REVIEWS

EDITED BY M. ROSS LEIN

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.

British warblers.—Eric Simms. 1985. London, Collins, The New Naturalist Series. 432 pp., 6 color plates, black-and-white photos, many line drawings and maps. ISBN 0-00-219810X. Cloth, £19.95. ISBN 0-00-219404X. Paper, £9.95.—Not since Eliot Howard's classic "The British Warblers" (1907–1914) has there been an in-depth study devoted to this group. Howard was so impressed by the aggressive behavior of these tiny birds that he went on to write another classic, "Territory in Bird Life" (1920), which Eric Simms seems to think was published as late as 1948. Simms is also a distinguished naturalist, and author of two other New Naturalist books, "Woodland Birds" (1971) and "British Thrushes" (1978). He therefore brings a wealth of personal experience to his book on warblers.

In some ways the comparison with Howard is quite valid, as Simms has a descriptive, discursive style, and his accounts are peppered with personal experiences and anecdotes. Apart from a few introductory pages on warblers in general, the bulk of the book is taken up by separate accounts of the 16 breeding species and 39 nonbreeding or vagrant species that have been recorded at some time in the British Isles. The accounts are a mine of information, and each has a bibliography at the end of the book. One has the feeling that while Simms has not missed much from the British bird journals, and even local reports, less attention is given to the ethological and ecological literature, and some key references are missing.

The maps and figures are useful, and it is nice to see an attempt made to include spectrograms. Generally these are accurate and helpful, but the Great Reed Warbler spectrogram (p. 230) has the more quiet introductory syllables missing from the typical song. The black-and-white habitat photographs are not of sufficient quality to be either helpful or attractive, and the color plates are disappointing. Although Eric Hosking's black-and-white photographs are always welcome, some in color would have been a great improvement.

After a while the large number of separate accounts, presented in the same way, tends to become repetitive, and some attempt to synthesize and compare the various trends and adaptations in the group would have been a welcome relief. This might have been done at the expense of the accounts of those many species that are rarely seen in the British Isles.

Finally, the publishers left an enormous margin (almost one-third of the page width) and opted for a tiny size of print. After reading more than 400 pages, many ornithologists will need not only their glasses but also, on many occasions, their binoculars.

In spite of all this, Eric Simms is to be congratulated on marshaling some useful information about warblers in this book. It will remain a useful source of reference for anyone who shares his obvious enthusiasm for the small, brown birds of the British Isles.—CLIVE K. CATCHPOLE.

Waders.—Desmond Nethersole-Thompson and Maimie Nethersole-Thompson. 1986. Calton, England, T. & A. D. Poyser. 400 pp., 32 black-and-white photographs, many text drawings, 5 tables, spectrograms. ISBN 0-85661-0429. Cloth, $45.00.—Studying shorebirds became a passion with Desmond Nethersole-Thompson in 1925. In this volume, aptly subtitled "Their breeding, haunts, and watchers," he and his wife distill more than six decades of his unequaled experience with European waders into a personal yet highly readable testament. In addition to incorporating his own extensive studies and those of his family members (some of whom have made independent contributions), the book summarizes much of the European literature, including work by many early workers whose contributions are not published but rather found in diaries.

This is not a highly technical reference. Rather, it is an authoritative natural history and an *appreciation* of shorebirds, more reminiscent of the works of A. C. Bent, who also called upon a host of correspondents to contribute important details to his "Life Histories." After a brief introduction and a lengthy historical introduction to nearly everyone who ever studied waders or collected their eggs in Europe, there follows a chapter on "spacing and dispersion," which provides the book's only attempt at synthesis.

The remainder of the book is arranged by major habitat types (downs, breks and farmlands; moors and heathlands; flows and peatlands, etc.), each section including detailed accounts of the species found there. The breadth of coverage is extensive, including habitat, territory, courtship and sex, dispersion and breeding density, social behavior, nest, egg and clutch, incubation, hatching, young, distraction behavior, predators, food, and estimates of distribution and

population size in Europe. Information about breeding behavior and how to find nests of several species will be especially useful to fieldworkers. Generally lacking are data on migration and habits in winter.

The species accounts are highly informative, perhaps the best being those of the Greenshank (*Tringa nebularia*) and Dotterel (*Charadrius morinellus*), subjects of earlier books by Nethersole-Thompson. All accounts, however, even those of species well known to the author, are dominated by long lists of facts extracted from the literature. Although these are pertinent, they would have been made more useful by the use of tables, for example, to synthesize data on nesting dates or egg size, and by some attempt to provide an overview of biological patterns. Outright errors are few. I can think of no current systematists (p. 53), however, who consider the Stone Curlew (*Burhinus oedicnemus*) to have "affinities to the bustards and cranes."

In reading this book, one cannot avoid sharing the authors' joy in their work, or wishing to have spent a few days afield in their company. Many other books on waders will eventually appear, but I doubt that any will have the ring of authenticity that can come only from years of experience with birds that have often been studied and known as individuals. But this book's most enduring contribution may be the long-term perspective it provides on change. An example (p. 199):

"Loch Morlich was the most important bird lock in Spey Vally and one of the best in all Scotland . . . . In the 1930s and 1940s [there were] up to 6–7 pairs of greenshanks, now rare waders in the eastern Highlands . . . 2–3 pairs of redshanks . . . several pairs of oystercatchers, 6–8 pairs of lapwings, up to 5 pairs of common snipe, 2 pairs of dunlin and 4 pairs of ringed plovers . . . sometimes as many as 30 pairs of common sandpipers . . . woodcock roded over soggy birch trees and a few pairs of curlews fed around the lock and nested in forest bogs . . . . In June 1979 I returned . . . there was almost complete silence . . . a survey . . . recorded . . . only 3–4 pairs of common sandpipers . . . ."

Similar reminiscences scattered throughout the book offer a unique and poignant legacy that should not be overlooked. For this as well as for his contributions to shorebird natural history future workers will be much indebted to Desmond Nethersole-Thompson.—J. R. JEHL JR.

Ornithology in laboratory and field.—Olin Sewall Pettingill Jr. 1985. Fifth ed. Orlando, Florida, Academic Press. xi + 403 pp., 58 text figures. ISBN 0-12-552455-2. $32.40.—Publication of the newest edition of Pettingill's well-known introductory textbook marks almost one half century of its use. With its dual focus on classroom and field learning experiences, the book continues to be unique among its competitors (Wallace and Mahan 1975, An Introduction to Ornithology, New York, Macmillan; Van Tyne and Berger 1976, Fundamentals of Ornithology, New York, John Wiley and Sons; Welty 1982, The Life of Birds, Philadelphia, Saunders Coll. Publ.). Users of Pettingill's earlier editions will immediately notice some major changes; one of these is a new publisher (from Burgess to Academic Press). This change also is accompanied by improvements in the physical appearance of the text. The conservative gray cover, subtly accented with Walter Breckenridge's stunning illustration of a Pileated Woodpecker, is durable and the binding is secure; I doubt this book will disintegrate like my moderately used 1970 edition. A quick perusal shows other significant modifications: 20% reduction in length, a change to a double-column format, elimination of the 3 color plates, and tighter organization through the use of more headings and subheadings. Another notable difference is the treatment of lab and field exercises. In previous editions the assignments were incorporated into the text, making it difficult to use the book for a "lecture only" course; the 1985 edition provides more options. Many of the unlabeled figures are now labeled, and in sections that still contain laboratory exercises, these activities are highlighted in boxes removed from the text. Other chapters contain suggestions for field studies, which are placed under the standard heading "Selected studies," again highlighted by a box.

Has the content changed? Yes and no. The book is divided into 22 chapters, each covering a different topic. There are four appendices. The chapter topics remain almost the same with the welcome addition of one on flight. As with previous editions, Pettingill consulted a diversity of colleagues for help in editing and writing text material. These contributions have significantly strengthened selected chapters of this edition. Much of the new short chapter on flight is taken from the "Home Course in Bird Biology" (1984, Ithaca, New York, Cornell Lab. Ornithol.), and it provides a brief but satisfactory introduction to the three general types of flight. Three chapters ("Behavior"; "Migration"; "Longevity, numbers and populations") either were rewritten or underwent major revision. Using the approach of classical ethologists, J. Hailman produced a succinct chapter on behavior. It begins with levels and determinants of behavior and follows with a discussion on how major ethological concepts relate to behavioral determinants. S. Gauthreaux's chapter on migration is perhaps the outstanding contribution to this edition. He integrated new and traditional approaches to the study of migration into a concise and interesting presentation; 60% of his references were not available when the 1970 edition was published. I know of no other comparable introductory chapter on this exciting and rapidly developing field of avian biology. Sections of the chapter "Longevity, numbers and populations" were reviewed and improved by J. Emlen. The updated "Selected stud-

ies" section is especially useful for field project ideas. I must express my strong disapproval, however, of the continued suggestion to use waterbird colonies for student census activities.

