

REVIEWS

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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.

SPECIAL REVIEW¹

Check-list of North American Birds. Sixth edition.—American Ornithologists' Union. 1983. Washington, D.C., American Ornithologists Union. xxix + 877 pp. ISBN 0-943610-32-X. \$35.00.—For nearly a century the A.O.U. has attempted to maintain an up-to-date, taxonomically sound list of North American birds. The charge to the original Check-list Committee was delivered only a few years after Charles Darwin's death; the mutability of species still was in dispute; Middle America was an unknown frontier. Since the production of the First Edition in 1886 numerous taxa were added to the North American list, and a few deleted, but little substantive remodelling worked its way into the official Check-list. That has now changed. With the publication of this Sixth Edition, gloriously timed to coincide with the A.O.U. centennial, the Check-list has undergone a revolution.

Four innovations in the new Check-list stand out among many others. All represent fitting tributes to modern biological thought, and to the role that North American ornithology has played in its development. (1) The Check-list now formally recognizes that North America does not stop at the U.S.-Mexico border and the Gulf of Mexico. The Sixth Edition treats the birds of all North America, south through Panama and including the West Indies. (2) Perhaps by accident of practicality, given the need to treat over 2,000 species, the Check-list recognizes the biological species as its fundamental unit of interest. Formal cataloging of subspecies has been relegated to a companion volume to be prepared over the next few years. (3) Modern zoogeographers recognize that written descriptions (or maps) of a species' range only reflect a part of the distributional picture; therefore, concise but generally very accurate habitat descriptions accompany each species in this Check-list. Although the original editions carried cursory habitat notes, those had all but disappeared by the Fifth Edition. (4) Recognizing that the ongoing process of speciation leaves many closely related, allopatric taxa at intermediate levels of reproductive isolation, the Check-list Committee took advantage of the super-species concept. Forms believed by the Committee to comprise superspecies are so indicated in the "Notes" section under each.

Armed with these four major advances and nu-

merous changes on additional fronts, the A.O.U. Check-list Committee has produced a radically new check-list indeed. More than a mere organized list, this is a comprehensive taxonomic work, presenting most generally accepted changes in nomenclature and classification and drawing our attention to hundreds of taxonomic disputes still unsettled. This kind of reference is essential, of course, but the work involved in its production is painstaking and rather thankless. Thousands of ornithologists and bird enthusiasts owe thanks to all those who contributed to this fine endeavor.

Especially at the level of the higher category, taxonomy-by-committee cannot help but be conservative. Radically new ideas occur first only to a few, requiring debate and testing before they are accepted. Examples of new suggestions for higher category arrangements abound in the recent systematic literature, but relatively few are incorporated in this Sixth Edition. The Check-list Committee acknowledges this in the Preface, stating clearly its policy toward gross changes in the established system (p. xvii): "The Check-list is not the appropriate place for the testing of boldly innovative ideas in systematics." The major changes from the Fifth Edition, besides the additions of tropical taxa, involve the arrangements and rankings of passerine subfamilies and families. Most of these already are commonly accepted in other taxonomic references. They are summarized in the Preface (pp. xvii-xix). (The best news to this reviewer is that the Corvidae, intelligent as they may be, are *not* placed at the end of the Passeriformes.) The genus *Donacobius* is transferred from Mimidae to Troglodytidae. While very likely correct, this is a curious counter-example to the Committee's stated requirements for published debate before affecting a radical change.

A reference work of such lasting use and influence should, in my view, include as much ancillary information as possible. In this vein, the Sixth Edition shines above all its predecessors (except, of course, regarding subspecies). Especially informative and useful are the "Notes" accompanying over half the species. Fully 43% of the species entries bear taxonomic comments, ranging from superspecies delineations to detailed explanations of alternative taxonomic treatments. Another 10% bear alternative English names. These comments, many indicating areas that require further study, represent one of the Sixth Edition's greatest assets. They have two major

¹ Because of the importance of this publication, we have invited several individuals with differing perspectives to prepare reviews.—W.E.S. & J.A.W.

drawbacks, however: (1) The Committee appears to have gone overboard in its zest to apply the super-species concept. Frequently, assignment to superspecies becomes a convenient alternative to making a taxonomic decision. More serious, numerous suggestions of possible superspecies affiliations are flimsy, premature, controversial, or downright incorrect in my judgment. Often the assignments to superspecies simply apply to species that appear to be each other's closest living relatives. I do not find this broad definition useful, because it obscures the numerous, interesting and biogeographically informative cases where differentiation really *does* appear to have approached species level only recently.

