountains and shrub steppes. What inferences about the importance of environmental (e.g. ecogeographic) determinants of phenotypic variation can be drawn from such an observation, assuming that it had been demonstrated statistically? Aldrich postulates that some environmental aspect common to these diverse habitats leads to thinner bills. Although it is unlikely that these populations are phenotypically similar because of a uniquely shared common ancestry, one cannot infer that they are genetically identical. Isolation leading to the origin of new habitats (in the western U.S.) also could isolate Song Sparrow populations, leading to genetic divergence. Song Sparrows might have similar bills in different (or the same) regions or environments owing to different genotype-environment interactions. Without a measure of environmental or genetic similarity across regions, one cannot determine that environmental factors alone "select" from a geographically widespread multilocus genotype common to all Song Sparrows.

Confusion of conceptual issues and problems in the quantity and analysis of data compromise this study of the determinants of geographical variation in birds. Hopefully, this paper will stimulate study of ecogeographical variation in Song Sparrows via a system of reciprocal transplants or common garden experiments (James 1983, Science 221: 184). Such experiments allow estimates of the relative influences of environmental and genetic factors on phenotypic variation among sites. Confusion of these issues is illustrated by Aldrich's conclusion that Song Sparrows "evidently possess the 'genetic plasticity' that permits them to evolve new morphological and physiological characters that preadapt young, pioneering individuals to different environments in unoccupied geographic areas . . . ." The latter statement refers to that portion of the phenotypic variance that is genetic, whereas the monograph does not demonstrate the relative contribution of environmental and genetic influences. Thus, the causes of geographic variation await clarification. For a thorough study of patterns of variation Aldrich should have included more specimens from across the range, pooled into (potentially) demic samples, not aggregates of specimens taken across many kilometers of "similar" habitat. Contributions of this monograph notwithstanding, we still lack a thorough quantitative documentation of geographic patterns of variation in the most polytypic species in North America.—ROBERT M. ZINK.

**John Abbot in Georgia: the vision of a naturalist artist (1751-ca. 1840).**—Vivian Rogers-Price. 1983. Madison, Georgia, Madison-Morgan Cultural Center. (Available from the Madison-Morgan Cultural Center, 434 South Main Street, Madison, Georgia 30650 USA.) 149 pp., 2 color plates, 116 black-and-white plates. ISBN 83-063081. Paper, $15.00 + $2.00 postage and handling.—This slim volume is the catalogue of a 1983 exhibition of the *oeuvres* of John Abbot, prepared for the 250th anniversary of the State of Georgia. The British-born Abbot came to North America in 1773, and for the next six decades he observed, collected, and depicted natural history specimens of Georgia. Abbot, justly famous for his careful studies and illustrations of the various stages of insect life, is less well known as a bird artist, even though he painted hundreds of watercolors of birds.

The organizers of the exhibition borrowed works from more than 40 sources; they also persuaded Vivian Rogers-Price to act as guest curator, and she postponed the completion of her doctoral dissertation on Abbot to help make the exhibition a success. Her thorough knowledge of Abbot's life and work is evident in the enjoyable, informative introductory essay. In this brief scholarly work Rogers-Price discusses Abbot's background in England, his life and work in Virginia and Georgia, and his relationship with late 18th- and early 19th-century American and British naturalists. A useful chronology of Abbot's career follows this essay.

The main part of the catalogue consists of 116 black-and-white plates, of which 47 are of birds and 2 are of birds' eggs. Ten bird specimens, collected by Abbot, complete the ornithological section of this work. The other plates are mostly of insects, in various stages of their life history. Short annotations, with pertinent information on date, size, and publication, accompany the plates. One can only wish that the plates were in color to enable the reader to share Abbot's vision of Georgia birds, such as the Great [Ivory-billed] Woodpecker, the Wild [Passenger] Pigeon, and the "Great Hooping" Crane. The lack of color (only a painting of a Mockingbird and Abbot's self-portrait are reproduced in color) renders some of the illustrations practically useless for those not having seen the exhibition. The dark pictures of Hermit Thrush, Field Sparrow, and "Male Sanderling" make identification impossible. The illustrations, varying from the size of a postage stamp to a full page, have no scale relationship to their actual size. Why is a 12¼ × 10-inch watercolor of a Moorhen shown in 1¾ × 1½-inch size, when the "Blue Egrett" [Little Blue Heron], originally of 11¼ × 8⅝-inch size, occupies a full page in 6½ × 5 inches? The lack of color and the seemingly random choice of size for the plates reduce the effectiveness of this volume.