Nine of the chapters received moderate but important changes in content. These include contributions from K. Parkes (portions of "Systematics and taxonomy" and "Plumages and plumage coloration"), Parkes and J. Loughlin (updated synopses and reconstructed keys of North American orders and families), P. Stettenheim (expanded material in "Feathers and feather tracts"), A. Gaunt (description of anatomy and function of the syrinx), D. Kroodsma (sections on song development and repertoires), and S. Rothstein (expanded sections on brood parasitism).

Nine chapters received only minor revisions. Those reviewed by A. J. Berger ("Anatomy and physiology") and A. Feduccia ("Ancestry, evolution and decrease of birds") are appropriate for an introductory ornithology course. I was very disappointed that little effort was made to strengthen chapters on breeding behavior, especially "Territory, mating and parental care." These subjects have been the focus of many stimulating research efforts in the past 20 years, and discussion of the new and exciting ideas surrounding topics such as mating system theory are conspicuously absent; most instructors will find the material in these chapters inadequate for course use.

Overall there have been many improvements in the format and content of this edition, but the entire revision effort is as uneven in coverage. For example, I was frustrated by the continued omission of a chapter on feeding behavior and ecology. Despite my criticisms, the text remains a valuable source for beginning students and amateurs and should be an essential holding in a diversity of libraries (e.g. university, community). In addition to its relevance to undergraduates, the book continues to be an important reference for more experienced individuals; many sections of the appendix "Ornithological methods" should be required reading for new graduate students and field assistants.

This new edition compares well to other currently available introductory ornithology textbooks. Although they still contain some useful material, Wallace and Mahan (1975) and Van Tyne and Berger (1976) are out of date in most areas and are no longer suitable as primary textbooks. Welty's (1982) apparent thoroughness of coverage will appeal to some instructors. In my attempts to use it, however, my students and I have been frustrated by the paucity of general theory, the apparent confusion about how natural selection operates, and the almost overwhelming comprehensiveness of many topics. My current preference is to use Pettingill as a primary text, focusing on its strengths and supplementing weak chapters with outside readings and lecture material. This recommendation may be short-lived, however, as those of us who teach courses in introductory ornithology soon will need to re-evaluate our choices in light of several new textbooks promised in 1988.—FRANCESCA J. CUTHBERT.

Restoring America's wildlife.—Harmon Kallman (Ed.). 1987. Washington, D.C., U.S. Dep. Interior, Fish and Wildlife Serv. xiii + 394 pp. Unnumbered photos, illustrations, color and black-and-white maps. Library Congress No. 86-600-588. Cloth, $15.00.—The 1930's were hard times. The American economy lay in wreckage, and the nation's wheatbelt was a landscape of parched desolation. But, as noted by historian Donald Worster, the era of the Depression–Dust Bowl offered an important pausing point, when the nation earnestly considered not only the idea of limits, but the idea of conservation. The 2nd of September 1937 thus was an eventful date for wildlife in the United States. President Franklin D. Roosevelt endorsed the Federal Aid in Wildlife Restoration Act, and with his signature began a legacy unmatched in the annals of wildlife conservation. This book heralds the 50 years of accomplishment that followed.

After opening statements by President Reagan, Interior Secretary Donald Hodel, and Fish and Wildlife Service Director Frank Dunkle, Lonnie Williamson begins the volume with "The evolution of a landmark law." There is a rich history of what Hodel correctly notes as the law that has done "its work in silent woods and fields and waters, in research laboratories and modest offices, far from the scenes where the news of the day is made."

The "father" of the Act was Carl Shoemaker, a lawyer-newspaper publisher who became permanent secretary of the Senate's Committee on Conservation of Wildlife Resources. With Jay N. "Ding" Darling, renowned for his cartoons and the first duck stamp, Shoemaker and others took aim on the 10% excise tax levied on sporting arms and ammunition. Instead of the funds disappearing into the general treasury, the tax monies would be earmarked for restoring wildlife populations. The drought of the Dust Bowl had been particularly devastating for waterbirds, but Wild Turkeys and other birds had fared no better for even longer periods. Shoemaker penned 13 drafts of the legislation, but each included the same formula for apportioning the funds to state wildlife agencies. The factors in the formula considered the size of each state and the number of hunting licenses sold annually in each state. No more than 8% of the funds could be used for administration. The states would receive their allotments provided the federal funds were matched with state funds. The match required only 1 part state for 3 parts federal funding, thus presenting a tempting carrot for state participation. Shoemaker soon gained the support of Sporting Arms and Ammunition Manufactors Institute, then looked for sponsors in Congress. It was not a long search.

Senator Key Pittman of Nevada chaired the special

committee on wildlife and quickly joined the movement. Representative (and later Senator) A. Willis Robertson of Virginia, chairman of a similar committee in the House, agreed to introduce the bill in the House, but only with the addition of language that prevented the states from diverting license fees paid by hunters for any other purpose than managing wildlife resources. Both houses of the Congress passed the bill quickly. Pittman, in fact, reported the bill to the floor of the Senate without the formality of hearings. Thus, within a span of 6 months, what has become popularly known as the Pittman-Robertson Act (or simply "P-R") became the backbone of funding for wildlife conservation. Within a year 43 states qualified by enacting laws that prohibited diversion of hunting-license revenues; today, all 50 states receive P-R funds (as do U.S. territories). The tax base later included handguns and archery equipment, and hunter education was added to the list of programs, along with the long-standing goals of purchasing lands for wildlife habitat, habitat improvement, and mission-oriented research. By fiscal year 1985, P-R had generated a total of $1.55 *billion* for apportionment to the states. For fiscal 1986 more than $107 million was apportioned (range: $5 million for Texas to $613,000 each for New Hampshire, Delaware, and Rhode Island).

After this introduction and another about the mechanics of federal-state administration of P-R, "Restoring America's Wildlife" moves on to some 30 chapters that deal with individual species or settings where P-R provided the means for accomplishment. "Restoring a land base," for example, is an account of acquiring wetlands and other habitat, and "Substituting facts for myths" provides an overview of the impact P-R has made on research. Many of the chapters deal with mammals (mountain lions, elk, and bears, among others), but ornithologists will find units on Wood Ducks, Bobwhite, Prairie Chickens, Pheasants, and Chukar Partridges. Each chapter is written and reviewed by specialists long associated with each species. The emphasis understandably focuses on game species, but other units in the book broaden the coverage (e.g. "The challenge of islands"). The capstone chapter, by Daniel Poole and Richard McCabe, is entitled "Wildlife tomorrow." The book ends with state-by-state highlights of P-R programs and a tabulation (in dollars) of P-R receipts and apportionment to the states, 1939–1985.

Aside from celebrating the 50th anniversary of P-R, much of the motivation for producing this book centers on the premise that few citizens, whether hunters or nonhunters, biologists or the lay public, know of the hard-core contributions P-R makes to conservation. The game-management area where duck hunters ply their sport is also the wetland home for myriad species of nongame animals—a home funded and maintained by sportsmen's dollars. About 10% of the birds and mammals in North America are game species, yet hunters alone have borne much of the burden of habitat protection for a far broader range of species. In Rhode Island, for example, P-R funds helped purchase nearly 7,000 ha encompassing a wading-bird rookery, nesting sites for Least Terns, nest boxes for Barn Owls and Bluebirds, and platforms for Ospreys. As of 1985, 38 states were spending P-R funds for research on nongame and endangered species. Species-specific projects were under way for Bald Eagles (12 states), Peregrine Falcons (9 states), Whooping Cranes (4 states), Ospreys (4 states), and Least Terns (5 states). Under provision of the Act, P-R funds may be expended legally only for birds and mammals. Nonetheless, in Mississippi P-R supports a program of prescribed burning as part of the habitat management for Red-cockaded Woodpeckers and Bachman's Sparrows, but the burning program also improves habitat for endangered gopher tortoises and several snakes that live in tortoise burrows. These and other examples of the maturing role of wildlife management vis-à-vis "game management" appear in John Anderson's chapter, "Restoring nongame wildlife." The point is well made: P-R is a hunter-supported program that benefits a broad spectrum of wildlife lying well beyond shooting range.

This volume contains a wealth of information for general reading. The text is not cluttered with graphs, tables, scientific names, or references. The photos and illustrations are excellent and adequately complement the highly readable text. The editor and his associates are to be complimented for a superb production. Professional ornithologists will not extend their scientific knowledge with this book, but they surely will find much of interest.