(2) Equally maddening is the casual wording used to indicate alternative taxonomic treatments. I noted the following phrases, for example, referring to the existence of alternative generic placements: "sometimes," "formerly," "often," "frequently," "usually," "placed by some authors," and "a few authors regard . . ." Actual references to published alternatives are presented extremely rarely. These would have added enormously to the taxonomic usefulness, as long as such detail already was being presented. Furthermore, the choice of wording bears no relation to the strength of the evidence favoring the alternative view, and not all alternative views of equal status are even mentioned. For example, the Olive-sided Flycatcher, *Contopus borealis*, includes the notation, "Formerly placed in the monotypic genus *Nuttalornis*." A less equivocal merger hardly exists in the recent systematic literature. However, no equivalent notations are included for species "formerly" in genera such as *Centurus*, *Dendrocopus*, or *Phloeocastest*, which represent natural groups at least as valid as *Nuttalornis*. Truly obsolete genera are mentioned in places, while potentially legitimate ones (e.g. *Phloeocastest*) are not. The unfortunate ambiguities that result could have been avoided easily by consistency, careful wording, and a few succinct policy statements.

Genera are recognized according to a traditional, eclectic approach: they are groups that "differ from each other by a decided gap" and have reached their own "different adaptive plateaus" (p. xv). The A.O.U. genus remains subjective indeed. Perhaps the day will come when sufficiently accurate phylogenetic reconstructions are available to make generic distinctions less arbitrary, and therefore more informative. We remain a long way from that day, however, so I can see no more objective criteria to use across the board than the skilled mental integration of characters and relationships used by this committee. By and large their genera "seem" appropriate to me; it's just a shame that this level of judgement still is the only one we can apply.

The Committee wisely chose not to follow Vaurie's revision of the Furnariidae, nor Wetmore's oversplit generic classification of Panamanian species. Equally wisely, they did follow T aylor's classification of the

Tyrannidae, Pipridae, and Cotingidae, also used in volume 8 of "Peters' Checklist of Birds of the World" (but retaining *Capsiempis* as a good genus). I was unable to locate a precedent for the implicit merger of the antbird subfamily Grallariinae into the Formicariinae, a move that contradicts the only cited reference to higher-order rankings within these forms (Lowery and O'Neill, 1969, Auk 86: 1).

The best thing that can happen to English names is that they *not* be changed from the most frequently used references unless absolutely necessary to avoid confusion. Despite some effort on my part, I still do not understand why *Gallinula chloropus* now is a "moorhen" while *Gavia immer* is not a "diver." More disappointing to me are the (admittedly few) divergences from English names established by Eisenmann and Meyer de Schauensee for Neotropical forms, where common usage finally had begun to be established from a single, standard reference. The Sharp-tailed Streamcreeper (*Lochmias nematura*) appears as such in every commonly used Neotropical reference, yet the A.O.U. Checklist lists it as the "Streamside *Lochmias*." Why? This was our chance to nip English-name confusion in the bud, for the Neotropics at least. The Sixth Edition comes close, but went astray with such names as Leaf-tosser for Leaf-scaper, Spectacled instead of Scaly-throated Foilage-gleaner, and Spiny-faced instead of Speckle-breasted Antshrike. Lest I be misunderstood, this is a minor quibble.

Important, useful innovations include a greatly expanded Preface, and a breakdown of the former Hypothetical List into four, more meaningful lists. The Preface is required reading for any serious user of this Check-list. In 20 pages (in previous editions it varied from 2 to 13) the committee spells out guidelines and policies used at every level of decision. History, geography, taxonomy, criteria for inclusion, A.O.U. numbers, the bases for choice of both English and scientific names, and other topics are explained in detail, leaving few ambiguities about procedures.

With coverage expanded to Panama and the West Indies, 1,973 species now constitute the regular list treated in the main text. The larger geographical scope and greatly increased amateur birding activity in recent years both contribute to a hypothetical list too varied to be meaningfully listed together. These 199 extra species (previous lists numbered from 20 to 46) are presented in four Appendices. Unconfirmed sight records (App. A) and valid species of uncertain status (App. B) are separated from those of doubtful biological validity (App. C). Species known only from unsuccessful introductions constitute Appendix D.