I am at a loss to decide to whom this catalogue should be recommended. Perhaps it is most suitable for museum libraries and for private collectors who are familiar with the originals, do not mind the lack of color plates, and are willing to pay the somewhat steep price for this volume.—MARIANNE GOSZTONYI AINLEY.

**Spatial orientation.** —Hermann Schone. 1984. Translated by C. Strausfeld. Princeton, New Jersey, Princeton University Press. xviii + 347 pp. ISBN 0-691-08363-0. $55.00 (cloth), $14.95 (paper).—Every behavior is oriented in some way. Indeed, orientation processes are the means by which animals adjust their behavior to the diverse spatial requirements of their environment. Virtually all behavior incorporates elements that help to ensure an individual will be oriented, whether it is foraging for food, fighting over some resource, or moving between seasonal home ranges. Birds that breed in temperate North America, for example, must cope with an environment that fluctuates periodically in suitability. Many species respond to this situation by migrating and, in the course of that migration, display goal-directed behavior. How migrants select an appropriate geographic direction and how they adjust and maintain that direction over the course of their journey are complex, causal questions in the study of avian behavior.

Herman Schone synthesizes an impressive amount of information on the proximate mechanisms of animal orientation in this important book. Much of the material is clearly relevant to the orientation behavior of birds. For example, complex and often ingenious experiments have revealed that migratory birds can derive directional information from a variety of environmental references. Exactly how migrants integrate the directional input from different stimuli, however, is not well understood. Schone's discussion of multimodal orientation systems and the weighting of reference cues is certainly relevant. He also makes the important distinction between identification and localization of reference cues. How birds, for example, identify the sun as a reference stimulus remains an unresolved question in the study of avian orientation.

"Spatial Orientation" was first published in 1980 as "Orientierung im Raum Formen und Mechanismen der Lenkung des Verhaltens im Raum bei Tier und Mensch" by Wissenschaftliche Verlagsgesellschaft mbH (Stuttgart). The editors of the new Princeton series in Neurobiology and Behavior, Robert Capranica, Peter Marler, and Norman Adler, selected Schone's book to launch their series, thereby ensuring that the "systems" approach to orientation behavior, the prevailing theme of his work, would gain the wider readership it deserves. The book is organized into three sections. The first introduces the geometry of orientation and attempts to place orientation behavior within an ecological context. While this attempt falls short, Schone at least acknowledges that a complete understanding of orientation requires both functional and causal analysis. In the second part, entitled "Physiology of Orientation," the author examines orientation as a system of interacting components and rigorously applies cybernetic analysis to different aspects of orientation. Numerous, nicely done illustrations facilitate the reader's understanding of this material. I was a bit confused when Schone opened this lengthy section with an unnecessary reference to sociobiology. Apparently, he saw value in pointing out parallels between the hierarchical nature of both orientational and social systems. Fortunately, this is only a brief distraction. The critical point is that systems analysis will help us to understand causal structures. Schone includes in this section a current discussion of tropisms, taxes, and kineses, which are historically important concepts in the study of orientation. If the second section of the book has a weakness, it is the abbreviated treatment of the development of orientation behavior, an area that certainly warrants more attention and undoubtedly would benefit from Schone's "systems" perspective. The last part of "Spatial Orientation" is organized according to the various sensory modalities involved in directing an orientation. Here, too, cybernetic models are developed to explain different mechanisms of orientation. While this section provides a nice overview, it suffers more than the second from the fact that the book is a translation of an earlier work. Although extremely well docu-

mented (981 reference citations, with 57 supplementary references appended), research published after 1979 is not especially well reviewed. Consequently, the reader must guard against generalizations that may no longer be as "safe" as they once were (or that never were very safe).

"Spatial Orientation" represents an important synthesis in the field of orientation behavior and is essential reading for those studying avian orientation. The quality of the publication, which clearly establishes a standard for the Princeton series in Neurobiology and Behavior, is measurably enhanced by Camilla Strausfeld's excellent translation. If Schone's book is any indication of what is to follow in this new series, university and college libraries should establish standing orders now.—FRANK R. MOORE.