"Restoring America's Wildlife" underscores that P-R was, and is, more than just another scheme for raising money. P-R instead is a far-reaching vehicle of conservation philosophy, professional biology and management, a state-federal partnership, and a user-friendly public. P-R is indeed an on-going success story. On the occasion of P-R's Golden Anniversary, we should remember Shoemaker, Pittman, Robertson, and those other pioneers who five decades ago so ably provided a means for "Restoring America's Wildlife." This book is a worthy commemoration of their vision.—ERIC G. BOLEN.

The origin of birds and the evolution of flight.—K. Padian (Ed.). 1986. San Francisco, Mem. California Acad. Sci. No. 8. vii + 98 pp. ISBN 0-940228-14-9. $12.95.—This slender book is primarily a vehicle for the publication of Gauthier's "Saurischian monophyly and the origin of birds," a contribution that takes up more than half of the book. Gauthier's contribution is a cladistic analysis of avian origins. Padian had already published the general outline of this cladogram placing the Deinonychosauria among the most advanced of dinosaurs and the group most proximate

to birds. This conclusion is in agreement with the well-known views of another contributor to the volume, J. Ostrom.

Gauthier has tried to maintain the formalities of cladism in his analysis, and this leads him to propose a number of nomenclatural changes including a new taxon, the Avialae, for *Archaeopteryx* plus other birds. His explanation for this procedure is as follows (pp. 11–12): "This new taxon, Avialae, is named so as not to violate the classificatory conventions of this work, in which widely used names like Aves are restricted to living taxa in order to maximize stability and phylogenetic informativeness." It is not clear if this procedure requires a new taxon above Aves for the Cretaceous Hesperornithiformes plus modern birds or how we would treat modern taxa that include extinct branches.

The heart of Gauthier's analysis is a list of 84 supposed synapomorphies placing birds well within a particular subgroup of dinosaurs that he has named the Maniraptora. This suggests that the Maniraptora and Avialae share a long complex history of evolutionary adaptations, and is most consistent with a geologically late origin of birds. Most maniraptorids occur in relatively young (Cretaceous) sediments. An early origin of birds, as indicated by recent reports of a protobird from the Triassic of Texas, would be a serious embarrassment for Gauthier's cladogram because it would require that almost all dinosaurian groups evolve before the first appearance of dinosaurs in the fossil record.

My major concern with Gauthier's cladistic analysis is that he clearly was not able to evaluate many of the characters and nearly half of them are only dubiously present or unknown in the taxa studied. In most cases the characters used are from the literature and are not well figured. Gauthier seems to be aware of this problem (p. 42) and states, "I realize that it is not enough simply to list supposed 'synapomorphies' in support of a particular hypothesis. To make the hypothesis most vulnerable to test, one should proceed through the entire system of Hennigian argumentation for each character and array this evidence in a taxon/character matrix. Furthermore, I have had to consider many specimens of taxa that I have not had the opportunity to study first-hand, and I have relied instead on published illustrations and descriptions. Finally, I have not had the time to consider several recent publications on archosaur phylogeny (e.g. Paul 1984a, b) in the detail that they deserve. Accordingly, the following can only be considered a preliminary analysis (or as R. Bakker [pers. comm.] put it, an exercise in 'armchair cladistics')."

The remaining three papers deal with the origin of flight in birds. Bock, using a number of new studies on avian flight and the anatomy of *Archaeopteryx*, strongly supports an arboreal origin for flight. Pennycuick does the same, and it would seem that the cursorial origin may be laid to rest. Ostrom as usual is the chief proponent of the cursorial origin of flight and gives a good summary of his previous work on the subject.

Pennycuick provides yet another restoration of the mythical "proavis," this time with wings much like a bat. He also argues that birds must have had an "upright ancestor" because of their divided ventricle. I doubt if this is really necessary because mammals have such a ventricle but are not thought to have been derived from an "upright" or "tall" ancestor.

The book is informative and well written, but it is neither light reading nor a basic reference. It will be of interest mainly to ornithologists seriously interested in the myriad models of avian origins.—LARRY D. MARTIN.

Development of the avian embryo.—James Metcalfe, Michael K. Stock, and Rolf L. Ingermann (Eds.). 1987. Alan R. Liss, Inc. xv + 376 pp., numerous figures. ISBN 0-8451-4227-5. $79.50.—A common view of biologists when examining works on avian development is that these studies remain distinctly narrow with little regard for nondomestic birds. The authors of the 42 papers in this volume, however, have extended the alternative tradition set by earlier symposia by including data on over 200 species of birds in at least nineteen orders. The majority of manuscripts that describe direct physiological manipulation (e.g. surgery, hormonal treatment) of the embryo still rely on domestic birds which supply easily attainable eggs in large numbers and of a sufficient size to gain access to the embryos. Approximately half the manuscripts in this volume describe data from the uncontested workhorse (workbird?) of avian embryonic physiology, the domestic chicken, *Gallus gallus*.

These symposium proceedings are divided into 4 major categories: Metabolism and Energetics, Gas Exchange and Respiration, Endocrinology of Growth, and Growth Regulation. Originally a satellite symposium of the International Union of Physiological Sciences, the emphasis was primarily focused on the physiology of the egg and embryo rather than on classical descriptive embryology. The papers are of superior quality but were not subject to traditional peer-review (each participant generally reviewed at least 2 other manuscripts in this volume). In this regard, the dearth of typographical errors, carefully articulated style, and author adherence to the symposium's subject are commendable. Manuscripts appear in the form of review, overview, or primary research articles.

The Metabolism and Energetics section is somewhat of a mixed bag. The first 4 papers deal with calcium metabolism during avian embryonic development. These studies are unique and exciting. The strictly embryonic (as opposed to post-hatch) target tissues in the bird embryo for calcium-regulating hormones are identified and excellent use is made of the

shell-less culture, the only model system of chronic calcium deficiency during growth and development in amniotes. Informative reviews on other aspects of embryonic metabolism, for example on trace elements, lipids, and vitamin-binding proteins, are included. Several papers follow on heat and mass exchange in avian eggs. Two of these articles, like the first 3 under Gas Exchange and Respiration, tend to deal with the avian egg as, in the editors' words, a "physico-chemical system" and not with the embryo *per se*. In contrast, the work presented by Tazawa and Rahn and another by Turner deal more directly with ontogenic changes in embryonic physiology that affect temperature regulation. The final 4 papers in the section are directed towards energetics and models of metabolism. They offer significant contributions to ornithologists in their thorough discussions of mathematical modeling of energetics and schemes for evolution of altriciality. The work by Vleck and Vleck on developmental patterns of energetics is replete with excellent tables and figures; these authors have a fine regard for the importance of comparative studies.

The second section on Gas Exchange and Respiration contains a number of classic studies and reviews on gas flow and water conductance through the pores of bird eggs. Together, these papers solidify the literature quite well by including more recent work and making use of particularly clear and informative figures. Excellent articles on oxygen utilization during developmental periods under either normoxic or hypoxic conditions are included. Studies of lung maturation during the paranatal period and red blood cell maturation during early- to mid-incubation periods are good examples of ontogenic (as opposed to "fixed-window") approaches to developmental physiology. The work by Raddatz et al. is particularly unusual since oxygen consumption of *in utero*, early embryos is examined.

Endocrinology of Growth is the most succinct section of *Development of the Avian Embryo*. Three of the papers describe thyroid development, function, and regulation during bird development. The first, a review by Thommes, provides strong evidence for hypothalamic control of thyroid function as early as day 11. In another, McNabb takes advantage of both precocial (*Cotrunix japonica*) and altricial (*Streptopelia risoria*) embryos to compare differences in thyroid development. The third paper, by King et al., is more directly concerned with thyroidal influences on specific growth events, especially skeletal muscle growth. I found the manuscript by Bassas et al. on insulin and insulin like growth factors most interesting. The picture of specific growth promoting (or inhibiting) effects of hormones is especially clear during early development where giving exogenous insulin to bird embryos enhances growth while antibodies to insulin retard growth. The most frustrating aspect of this entire section was the paucity of information on a variety of hormones classically known to have growth promoting or regulating effects in other vertebrates. The review by Scanes offers some tantalizing possibilities for endocrine studies of embryonic and early post-hatch growth.

The final section, Growth Regulation, is more focused on environmental (oxygen and water availability) or physical (mechanical tension, turning of eggs) influences during *in ovo* or early *in vitro* development. The experimental designs are interesting and rather straightforward. I must admit, however, to raising an eyebrow while reading the otherwise excellent paper by authors who state, "Our attempts to remove allantoic fluid with a syringe or by gravity were unsuccessful and resulted in immediate death of the embryo." Since this is a reasonably standard technique and even complete emptying of the allantois does not kill chick embryos for several days, I admire their courage in putting pen to paper.

In summary, this volume is a worthwhile contribution especially in light of the fact that traditional texts on avian physiology only sporadically include research during developmental periods. My one reservation is that the price appears a bit steep, especially when compared to the average book price for volumes submitted to *Science* during 1987.—MICHAEL J. MURPHY.

Identification guide to North American passerines.—Peter Pyle, Steve N. G. Howell, Robert P. Yunick, and David F. DeSante. 1987. Slate Creek Press, P.O. Box 219B, Bolinas, California 94924. x + 278 pp., 219 text figures, 7 tables. ISBN 0-9618940-0-8. $19.50 + $1.50 (U.S./Canada), $2.50 (elsewhere) postage & handling.—If any book is predestined to go into revised editions, this is the one. This is by no means said pejoratively. The preface specifically solicits contributions of new information or corrections of errors, and gaps in our knowledge are highlighted throughout the book.

The authors were inspired to produce this manual by their admiration for Lars Svensson's "Identification guide to European passerines" (see my review of the 3rd edition: 1985, Wilson Bull. 97: 245). The size of the North American passerine fauna (276 species versus 207 in Svensson) and particularly its diversity (28 families and subfamilies versus 24, 8 of which have only 1 European species) clearly militated against single authorship, and no single American is as knowledgeable about that fauna as Svensson is about his. The senior author therefore recruited Howell as illustrator and Yunick and DeSante as East and West coast "reviewers" (Pyle's word) respectively; all four are listed on the cover and title page as coauthors.

In my opinion the authors surpass Svensson's guide in many ways. The page size is substantially larger permitting, among other benefits, fewer abbrevia-

tions. Each family or subfamily is preceded by a convenient summary of commonly held characteristics. Primary feathers are numbered ascendently (from innermost to outermost) rather than in the homologically-inaccurate descendent sequence used by Svensson and other European authors. The Humphrey/Parkes terminology of molts and plumages is integrated successfully with the age terminology of the Bird Banding Laboratory. I found only two slips in their interpretation of the Humphrey/Parkes terminology. They state (p. 12) that birds "that lack a prealternate molt acquire their alternate plumage by the natural wearing of the tips of the contour (body) feathers." The alternate plumage is a distinct generation of feathers; those birds that lack a prealternate molt but attain a different aspect by feather wear are merely clothed in worn basic plumage. Similarly, they mention (p. 13) species in which "the first molt [out of juvenal plumage] occurs in the late winter and spring, such that it is, perhaps, more aptly considered a first prealternate molt." Temporal shifts in molt periods are not uncommon throughout the class Aves; such a shift does not alter the homology (and hence the nomenclature) of the molt/plumage sequence.

The book opens with a brief explanatory introduction, followed by drawings giving topographic terms (and their abbreviations) for the head region and for the bird as a whole. A chapter on "identification, ageing and sexing techniques" is divided into sections on measurements, wing formula, skulling, molt, plumage, juveniles and soft parts, feather shape and wear, growth bars, and breeding characteristics. The wing measurement adopted is that of the chord, found by Svensson and the reviewer to be the least consistent or reproducible of the available techniques. Svensson, having found that the flattened and straightened measurement was the best in these attributes, remeasured practically all wing-lengths in preparing his third edition. Unfortunately, the huge North American data base for wing measurements is largely based on the chord, which would seem to preclude a switch to the more accurate method as has been done by European ringing schemes.

The bill measurement advocated is the simple and most consistent method, with one point of the dividers at the anterior edge of the nostril and the other at the tip. The authors use the term "culmen" for this measurement, which is misleading. Traditional "culmen" measurements have been either the "total culmen" (from the base of the bill at the forehead) or the "exposed culmen" (a poorly reproducible measurement from the base of the most anterior feathers at the posterior end of the culmen). The measurement recommended by the authors (and the reviewer) is actually a diagonal, as it is not taken along the ridge of the culmen itself. I recommend that in future editions, they simply call this measurement "bill," and explain in the techniques chapter how to take it.

Weights are mentioned only briefly. The only weight compilation cited is that of Dunning (1984. West. Bird Banding Assoc. Monogr. 1: 1) who used primarily information gleaned from the literature. The authors overlooked the important paper by Clench and Leberman (1978. Bull. Carnegie Mus. Nat. Hist. 5: 1), in which original weights of 151 species are analyzed by month, age, and sex. Dunning used many of the weights in the Clench and Leberman paper, but combined them in a way that loses much of the information available.

The "further study" that the authors call for (p. 10) on the occurrence of skull "windows" in spring (and in fact well beyond in some species) has been underway for some years at Powdermill Nature Reserve. In a few species, such as the Red-eyed Vireo, windows can be found substantially longer (in known-age birds) than the current literature would lead one to expect (Parkes 1988. J. Field Ornith. 59: 60).

On p. 13, the authors state that the last rectrix to be molted is the outermost, that is, the rectrices are molted centrifugally. This is not true of many Icterinae, which molt the rectrices centripetally (Parkes 1972. Proc. XV Int. Ornith. Congr: 674). A discussion of growth bars (p. 20) states that "adults will sometimes replace rectrices simultaneously during the prebasic molt. . . ." I know of no North American passerine for which this is true, although "*Cassidix*" grackles approach simultaneity in their tail molt.

In each species account in the main text, the scientific and English names (with a four-letter code based on the latter), A.O.U. number, and recommended band size are given, followed by paragraphs (as appropriate) on species identification, molt, timing of skull pneumatization, aging, sexing, subspecies (for a few species), and references. The authors appear to have an excellent command of the literature, especially the most recent.

The production of the book, in general, appears to be good, with well-designed pages and clear typography. However, I suspect that the binding will not last long under steady use. I found some of the inevitable typographical errors: "Rowher" for Rohwer (p. 13), "monthes" for months (p. 16), "*Myiarchis*" for *Myiarchus* (p. 21), "*Camphylorhincus*" for *Campylorhynchus* (p. 84), "difinitive" for definitive (p. 119), "rectricies" for rectrices (p. 228), and "flcatchers" for flycatchers (p. 264) are the ones I jotted down. The caption to Fig. 118 should read "second rectrix" rather than "fourth rectrix." An editor should have caught the consistent misspelling of calendar as "calender" and the common error of "irridescent" for iridescent. Much more serious, however, are omissions from the bibliography. Of the nine references cited for the Blue Jay (p. 67), two (Laskey 1958, Olyphant 1977) are missing from the bibliography. I admit that these are the only such omissions I discovered when trying to look up additional information on species of interest to me, but obviously there shouldn't be *any*.

A few points on terminology are in order. I don't

think "stature" is the right word to use for bill size (p. 93). The authors frequently characterize the small tenth primary of many passerines as "spurious," an old term better forgotten, as the dictionary definition of the word is "not genuine, authentic or true," and the tenth is a genuine primary. Furthermore, I did not find that the authors anywhere *defined* their use of the word in this connection. The authors define "wing formula" to include three parameters of primary feathers: relative lengths, occurrence and lengths of notches on the inner webs, and occurrence of emarginations on the outer webs. In my experience, "wing formula" has been used exclusively for the first of these, although various other ratios and measurements have been called "formulas," as in some of the published keys to identification of *Empidonax* flycatchers.

Readers who have had extensive experience with birds in the hand, whether it be with museum specimens or at banding stations, will have corrections and suggestions to pass along to the authors. Some will deal with techniques, other are applicable to the individual species accounts. I will mention a few of the latter I encountered.

Acadian Flycatcher: The species identification paragraph (p. 34) should mention the conspicuous buff feather edges of the upperparts of juveniles, unique in the genus *Empidonax*; this character is mentioned on the next page under "age" where its uniqueness is easy to overlook.

Northwestern Crow: In a review of the genus *Corvus* that seems to have been overlooked by most recent authors, Meinertzhagen pointed out many years ago (1926. Novit. Zool. 33: 57–121) that the Northwestern Crow (*C. caurinus*) differs from all races of the American Crow (*C. brachyrhynchos*) in the configuration of its nasal bristles. As clearly shown in Meinertzhagen's Plate VI, the nasal bristles of *caurinus* meet along the culmen, whereas those of *brachyrhynchos* lie principally along the sides of the bill. Meinertzhagen sampled 11 specimens of *caurinus* and 84 of *brachyrhynchos*. A smaller series in the Carnegie Museum of Natural History collection confirmed this character, although displacement of the nasal bristles in some museum specimens can make individuals difficult to evaluate. This character should be restudied in living crows.

Chickadee sp.: I find the distinctness of the edge of the black bib a dubious character for separating the Black-capped and Carolina chickadees, and discourage its use in areas of sympatry.

Tufted Titmouse: The juvenile is characterized only as having more loosely textured under tail coverts. Much more obvious is the lack of the black forehead of later plumages; in juveniles there are no more than a few black feathers just at the base of the bill.