**The Oxford book of British bird names.**—W. B. Lockwood. 1984. Oxford, New York, Oxford University Press. 174 pp. ISBN 0-19-214155-4. $16.95.—Concise, reasonably priced, and accessible to the general reader with no specialized knowledge of philology, this book is a useful addition to the ornithological literature. Bird-name etymologies contained in works such as the Oxford English Dictionary and the Scottish National Dictionary previously were inaccessible to many ornithologists because of the high price and daunting size of these volumes. In synthesizing findings from such monumental primary sources, Professor Lockwood has brought the fruits of earlier scholarship within the scope of modest personal libraries. As might be expected in the first major work on British bird names by a professional philologist, the book also presents much new material from Lockwood's own research. This is used to reexamine the more problematic names and revise erroneous etymologies presented in earlier works. The text indicates the general pattern of analyses that led to new conclusions about difficult names, with references to published papers appended for those who wish to delve for finer details.

The Indo-European languages contain a plethora of onomatopoeic bird names, their origins self-evident in names such as Cuckoo and Chiffchaff but opaque in a name such as Fieldfare. One of the pleasures of this book is the way the author teases out echoes of calls and sounds from corrupted names that now carry no trace of bird sound for the modern English speaker. Fieldfare, for example, has nothing to do with faring over fields, but probably is a corruption of an old English term meaning "grey piglet," gloriously descriptive of the bird's animal-like calls. The word "swan" probably is derived from a proto-Germanic name meaning sound or noise, and thus originally was identified with the Mute Swan and its noisy wingbeats.

Several other major influences on the naming of birds also are illustrated. Notable among these are superstition, which resulted in the replacement of taboo names with evasive substitutes or "noa" names; folk etymology, whereby unusual-sounding names changed by association with a familiar word; and the naming of species by scholars, often by translation from the Latin of earlier authors. This book is highly recommended, both as a reference and as a source of enjoyable surprises.—KENNETH TAYLOR.

**Oiseaux nicheurs de la haute vallée de l'Orbe.**—Daniel Glayre and Daniel Magnenat. 1984. Nos Oiseaux, No. 398, special issue of volume 37. 143 pp., color plates, text figures, maps. Available from Dr. Paul Géroudet, Editor, Nos Oiseaux, 37 avenue de Champel, 1206 Geneva, Switzerland. No price given.—In the wake of the publication of atlases of avian distribution at the national scale, several ornithological associations have sponsored the preparation of regional atlases. The goals of these endeavors are usually three: first, to document in a very precise manner the distribution of breeding species during a short period of time (about 3–5 years); second, to record changes in distribution between the censusing period and previous records; and third, to establish a baseline for conservation studies, including impact statements. These are all worthwhile goals. For the biogeographer interested in causality, these atlases, when well done, are also a rich mine of raw data that can be analyzed for their own sake or used in comparative studies. To date, unfortunately, few such analyses have been published, and so it is pertinent to review local atlases when they can lead to such syntheses, in the hope that the readers of the review will be stimulated to peer into the data. The thin book reviewed here is a remarkable source of biogeographical information at the local scale of perception.

Glayre and Magnenat are amateur ornithologists who logged 2,830 h in the field during 322 field days in 1980–1982, covering 268 squares of 1 × 1 km in an area of the Jura, on the border between France and Switzerland. Why they would want to document avian distributions in such detail is obvious after seeing the aerial photograph on page 11. They selected what may be one of the least disturbed watersheds remaining today in the Jura Mountains, a magnificent valley nestled between two of the great anticlines that make the Jura so imposing. The anticlines are largely forest clad, whereas the valley in their center has more varied habitats, including lakes with undisturbed shorelines, moors, grasslands, open woodlands, and other open biotopes. Land use in 1982 was 53.5% forests, 28.6% rangelands, 9.2% grasslands, 5.6% lakes, 1.4% uncultivated lands, and 1.7% developed land. The forests, especially the beautiful Risoux Forest, are composed mostly of *Picea abies*, either in extensive pure stands or mixed with *Fagus silvatica* and

*Abies alba*. I know the valley first hand and can attest to the authors' assiduity and labors: to have covered every square kilometer of this basin is an extraordinary feat. Further, the fact that only two observers covered the area makes for great uniformity in the method of fieldwork and data presentation.

The book describes the study area in detail (and many text photographs as well as a series of color plates illustrate the habitats and the geography of the valley), then presents distribution maps for each of the 95 breeding species. A brief analysis of the data follows. The second part of the book includes maps of species that probably nested during the study period, a list of possibly breeding species, and a list of vagrants. The book ends with a discussion of the numerous threats to preservation of this unique watershed. These include skiing, mass tourism, motorcycle tracks through the forests, military exercises, and an increase in the number of hunters.