White-breasted Nuthatch: Females of the northeastern populations do not have "dull black" crowns; their crowns are blue-gray. Farther south, it is true, females develop black crowns so that in much of the eastern United States sexing can be done only one-sidedly; if it has a gray crown, it is a female.

American Robin: In addition to the caveats listed for sexing this species, it should also be pointed out that females of the Newfoundland/Labrador breeding race *nigrideus*, which migrates into the eastern United States, are often fully as richly colored as males of *migratorius* of equivalent age.

Cedar Waxwing: I have found adults finishing the molting of the flight feathers of the wing as late as January, thus extending beyond November the period in which this might be used as an age character.

Parulinae juvenal plumages: Many of the authors' descriptions are inadequate, misleading or wrong. Among the Parulinae, juvenal plumages divide rather clearly, even within the genus *Dendroica*, into two categories. Some are ephemeral, with the first prebasic molt beginning in some species even before the juvenal plumage is fully acquired (e.g. American Redstart, Petrides 1943, Wilson Bull. 55: 193). In others, young birds are fully grown and flying before the first body feathers of the basic plumage appear. This was one of the characters invoked to show that the Painted Redstart belonged in *Myioborus* rather than in *Setophaga* with the American Redstart (Parkes 1961, Wilson Bull. 73: 374). For those species with ephemeral juvenal plumages, the descriptions by Pyle et al. are sometimes actually of the first basic plumage, as in the Golden-winged and Parula Warblers. Specimens of such species in the true juvenal plumage are very rare in collections, and were probably not available to the authors, who simply described the youngest specimens they could find.

Townsend's and Herit warblers: Under species identification, I would have expected a caution that these two hybridize rather regularly where their ranges meet.

Hooded Oriole: Although I appreciate that this manual is addressed principally to workers in the United States and Canada, banders in southern Mexico should be warned that ASY females of this species in that area frequently have black throat patches, and should not be mistaken for males (Parkes, in prep.).

In summary, the authors undertook a massive project, and have done an exemplary job for the first attempt. Even with its flaws and gaps, the book will be of tremendous value for those who need to identify, age and sex birds in the hand (and many of the characters invoked can be used in the field as well). It is up to all of us now to help to make the next

edition as nearly definitive as current knowledge will permit.—KENNETH C. PARKES.

Ecology and behavior of gulls.—Judith Latta Hand, William E. Southern, and Kees Vermeer (Eds.). 1987. Cooper Ornithol. Soc. Stud. Avian Biol. No. 10. vi + 140 pp., 14 black-and-white plates, figures, tables. ISBN 0-935863-31-3. $18.50.—In December 1985 the Colonial Waterbird Society and the Pacific Seabird Group, North America's two contenders for the role of specialist working group on aquatic birds other than ducks, held a joint meeting in California. To integrate the event further, they included a special symposium on the subfamily Larinae, the main area of overlap between their respective spheres of influence. This volume is the result. Considering the delays often attendant on the production of such symposia, the editors deserve thanks for getting this one to us quite speedily. Like all of the Studies in Avian Biology series, it is attractively produced on good, glossy paper.

Eleven research papers are included, as well as the abstracts of ten others, and an overview chapter by W. E. Southern, which effectively preempts many of the comments on gulls as research tools that a reviewer might otherwise have made. The papers are grouped into four sections: life history strategy, behavior, foraging, and habitat selection. A fifth category, hybridization, is represented by a single entry (A. Ingolfsson's informative study on the progress of introgression between *Larus argentatus* and *L. hyperboreus* in Iceland).

Under life history strategy, W. V. Reid presents a thoughtful study of the constraints on clutch size in large gulls. He demonstrates convincingly that clutch size is unlikely to be limited by incubation capacity, by the "shelf-life" of eggs, or by energy constraints during the pre-laying period. However, his own suggestion, that clutch size is limited by the ability of females to mobilize reserves after the start of incubation, itself begs several questions. D. M. Fry and three coauthors review data on sex-ratio skew, supernormal clutches and female-female pairings in gulls and present additional highly suggestive evidence that organochlorine pollution may lead to the feminization of some male embryos. Spear et al. wrestle with a segment of the huge data base on Farallon Island seabirds that Point Reyes Bird Observatory has accumulated for the past 17 years. They show that, in *Larus occidentalis*, males 1–3 years old have lower survival than females, but among breeders females have lower survival, particularly in years of low reproductive success. Finally, in this section, Spaans et al. describe how increased breeding density in a Dutch colony of *L. argentatus* was correlated with lowered reproductive success, smaller eggs and slower growing chicks.

In the behavior section R. D. Morris describes how *L. argentatus* parents with irregular incubation regimes generally exhibited lowered reproductive success, while J. G. Galusha and R. L. Carter present some experiments that suggest, contrary to some previous assertions, that *L. glaucescens* parents will adopt unrelated chicks as much as 30 days old.

Foraging behavior includes a comparison by J. Burger of feeding success in 16 species of gulls (15 *Larus* spp. and *Rissa tridactyla*) in relation to individual age and the normal age of the species at first breeding. She concludes, conforming with theoretical expectations, that the effect of age on feeding efficiency (as measured by inter-feed interval) is greatest in those gulls which begin to breed latest. The other paper in the foraging section, by J. R. Jehl Jr. and C. Chase III, is not about foraging by gulls, but by their predators, mainly *Bubo virginianus*. They are concerned mainly with the effect that such predation has on nest-site selection by the gulls. Under habitat selection K. Vermeer and K. Devito compare the habitats and nest-site selection of *L. canus* and *L. glaucescens* in British Columbia and R. Pierotti reports on the reproductive success of *L. argentatus* in Newfoundland in relation to breeding habitat and density.

If I had been refereeing, rather than reviewing, this volume, I might have found much with which to quibble. My impression was that, although the normal procedures of peer review were no doubt followed, the authors did not have many enemies among the reviewers. A problem with all small, specialist groups, such as the CSW and the PSG, is that the membership tends to talk mainly to one another rather than to the ornithological community-at-large. Consequently, a consensus develops that certain types of data are of interest, despite having only modest relevance to science in general. The result is a sometimes-awkward blending of science and natural history.

Another factor that lends a slightly parochial air to the collection is its concentration on the *L. argentatus, L. glaucescens, L. occidentalis* group of large gulls. Six of the papers involve this group and in three others half the paper is devoted to them. Only Burger made an attempt to exploit the diversity of the sub-family and its consequent suitability for comparative studies, in the manner advocated by F. Pitelka in his preface. The presence of two papers by European authors does something to alleviate the "club" atmosphere, and the importance of such contacts is emphasized by a comparison of bibliographies. On average only 30% of works cited by North American authors were published outside North America; the average rose to 75% in the two European papers.

Despite its rather ambitious title, this volume is mainly a random sampling of the research currently being done on large *Larus* gulls in North America.

For those actively involved in the field it will be essential reading. For anyone looking for an up-to-date review of gull ecology and behavior, this is not it. Moreover, we could hardly expect such a book at such a price and in 140 pages.—ANTHONY J. GASTON.

Ecology and evolution of Darwin's Finches.—Peter R. Grant. 1986. Princeton, New Jersey, Princeton University Press. xiv + 458 pp., 101 text figures, 63 plates (8 color). ISBN 0-691-08427-0. Cloth, $55.00. ISBN 0-691-08428-9. Paper, $22.50.—There are many species of Darwin's Finches (14), a larger number of Galápagos Islands (about 30) and an even larger number of scientific papers about both (>120). During the last 15 years, over one-half of these papers have been authored or co-authored by Peter R. Grant. Keeping track of the works by Grant, his students and colleagues (e.g. Ian Abbott, Lynette Abbott, Peter Boag, Lisle Gibbs, Stephen Millington, Trevor Price, Laurene Ratcliffe, Dolph Schluter and Jamie Smith) is a research endeavor in itself. This book appears just in time to bring everyone up to date and to integrate the various research projects into a comprehensive package.

The book is attractively prepared; the 63 plates add considerably to the text even though their quality is variable. Few typos were noted and the only ornithological error I discovered was the naming of *Asio flammeus* as *Asio galapagoensis* (plate 38). Since nomenclature can be confusing, a consistent use of common names for Cactus vs. Cactus Ground Finches would have been nice.

It is ironic that Darwin never mentioned the Galápagos finches in the *Origin of Species* and that the birds named for him have assumed such a central role in our thinking about his principle of natural selection. In a way I suppose it's fitting that the birds have posed such a challenge to ornithologists. Following a taxonomic treatment by Swarth in the 1930s, the finches were studied by Lack in the 1940s, culminating in the publication of his "Darwin's Finches" (1947, Cambridge, Cambridge Univ. Press). Bob Bowman began a series of papers on the finches in 1961 (Univ. Calif. Publ. Zool. 58: 1) and in the early 1970s, Peter Grant initiated his studies. Despite these investigations, there is no agreement on the putative common ancestor of the finches, and there are still arguments about the relationships among species within this presumably monophyletic assemblage and several possible models of speciation in the group.

The book comprises 16 chapters, each well thought-out with an introductory section and a valuable, concise summary. The first 3 chapters detail some of the key questions addressed in the book, provide an introduction to the geology and vegetation of the Galápagos archipelago and acquaint us with the birds, respectively. In chapter 2, the significance of climatic variability is stressed and we begin to appreciate the value of Grant's 12 years of fieldwork as opposed to David Lack's one visit in 1939. The 14 finches fall into 4 groups: ground finches, tree finches, a warbler finch and the Cocos Finch. Within the ground and tree finches, morphological differences among several pairs of species relate to bill and body size. Even though Grant states that most can be recognized easily, throughout the book there are examples of morphologically-distinct allopatric populations, extinct populations, rapid selection on bill characters, and formation of interspecific hybrids. The overall impression is one of fuzzy species boundaries.

Detailed morphological variation among and within species is treated in Chapters 4 and 5. A central point for these birds is the extensive variation of bill morphology among and within species. While this is a given, conclusions such as that of isometry for most characters, or that tree finch and ground finch groups differ more in bill shape than in body size, are not supported by the data presented. For instance, in a Principal Components (PC) analysis of external characters, bill shape is represented on PC 2, which accounts for only 6.1% of total variance as opposed to 90% for body size on PC 1. If PC plots (e.g. Fig. 21) were scaled by the proportion of variance each axis represents (as they should be but computers don't do), then the apparent separation among groups on PC 2 would disappear.

Chapters 6 and 7 summarize the extraordinarily-detailed and labor-intensive work required to quantify the diet of the finches and the relationship between food supply and breeding phenology. A chart (Fig. 38) showing the relationship between abdomen width of spiders fed to nestlings of three ground finch species and the frequency distribution of spider abdomen widths in nearby vegetation gives the reader a grasp of the detail involved. Chapter 7 concludes with the significant observations that finch biomass is highly correlated with food biomass and that the dry season is the likely time of food limitation. On occasion, the combining of information from several studies can be confusing. In four consecutive figures, finch biomass is measured in g, g/net census and kg while seed biomass is in g/m^2 and kg/m^2. Also, survivorship for *Geospiza scandens* in Fig. 51 does not appear to follow from population sizes given in Fig. 50.

After establishing the significance of diet, Grant moves to a discussion of heritability of size of body parts and an explicit demonstration of the effect of seed-size availability on body size of *Geospiza fortis* (Chapter 8). The value of long-term studies for observing ecological "crunches" is aptly demonstrated here.

Chapter 9 focuses on species recognition and hybridization while chapter 10 discusses evolutionary scenarios. As Grant points out, more biochemical analyses, particularly MtDNA or nuclear DNA studies, are needed to guess at continental ancestors and

the sequence of speciation events which led to the 14 extant species today.

Chapter 11, entitled "Ecological Interactions during Speciation," addresses the fundamental question of how allopatric populations of the finches might have differentiated. Did newly-established populations encounter different competitors or were they forced to adjust to a new floristic environment? Two quantitative tests of predictions from the competition hypothesis are provided. Inter-island variation in food supply alone appears inadequate to explain the morphology and distribution of the finches. The photographic evidence (plate 63) documenting character displacement from competitive release is misleading because of scaling differences in the photos.

More detail on the role of competition is provided in chapter 12. A strong case is made for nonrandom association of finches mediated by competition for food. Chapters 13 and 14 are catchalls for a discussion of species recognition, body size variation and plumage. An interesting comment at the end of Chapter 14 is that despite the variable morphology among species, courtship behavior and breeding characteristics such as clutch size, incubation, and nestling period are relatively unvarying.

For me, the weakest part of the book is chapter 15, where an attempt is made to use Lande's (1979, Evolution 33: 402) quantitative genetic methods for examining multivariate evolution. The idea is to calculate the net force of selection required to transform one species into another. The weakness lies in the calculation of the genetic covariance matrix, which varies depending on the characters used, contains elements which themselves are highly variable (as are heritability measures) and is likely to mimic a phenetic covariance matrix. To suggest, as Grant does, that phylogenetic relationships can be inferred from selection distances is to suggest also that they can be inferred from phenetic distances. While true in many instances, this approach to reconstructing phylogeny is a poor substitute for MtDNA or similar biochemical analyses.

Chapter 16 provides an excellent summary of the answered and as yet unanswered questions about Darwin's Finches. A call for further studies, including biochemical and paleontological ones, is issued.

Those who have every paper on Darwin's Finches by Peter Grant and his students will find little new in this book. For the vast majority of ornithologists though, "The Ecology and Evolution of Darwin's Finches" will provide a concise and comprehensive reference to this large literature. I have difficulty accepting the conclusions drawn from some analyses, particularly those involving multivariate statistics. At times I got lost flipping between all the plates, figures and tables; but the quality of the science being presented is evident throughout. The book will be, if it is not already, a classic that deserves to be in everyone's library. I still have trouble keeping track of which finch species did what to whom on which island, but at least now I need look at only one reference to find out.—W. BRUCE MCGILLIVRAY.

Lovebirds, cockatiels, budgerigars: behavior and evolution.—J. Lee Kavanau. 1987. Los Angeles, California, Science Software Systems, Inc. xxvi + 1,002 pp., 3 text figures, 4 tables. ISBN 0-937292-03-6. $69.00.—This book is an ambitious attempt, on one hand, to touch upon almost every aspect of ornithology and, on the other, to give a detailed account of the behavior of three parrot species in captivity. Kavanau's specific goals seem to be to impress upon the reader the importance of behavioral studies that are carried out only in the lab, and to offer a hypothesis for the evolution of avian egg care. The book is intended to appeal to anyone with any interest in birds, from aviculturists to academicians, particularly those who are interested in behavioral evolution. What emerges is a rather unwieldy mass of information compiled from over 1,400 sources and over 300 pages of Kavanau's aviary notes. Embedded in the middle of it all is a reasonable hypothesis for the evolution of some aspects of reproductive behavior in birds.

The book reads like the earliest draft of a doctoral dissertation—the version that is seldom read by anyone but the writer. Each topic, even if relatively peripheral, is covered in excessive but, by Kavanau's own admission, not thorough detail. For example, in his general discussion in Chapter 1 (Budgerigars) there is a section on flight feathers and flight. This is not restricted to Budgerigars, or even parrots, but includes studies carried out on House Sparrows, Zebra Finches, Rock Doves, and hummingbirds. He even concludes the section with a comparison of flight musculature in birds and bats. As this discussion is only 3 pages long, it is obviously not a comprehensive coverage of the topic, nor is it relevant to what seems to be his central thesis. Similarly, the coverage of paleoclimatology, paleogeography, paleobotany, and origin of mammals is interesting but superficial, and not essential to an understanding of his own work. In fact, these digressions actually obscure the worthwhile portions of the book. If it were absolutely necessary to acquaint the reader with all of this, beyond giving references, appendices would have been a more effective way of doing so.

This excessive attention to peripheral topics also makes the organization of the book elusive. As the topics are not presented in a logical sequence, even the detailed table of contents (8 pages) is not very helpful in guiding the reader. Chapter 1 begins with a 35-page coverage of the history of the Australian continent and its biota, along with the origin and distribution of parrots. Part 2 of this chapter is titled Budgerigars, but actually "introduces some properties of all parrots, of birds in general, of bats, of certain other mammals, and of reptiles, particularly croco-

dilians . . . ." There follows a rather rambling and disorganized treatment of natural history, morphology, reproductive behavior, embryology, young and their care, and diseases. Some of this will be of interest to aviculturists, but much of it is repeated in other chapters, and some points seem entirely out of place. For example, on p. 112 there are two paragraphs headed WARBLING and INTELLIGENCE. They are clearly set off by themselves in the text, but are placed between the sections on the digestive system and reproductive behavior.

Parts 3 and 4 of Chapter 1 deal with general information on Cockatiels and Peach-faced Lovebirds respectively. Part 5 gives a three-page account of colonial behavior in captive birds, and Part 6 is a discussion of neural control of sound production and vocal mimicry in his three species as well as birds in general. If Parts 5 and 6 had to be included in the book, they should have been integrated into Part 2.

After a brief chapter devoted to practical aviculture, Kavanau begins an exhaustive account of his own observations on Lovebird pair-bonds, specifically the interactions of three juvenal brood-mates. I certainly do not regard behavioral studies carried out on captive animals as being insignificant. I agree with Kavanau on the importance of "what *can* happen in the lab, as opposed to what *does* happen in the wild." But the introduction of a Lovebird with clipped wings and a missing toe into an enclosure with his two pair-bonded broodmates seems to include a rather cluttered array of variables. At the very least I would like to have seen these observations repeated using other birds.