Numerous biogeographic patterns emerge from an examination of the maps and texts. Several species are clearly forest specialists (*Bonasa bonasia, Tetrao urogallus, Scolopax rusticola, Aegolius funereus, Dryocopus martius, Dendrocopos major,* and *Certhia familiaris*), whereas others have complementary distributions in the open habitats (*Alauda arvensis, Anthus trivialis, Turdus pilaris,* and *Saxicola rubetra*). Five *Turdus* species occupy the valley and were found in 66% or more of the 1 × 1-km squares. Although the distribution maps reveal certain differences in patterns (especially *Turdus pilaris,* which avoids the forests), the distributions of *Turdus merula, T. philomelos, T. viscivorus* and *T. torquatus* are remarkably similar. A study of their habitat preferences would be highly rewarding. Again, the distributions of the two species of *Regulus* are very much alike. In some genera (e.g. *Anthus* and *Parus*), one finds both complementary and greatly overlapping distributions. Thus, three species of *Parus* (*montanus, cristatus,* and *ater*) have similar distribution patterns and are found in forests and nonforested habitats; but *P. palustris, P. caerulescens,* and *P. major* avoid the forests and overlap each other, and the first three species, in the nonforest habitats of the valley floor. Several species, including *Fulica atra, Motacilla cinerea,* and *Carduelis flammea,* appear to be colonizing the area. One last item: in the summer of 1971 a tornado destroyed some forest sectors by literally cutting a path through them. The results of this natural catastrophe, quite rare in this region, were spectacular indeed. Glayre and Magnenat publish a photograph of the tornado-ravaged area taken in 1982. The area was then covered by successional scrub and isolated small trees. Several species have occupied these new successional habitats, for instance *Anthus trivialis, Phylloscopus collybita, Sylvia atricapilla,* and *Emberiza citrinella* (an interesting ecological mixture!).

This book is attractively produced and richly illustrated. The maps are all of high quality. Published locally in Switzerland, this atlas should be in the hands of all naturalists and conservationists active in that part of Europe.—FRANÇOIS VUILLEUMIER.

**Ecological communities: conceptual issues and the evidence.**—Donald R. Strong, Jr., Daniel Simberloff, Lawrence G. Abele, and Anne B. Thistle (Eds.). 1984. Princeton, New Jersey, Princeton University Press. xiii + 613 pp. ISBN 0-691-08340-1. $60.00 (cloth), $22.50 (paper).—Some would say that the last decade has been an exciting time for community ecologists, primarily due to assaults by Simberloff and colleagues at Florida State University upon such pillars of modern ecology as character displacement, interspecific competition, size ratios of coexisting species, and island-biogeography theory. Calling for more rigorous hypothesis testing and statistical analysis of appropriate "null" models, they seemed to be undermining the foundation of modern ecological theories closely associated with the late Robert MacArthur. MacArthurites, many of whom had been associated directly with MacArthur himself, were quick to respond, and a plethora of papers has appeared that rehashes old data sets, debunks certain statistical procedures, and introduces ecologists to more arcane mathematical treatments.

When word went out that the "Tallahassee School" was inviting most of the people involved in these ecological polemics to attend a 3-day symposium in March 1981, many of us thought, Could these researchers actually assemble in one room and resolve their differences? This book, long awaited and published more than 3 years after the symposium, demonstrates that some researchers did, some researchers did not, and some apparently did not try.

The 28 papers presented in the book are divided into 6 major sections following an interesting overview by Robert May. As in many symposium volumes, contributions range from very interesting to rather boring. Although a wide variety of animal taxa are discussed (only one paper deals with plant communities), I focus here on the 10 papers that deal directly with ornithological data.