Chapter 4 is the heart of the book. Here, using observations and experiments on Cockatiel egg care, Kavanau arrives at a hypothetical sequence of stages in the evolution of avian egg care. He also offers an interesting synthesis of avian evolution, in general, tying together his views on evolutionary sequences involved in thermoregulation, insulation, egg care, care of young, mode of feeding, and degree of arboreality. This is presented in a concise 2-page table, which is fortunate, as the text follows the rest of the book in its convoluted organization. Even if one were to reject his hypothesis on the evolution of egg care, his methods (using transparent nest box panels and extensive observations) make the data seem credible.

I perceive two problems with his Cockatiel experiments. Obviously more observations on many more birds would be desirable. But the time involved in this kind of work makes this impractical for one person. In addition, we have the same difficulty here as with any explanation in behavioral evolution. Behavior seldom fossilizes in the same manner that morphology does. There is no certainty that what we see in living species represents a graded series in time, hence we cannot be certain that any behavior is relict. As there are only so many methods by which a bird can search for missing eggs, the Cockatiels' reaction to artificially buried eggs could be relict, or it could be innovative.

The remaining 3 chapters consist of further observations of his breeding colonies, with no particularly surprising results to anyone who has done any avicultural work. Chapter 5 recounts another example of unusual behavior in Lovebird pair-bonding, and seems out of sequence following the section on Cockatiel egg care. Chapter 6 presents a detailed account of care of eggs and young, and behavior of young in the three species. Chapter 7, as the final section of the book, might be expected to tie this diversity of topics together, but for the most part it consists of odds and ends of aviary notes. And then, after 848 pages, the text comes to an abrupt end.

The presentation and binding are unimpressive. As a computer generated output, the letter quality is clear, but 848 pages with only three figures and four tables makes for a most unstimulating piece of work. Further, the binding on my volume was deteriorating by the time I reached p. 300.

With the exception of Chapter 4 and the References, I doubt that this book will have much to offer workers in avian biology. Anyone who is really interested in the information provided by the 1,400+ references would probably want to consult the original literature. To the author's credit, the references here are very useful. In fact, anyone organizing an ornithology course for the first time might consider consulting this bibliography. This book may have some appeal to aviculturists who are interested in more than just propagating large numbers of birds. Still, there is a lot here that will probably be inaccessible to those without some background in biology. It is unfortunate that Kavanau chose this format in publishing his work. The information in Chapter 4 could have been the basis for an interesting journal article, whereas the detailed observations of behavior in his aviaries could have made interesting reading for aviculturists. As it stands, the book is a poor compromise between ornithology and aviculture. At $69.00, even those interested specifically in avian behavioral evolution are likely to be disappointed. I recommend it only for large libraries with ample budgets.—SUSAN L. BERMAN.

Clinical avian medicine and surgery.—Greg J. Harrison and Linda R. Harrison (Eds.). 1986. Philadelphia, W. B. Saunders Company. 717 pp. ISBN 0-7216-1241-5. $75.00.—Avian medicine and surgery is a rapidly expanding specialty within veterinary medicine. This text is developed primarily for the clinician. The contributors are all active in avian medicine and represent a balance of avian practitioners, surgeons, pathologists, microbiologists, and academicians.

The book has a few chapters that address basic avian biology from a clinical perspective. The chapter on

anatomy is based on the Amazon parrot and provides excellent illustrations of the skeleton, appendicular musculature, respiratory passages, gastrointestinal and urogenital systems. The cardiovascular system is well described and illustrated. The section on physiology is a brief review of basic concepts and is referenced by a short selection of books and journals.

The section on diagnostic procedures is detailed and well-written by several contributors. This portion of the text may be of selective use to the avian biologist, but is essential to the clinician. To researchers not directly affiliated with a medical field, it may be enlightening to discover the variety of dynamic tools used for evaluation of birds' health and physiological status. These chapters provide information on techniques as well as normal values. Some of the appendices provide reference values on clincial chemistry tests, survey weights and average breeding characteristics on selected species of cage birds.

The current and well-referenced section on avian diseases deals primarily with psittacines. Some tables are broader, such as those on avian pox, avian herpesvirus and avian hemoparasites.

Finally, chapters on reproductive medicine and pediatric medicine may be useful to individuals rearing birds in a laboratory or aviary. Problems with fertility and raising birds prior to weaning are common in aviaries and basic considerations for husbandry and nutrition are addressed.

This multi-authored text is one of the best resources available to the practicing veterinarian. It documents the recent advances made in a rapidly expanding specialty. The 46-page index makes the information very accessible. Appendices help separate catalogs of reference information. The avian drug formulary is inconveniently placed in the center of the book, but it is marked along the page border.

The emphasis of this text is placed on psittacine and passerine cage birds and has few references to raptors, waterfowl or gamebirds. This book will be useful to aviculturists and biologists studying birds in confined situations. It is of limited use to the field ornithologist.—JOANNE PAUL-MURPHY.

Birds of Baja California.—Sanford R. Wilbur. 1987. Berkeley and Los Angeles, University of California Press. ix + 253 pp., 12 black-and-white photographs, 3 text and 3 appendix figures, black-and-white frontispiece and color dust-cover illustrating five unique terrestrial species or subspecies. ISBN 0-520-05820-8. $41.55.—This is essentially an annotated list of known avifaunal records of Baja California, Mexico, with an introductory section on habitat and conservation, a bibliography of Baja California ornithology, and an appendix of place names, a checklist, and an additional reference section. It summarizes current distributional knowledge on Baja California avifauna (and the nearby Gulf of California) and provides future workers (researchers and managers alike) a baseline against which future expected changes in avian habitat and bird distribution can be compared.

Wilbur recognizes the unfinished nature of the present data-base and encourages more research. Bird records from northwestern Baja California are likely to be the most complete and accurate because many ornithologists in southern California have worked in habitats and areas very similar to northern Baja California. Information is more likely to be wanting from areas to the south and from the Gulf of California because most data from these areas are as yet unpublished or lacking. One needs to recognize this information continuum.

In reviewing this book, one should ask several questions. First, will it be useful to professionals, researchers and managers alike? There is certainly enough information in this book to make it useful to anyone going into the area. Mexican resource managers and young scientists now being trained at various new and growing educational institutions in Baja California stand to benefit the most. The most important progression will be to produce a Spanish translation. Wilbur's agency, the U.S. Fish and Wildlife Service, should subsidize such a project as part of their international activities, and do it soon. People in the field will still require a good field guide.

Next, is the book up-to-date? This book is long overdue. It is also inevitably incomplete on many details, due to no fault of the author. It is meant to stimulate the documentation of more field data. Anyone serious about Baja California's birds should have a copy of Wilbur's book to use as a notebook, annotating the margins as I do. I urge both bird-watchers and avian researchers in Baja California, the Gulf of California, and the Mexican West Coast to do the same. In ten years we can have a conference.

This raises one problem; namely, the inclusion of the Gulf of California logically necessitates the inclusion of at least Sonoran, Sinaloan, and Nayarit coastal birdlife. The restriction of the book mostly to the peninsular Baja California, and in reality to only part of the Gulf of California, makes its boundaries a bit awkward. The more interesting and relevant ecological comparisons between the natural biogeographic boundaries of the area are thus neglected. For example, these include the seabird affinities and mixing among at least three ocean biogeographic zones surrounding the Baja California peninsula, the dispersal of land birds into Baja California from various habitat zones to the north and east, and the dispersal of landbirds onto offshore islands. Wilbur's book and the much-needed supplemental data will help contribute to such future analyses.

I have found a few errors or omissions in the book, but most are not major or appropriate here except to provide a few examples. First of all, the Ring-necked Pheasant (*Phasianus colchicus*) is not hypothetical in Baja California. Populations increased significantly

near Mexicali in the 1960s, due probably to some unusual changes in agricultural practices (G. Kramer, U.S.F.W.S., pers. comm.) and are now abundant enough to provide a significant sport-hunting harvest. Ironically, this may be just one more signal of the many man-induced changes that are coming very rapidly (Wilbur thinks more slowly, p. 24) to the peninsula. In addition, the Red-footed Booby (*Sula sula*) is not mentioned by Wilbur although it is a breeding species within the Gulf of California and there is also a specimen record from La Paz (G. Gomez, Universidad Autonoma de Baja California Sur, pers. comm.). Thirdly, my "conjecture" that Brown Pelicans (*Pelecanus occidentalis*) migrate across the Baja California peninsula (p. 43) is actually based on 6 or 7 seasons of study on this migrational pattern. And the White Pelican (*P. erythrorhynchos*) is common at Laguna Salada, the Rio Colorado delta, and can be found in most estuaries anywhere on either coast of the Gulf of California. Finally, I think that "Conservation International" (formerly of The Nature Conservancy) and the many people involved in the conservation program of the islands of the Gulf of California need to be recognized as more than just "Anonymouse (1985)" (p. 234). In fact, I believe that avian conservation in some areas of Baja California and the Gulf of California is an urgent problem that needs immediate attention.