Grant and Schluter ("Order of authorship determined by competitive ability.") present an overview of the controversy surrounding Darwin's finches and an excellent summary of their research on the Galapagos Islands; this should be required reading for any graduate student studying for comprehensive exams. Their results suggest that interspecific competition may be important among these finches, and one gets the distinct impression that Grant eventually is going to sort out everything about Darwin's finches. This paper is followed by one by Simberloff, who analyzes (again!) bird data from the Tres Marias and Galapagos islands. He obviously is interested in informing the reader of what he has and has not stated previously (e.g. 12 words, such as "not," are italicized for emphasis in his presentation). One gets

the impression that Simberloff may have reconciled some previous differences with Grant. On the other hand, it is clear that Simberloff has not conceded an inch to Diamond, nor has Diamond backed off his contention that bird species are nonrandomly distributed with respect to each other on islands and that "assembly rules" govern the formation of these groups. Enlisting the help of Gilpin, a mathematical ecologist, Diamond reaffirms the validity of his "rules" in light of an earlier attack by Connor and Simberloff. In the next paper, Connor and Simberloff cry foul: Gilpin and Diamond have changed the "rules" from those originally stated by Diamond. In rejoinders, Gilpin and Diamond are again on the offensive, claiming more misinterpretations by Connor and Simberloff. Connor and Simberloff, however, have had enough: they ask interested readers to read carefully the original works involved and draw their own conclusions—no easy task for those with weak mathematical backgrounds.

In other ornithological contributions, Wiens reviews his work with Rotenberry on shrubsteppe bird communities and reaffirms his position that, rather than gaining knowledge on how communities are structured in nature, we actually are discovering how little we know. James and Boecklen present an ecomorphological analysis of a breeding bird community in Maryland censused for 7 years by Chan Robbins. Using a variety of univariate and multivariate statistical procedures, they find no evidence for the importance of interspecific interactions in organizing the avian community. On the other hand, Brown and Bowers discuss morphological variation (such as it is) in hummingbirds (and chipmunks and heteromyid rodents), concluding that nonrandom patterns exist in species morphology and distribution. Pimm draws upon several bird examples in discussing the cause(s) of short food chains in nature, defending his earlier hypothesis based on dynamic constraints. Schoener presents an "armchair" study: a worldwide analysis of sympatric bird-eating hawks derived solely from the literature. Järvinen and Haila present yet another analysis comparing insular bird communities with those on the mainland (in this case, a big island) based solely on censuses.

In the Preface, the editors state the importance of evidence, vigorous hypothesis testing, and experimentation. How does this volume reflect those standards? The editors themselves state that much evidence in community ecology today is "flimsy," and most of the papers in this symposium did little to sway me from agreeing. Many of the papers mention various hypotheses, but, by my count, only 7 of the 28 papers actually present experimental results. Formulating hypotheses that produce clear-cut results when rigorously tested is a pleasing exercise, as the editors state, but it appears that community ecology has yet to reach such a level of examination.

The volume is remarkably error free. The single Literature Cited section contains over 1,000 references (through 1982), about 20% of which are ornithological studies. The presence of author, taxonomic, and subject indexes also should be useful for quick reference. Although much has happened in the field of community ecology in the last 4 years, there is still much meat in this volume for graduate seminars, particularly if the participants read the critical original works along with the symposium papers.

The usefulness of the Simberloff et al. onslaught would appear to be that it has flushed ecologists into the open, where they must attempt to defend their beliefs in a rigorous scientific manner. In so doing, Simberloff et al. may have been able to exorcise some "ghosts of competition past," but they seem to be having trouble with the "ghost" of an ecologist past: this volume reflects again the pervasive influence that Robert MacArthur had on modern ecological thought.—KIMBERLY G. SMITH.

**Vertebrate natural history.**—Mary F. Willson. 1984. Philadelphia, Pennsylvania, Saunders College Publishing. vii + 621 pp. ISBN 0-03-061804-5. $37.95.—Many colleges and universities offer an undergraduate course that emphasizes the natural history of vertebrates. Previously, a limited number of books (e.g. Orr's "Vertebrate Biology," Alexander's "The Chordates") were available as texts for such a course. Three natural-history courses I have been associated with were taught without a textbook. Thus, a need would seem to exist for a good introductory text on this subject.

Outwardly, Willson's book, with its attractive color picture of a Red-winged Blackbird on the front cover, would appear to be such a book. But, as the cliché goes, you can't judge a book by its cover: all the illustrations and photographs in the book are black and white. I was disappointed by the lack of color illustrations, because numerous colorful vertebrates are illustrated, many of which most students may not have seen before. The author is aware of this shortcoming: at the end of a figure legend describing the colors on a Ring-necked Pheasant, she states that a "black-and-white photograph hardly does justice to the resplendent plumage." I agree.

The text is divided into 4 major parts. The first, entitled "Perspective," gives an adequate overview of some principles, such as evolution and body size relationships; classification of major vertebrate groups, with discussion of vertebrate origins; and zoogeography and ecology. The second part (the longest) deals with vertebrates and the physical environment. Selected aspects of animal physiology are discussed, along with locomotion and migration. The third part (the shortest), curiously entitled "Relations with other species," discusses how vertebrates feed and how they avoid being eaten. Apparently, the author feels that these are the only interactions vertebrates have

with "other species." The fourth part discusses social and reproductive patterns. I found this to be the strongest section of the book, which is not surprising given Willson's research background.

In most cases, Willson's approach is to present general or common patterns for each major topic of discussion, and then present examples that substantiate the pattern. There is nothing wrong with this approach, but I would have preferred more "gee-whiz" counterexamples. To me, vertebrates that have bizarre and unique attributes make the study of natural history interesting. Also, in almost every case, Willson does not put any historical perspective into her presentations, giving more of a state-of-the-art report. We learn about modern "buzz" topics, like the "big-mother" and "sexy-son" hypotheses, but few works prior to 1960 are cited. Also, few scientists are mentioned by name along with their works. These problems, however, can be remedied by the instructor, who can supply "gee-whiz" examples (students will be impressed) and historical background. Still, it does seem backwards for a textbook to present the recent material and expect the instructor to supply the classical foundation.

Phylogenetic treatments and evolutionary patterns within groups generally are not emphasized. Examples are drawn from different taxa to substantiate general trends, rather than attempting to trace a particular trait through the classes of vertebrates. I believe that this stems from the emphasis that Willson places on the recent literature. Most references cited were published between 1970 and 1980, the period over which this book probably was developed.

Several aspects of the book detract from its being truly "user-friendly." Words that may be unfamiliar to most readers are defined parenthetically after the first use of the word. This makes it difficult to find definitions quickly, and most definitions consist of only a few words. I would have preferred a glossary. Also, using boldface or otherwise highlighting key words would have been useful. My impression, however, is that the author did not intend to emphasize vocabulary because most discussions within the book do not use technical terminology.

More confounding is the presentation of "Selected references" at the end of each chapter. In the Preface, Willson argues that much of the material presented is "readily available in standard textbooks," so full citations are not necessary. Many natural-history examples involving specific organisms are therefore unreferenced. In many cases, it was not clear to me which selected reference, if any, the reader should pursue for more information. The Selected References section is also uniquely edited. Commas separate the authors' names from publication dates, and reference is made to such journals as "Ecol.," "Evol.," "Behav.," and "Wils. Bull." (How about A. for Auk?). I would not want my students to learn scientific citation from this book.

The text reads well, with only a few typos, but little or no attempt has been made to tie the 15 chapters together. Also, within each chapter, concepts are not introduced well. Few chapters have introductory paragraphs that present the reader with an overview of the concepts to be covered in that chapter or how the concepts are interrelated. For example, Chapter 2 is entitled "Classification, characteristics and relationships," but the chapter contains no explanation of classification. The author assumes that the reader already understands taxonomy, biological hierarchies, and binomial nomenclature.

My impression is that there are more examples from ornithological studies used in the book than from the other classes of vertebrates. As a text, this book would present a good review of recent advances in vertebrate natural history. However, the inadequate treatment of concepts, lack of glossary, and de-emphasis of key words detract from its usefulness. The book also will be hard to use as a reference book, due to the lack of historical perspective, references to individual researchers, and complete citations. Many of these shortcomings would appear to be cost-cutting measures. If so, the price of the book may be high for what is offered. My general impression is that the book is more similar to up-to-date lecture notes than it is to an introductory textbook.—KIMBERLY G. SMITH.

## ALSO RECEIVED

**Beyond Neo-Darwinism.**—M.-W. Ho and P. T. Saunders (Eds.). 1984. London, Academic Press. xiv + 376 pp. ISBN 0-12-350080-X. $40.00. **Evolutionary theory.**—J. W. Pollard (Ed.). 1984. Chichester and New York, John Wiley & Sons. xxii + 271 pp. ISBN 0471-90026-5. $37.50.—These two multiauthored volumes represent an intriguing landmark in contemporary thinking. The fit among Neo-Darwinism, revisionary interpretations of the fossil record, and our understanding of genetic mechanisms, variation, and natural selection currently are a source of vigorous debate. While no one contends that evolution by descent from common ancestors has not occurred, there are challenging questions regarding mechanisms, rates, and the potential importance of linear programming and hierarchical organization. These are the areas covered in these volumes. Generally, the two volumes cover much of the same intellectual ground, and there are four authors whose works appear in both volumes.