The "ardent" (I avoid the word "amateur") bird-watcher might be disappointed with the bird-list in Appendix B because of omission of various check-off categories (date of sighting, room for remarks, habitat seen, etc.) and certain additional information (phenological charts, habitats expected, etc.). I suggest that future editions include a separable, wide and spacious bird-list to be taken out of the book (and extra copies available on order) for interested birders. This would not detract from the scientific value of Wilbur's book, but an improved checklist would get his book into the hands of more bird-watchers going to Baja California (there are many). For educational purposes, a more usable bird-list might also help to stimulate a more widespread interest in birds and therefore help promote their conservation.

In summary, Wilbur's book may help improve the documentation of avian distribution and status in Baja California; and increased interest can only lead to stronger conservation efforts. Thus, the book was not a disappointment. As Wilbur says himself: "I encourage others to see what they can find."—DANIEL W. ANDERSON.

Atlas of breeding birds in Maine, 1978-1983.—Paul R. Adamus. 1988. Augusta, Maine Department of Inland Fisheries and Wildlife. vii + 366 pp. Paper, $9.00, and **Atlas of Victoria Birds.** —W. B. Emerson, C. M. Beardsell, R. I. Normand, and R. H. Lyon. 1987. Melbourne, Australia. 271 pp. ISBN 0-7241-8387-6. No price given.—Breeding bird atlases are a growth industry. The wave that began in the U.K., swept to the U.S. (Vermont's was the first published in the U.S.), now shows promise of eventually consuming the entire world. The Maine survey is the second U.S. entry, but the tide will eventually involve most, if not all the states. There are currently several underway in Canada.

The Victoria atlas is the first for Australia. The records cover a decade and the volume is an expansion of the earlier RAOU atlas. It is unusual in that both breeding and occurrence records are included and it covers all seasons. Maine includes 201 breeders; Victoria, a total of 451 species. The analysis of the Victoria data (by S. C. Bennett) is based on blocks of 10-min resolution; and Maine was divided into 706 blocks of 7.5-min resolution. Both books have the same page size and deal with birds; but, beyond that, the similarity decreases quickly. All the statistics in both volumes are intrinsically useful, but the types and quantities of data illustrate an important point. Namely, that there seems to be no uniform code for the compiling and production of a breeding bird atlas. Consequently, the usefulness of the information varies. This inevitably leads to problems.

The half-page accounts in the Australian volume are highly informative. There is a paragraph of ecological and behavioral information. Separate maps give the species occurrence (quantified by symbol) and breeding status (by block). There is a table of monthly breeding numbers and a bar graph of "monthly reporting index." The Maine volume appears much less sophisticated by comparison. Gray shading and simple symbols on a full-page map represent the levels and status of breeders and only a "detectability" scale is added.

Many people were involved in these projects (3,000 observers in Victoria, about 200 in Maine). The programs involved long-term commitments to the fieldwork and to the data processing and analysis. Volunteers contributed an enormous amount of time and effort. The volumes were government supported, but in addition to the comprehensiveness of the reports, they differed noticeably in paper and print quality. One senses vast discrepancies in the availability of financial support on behalf of the sponsor. The production of an atlas is an important event. There are implications for conservation and management, they provide a baseline from which changes can be tracked. Standards need to be set as to what material is collected, how it is done, and the format the atlas must take. It is equally important to include maps of physiographic domains, mean annual rainfall, and elevations. Habitat descriptions are an absolute necessity. The effort required to collect these data and produce an atlas is immense. It is incumbent on the authors and sponsoring organizations to make them as useful and accessible as possible.—A.H.B.

OTHER ITEMS OF INTEREST

The unknown music of birds.—Peter Szöke. 1987. HUNGAROTON SLPX 19347, Hungarian Record Company, Budapest, V. Vörösmarty tér 1, Hungary. 47 min, 33⅓ rpm disc, jacket and pamphlet in English, Hungarian, German, and French. Available in the United States for $11.50 (postpaid) from Qualiton Imports Ltd., 39-28 Crescent St., Long Island City, NY 11101.—Roll over, Beethoven, Strauss . . . . Move aside, humpback whales. Here come *The Birds,* as presented on a first class "ornithomusicological record." Szöke has captured the sounds of renowned songsters, such as nightingales and thrushes, as well as the sounds of birds less well known for their musical abilities (e.g. a heron and even the barnyard fowl). He first presents the sounds as we would hear them in nature and then at successively slower speeds but *without* the customary lowering of frequency that one encounters on a standard tape recorder. We thus hear "the hidden true melodic structure of the song . . . musical forms identical with those of human music": "simple pitch intervals" (e.g. perfect fourths, an octave leap), "complex musical motifs," "human-like biological rhythmicity" (e.g. 2/4 bars, 5/4 bars), transpositions of motifs into different registers, "human-like strophic song (lied) forms," and even "contemporary music" (the "disordered, ugly sound structure" of the slowed-down song of the Blackcap, *Sylvia atricapilla*).

One need not know music or accept the universality of musical forms throughout the animal world to appreciate the truly remarkable sounds on this record. The song of the Veery (*Hylocichla fuscescens*) at reduced speed may be a "'double-axled' four-line transposing lied form," and (but nevertheless?) it is an extraordinary sound. The author's vocal rendition of slowed-down Hermit Thrush (*Hylocichla guttata*) song was, when speeded up, surprisingly similar to the real thing. Szöke has prepared one of the finest, most unusual recordings of bird sounds I have ever heard. One who listens will never hear birds again in quite the same way.—DONALD E. KROODSMA.

The tanagers: natural history, distribution and identification.—Morton L. Isler and Phyllis R. Isler. 1987. Washington, D.C., Smithsonian Institution Press. 404 pp., 32 color plates, maps. ISBN 0-87474-552-7. Cloth, $70.00. Paper, $49.95.—Two decades ago Robert Storer (1969, Living Bird: 127) grappled with the conundrum "What is a tanager?" That discourse emphasized the need for more information and particularly for North American (Temperate Zone) ornithologists to take a broader perspective on "the much more complex assemblage(s) in the tropics." There was wisdom in his advice. His plea was, in part, for more field data. The Islers have now gathered a massive amount of data on 242 species of tanagers. They had first-hand field experience but also thoroughly searched the literature, examined museum specimens, and present an unusually wide range of previously unpublished data. Their efforts were supported by many of the new generation of Neotropical ornithologists. Their efforts are well rewarded.

Each species is illustrated in color. Where appropriate, sexual differences, alternative plumages, and subspecies are included. An additional 23 figures illustrate plumage features of birds in flight. Each species account includes a detailed range map. The maps are large and, unlike some field guides, legible. There is a short glossary and an index to scientific and English (but not local language) names.

The color plates are extremely useful. Images are large, and poses are natural and well proportioned. There is an overemphasis on surface texture that is mildly distracting, and the space between images is left unpainted, which gives an unnatural contrast where one would not normally exist. I have a special interest in feather pigments, and the Islers have handled them well. Colors are important field traits and are represented accurately, at least as seen on study skins. This makes the drawings a useful reference for species differences. Under the variable illumination of field conditions, all bets are off.

The species accounts provide the core of the book. Each gives standard physical measurements, information on subspecies, geographic and elevation ranges, habitat and behavior, vocalizations, and breeding. A section on sources provides direct entry into the literature cited. The accounts are of uniform length and carefully edited. There is good natural history here.

In spite of the information compiled in the 20 years since Storer's comments, it is still difficult to distinguish the boundaries among the 9-primary oscines. The Islers give a 10-page summary on "The nature of tanagers" that is direct and succinct. The issue of "What is a tanager?" persists.—A.H.B.

Eagles of North America.—Candace Savage. 1987. Ashland, Wisconsin, NorthWord, Inc. 127 pp., unnumbered figures. ISBN 0-942802-76-4. $19.95.—There are two "eagles of North America." Or, more precisely, two that breed. There are 11 pages of large-type text that gives a feeling for eagles in general, and these two species in particular. The core of the book is about 100 pages of photographs. Many of them are excellent, some are outstanding. Unfortunately, only the photos on the dust cover are credited. Images of the Bald Eagle outnumber those of the Golden better than 3:2.

There is some sound information in the text, but the figure captions tend to be anthropomorphic. This reflects the attempt to popularize the subject. The volume would be appropriate for public libraries and local nature centers.—A.H.B.

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