The volumes focus on conceptual schema used to construct an understanding of biological processes. In one sense this focus abandons the traditional historical approach, the adaptationist paradigm, with its stress on "particulars, of contingencies, and of genealogies" for the evidence of "regularity, of constraint, of order" in the material. Emphasis includes organizational hierarchies, emergent properties, and

transformations. There is considerable philosophy and semantic argument, but not enough to deter from the presentation or to interfere with an essential understanding. Much of the material is challenging, and the arguments are refreshing. Other material is a rehash of arguments made previously and evidence presented elsewhere.

Some of the material (e.g. Steele's hypothesis of acquired characteristics and Brooks and Wiley's entropic approach) has been criticized extensively. Several chapters present material of current interest and is forcefully argued. The combination is rich and thought-provoking. There is little here that deals directly with birds or avian material, unlike the synthesis of a generation ago that was so concerned with speciation and systematics. Many of the chapters include chromosomal or molecular processes then unknown and philosophical approaches built on new interpretations of older data. The issues discussed are primary to an understanding of the world at several levels. Beyond some of the jargon there are some cogent arguments, solid speculation, and new thinking. Because of its newness, the politics, and the potential for controversy, the material presented here is of value.—A.H.B.

**The dictionary of American bird names.**—Ernest A. Choate. Revised by R. A. Paynter. 1985. Boston, Harvard Common Press. 276 pp. ISBN 0-87645-121-0, $17.95 (cloth); 0-87645-117-2, $9.95 (paper).—Revised edition of a 1973 publication that "has been updated to include the radical revisions" of the 1983 A.O.U. Check-list. Fun to browse through. The accounts vary greatly in length and information content. In addition to the section on common names, there is a biographical appendix and glossary of English and Latin names.—A.H.B.

**Zoological philosophy.**—Jean Baptiste Lamarck. Translated by H. Elliot; introductory essays by D. L. Hull and R. W. Burkhardt, Jr. 1984. Chicago, University of Chicago Press. lxvi + 453 pp., index. ISBN 0-226-46810-0 (paper). Cloth, $30.00; paper, $15.00.—A reprint of the 1809 edition. Burkhardt writes on Lamarck's life and the intellectual environment in which he developed. Hull analyzes some of the diverse responses to Lamarckism, both in science and culture. Lamarck attempts to derive a broad philosophical base for his biological observations. The results are rich and the reading fascinating.—A.H.B.

**Birds of the Fiji bush.**—Fergus Clunie. 1984. Suva, Fiji Museum. 160 pp. $9.00.—A pocket-size guide to approximately 75 species of land birds recorded on Fiji since 1800. Both native and introduced species are included. Species accounts included descriptions of plumage, general habitat, voice, and feeding behavior. Range information includes the status on essentially all the islands in the group. Breeding information records nest descriptions, clutch size, and timing. An appendix of Fijian names by Paul Geraghty is included.

Each species is illustrated. The color plates by Pauline Morse are slightly stereotyped, lack scale, and seem too brightly colored. They are, however, very easy to use in the field because of their large size (many are a full page) and clarity. Although not as thorough as Watling's volume, it is considerably easier to carry, and cheaper.—A.H.B.

**A new look at the dinosaurs.**—Alan Charig. 1985 (reprint of 1979 issue). New York, Facts on File, Inc. 160 pp., 19 color plates, numerous black-and-white photographs and line drawings. ISBN 0-8160-1167-2. Paper, $9.95.—This is a very even-handed presentation of the nature of dinosaurs and important aspects of their biology. It deals well with the problem of the origin of birds and is therefore noted here. The book is intended for a popular readership, and is well written.

Considerable space is devoted to a clarification of systematic problems, and the fact that all large, extinct reptiles were not dinosaurs is emphasized. Charig, a paleontologist, discusses the evidence for endothermy, causes of extinction, and paleoecology. I found the science carefully stated and well presented. The black-and-white figures are unnumbered, causing some confusion. The color plates are unexciting. Almost all the species in the color plates are also found in small line drawings.

Dinosaurs are news. *Time* had a recent cover article on mass extinctions, and there are popular press reports of "the world's oldest dinosaur" found in Arizona. Presumably, it was a fossil! Charig treats these items fairly and develops a responsible perspective. The book is an excellent introduction to many of the controversial issues surrounding dinosaurs.—A.H.B.