Finally, the Check-list is a masterful product from the technical and aesthetic point of view, highlighted by outstanding political and topographic maps of the Check-list area inside the front and back covers. These maps give enough detail to allow the least experienced user to visualize for himself the ranges of

all species treated in the volume. I located only three typographical errors, none of them important. In fact, the Check-list corrected *me* on several misspellings I had learned from errors in other standard reference works.

It was said by many, when this project began coalescing, that the expanded geographic coverage made the very concept of a North American Check-list too unwieldy, or that losing the "most useful feature" of

the Fifth Edition—subspecies delineations—would destroy the worth of the project. I went through periods of agreeing with one or both of these objections. The final product, however, is so exhaustively researched that it should silence these suspicions, especially in light of the follow-up volume on subspecies, already planned. Elliot Coues himself would have been proud of this new face for the A.O.U. Check-list.—JOHN W. FITZPATRICK.

Now, don't get me wrong—I am happy and pleased to see the appearance of the Sixth Edition of the new Check-list and applaud the diligence and sincerity with which my colleagues of the Check-list Committee have done their work. Likewise, I understand the conservative stance taken by the Committee in paying so much homage to the past; we all stand on the shoulders of our predecessors. But for all its virtues, to which we shall come momentarily, the new edition will haunt the remainder of 20th Century ornithology as an opportunity missed.

At one level the Sixth Edition is quite a success. Its major aims—to delineate the species-level taxa in the region of reference, to summarize information on habitat and geographic distribution, and to somehow treat the phylogeny of the included taxa in a list—are mostly well met. The scope of this undertaking is enormous, which makes its general success even more impressive than it would be otherwise. For every species, in varying detail dependent on available information, we can find its seasonally-documented occurrence in North and Middle America and the Hawaiian Islands and any extralimital distribution. For the first time since the First Edition, a profile of the habitat or habitats used by a species is included. We even learn of species that might have occurred here, and of those that were once, erroneously, thought to have occurred. All this is done at the level of species, with only the briefest of taxonomic commentary. And it is all done remarkably well. To the extent of this accomplishment, the members of the Committee should feel satisfaction for a hard job done well.

However (and here's the rub), the species are listed in a fashion intended to show phylogeny. This is an intent devoutly to be wished, but difficult to do at all, much less do well. Alas, it here could have been done better. First, diagrams of relationships could have been inserted for genera, families, and orders. It is not enough for the Committee members to say that they know how difficult it is to present a phylogeny by means of a classification in the form of a linear display in a book of more than 900 pages; diagrams depicting either the phylogeny or the classification could have been employed with little extra space. Second, the characters and the character-state polarities used in drawing the conclusions from which

the diagrams were developed could have been presented in the legend beneath each such diagram. I'm not asking for the moon. The Check-list could readily have been produced this way; it would have been better science.

But, almost as important, it would have made the eventual preparation of the Seventh Edition infinitely simpler. This is because, if the phyletic diagrams and the characters and character-states had been even briefly detailed, it would have been possible for any competent taxonomist one day to take up the task of further research on phyletic relationships, irrespective of his or her philosophy of systematics. As it is now, it will not be simple, for as soon as a current member leaves the Committee, he will surely take with him special information not generally known—the character set used for the groups he worked on, whether the polarities were worked out, what, if any, weighting was applied, what mix of anagenesis and cladogenesis was used, and so on. Or perhaps it is not too late—perhaps the data bases on which the several specialists worked still exist and could be preserved until the Committee begins work on the next edition. Perhaps the ballots for each contested taxonomic decision were recorded, along with the preceding arguments. Otherwise, for the Seventh Edition, the avian taxonomic wheel will have to be invented again, instead of just modified.

The text for the Sixth Edition was essentially completed in 1980, and so it is that neither the classification used, nor its antecedent phylogeny, reflect much of the information derived from DNA-DNA hybridization studies, which reached reasonable maturity and satisfactory scope about the same time. The Committee touches on the consequences of DNA hybridization work, but we will have to await the Seventh Edition before the information already assembled will be exploited. I would have preferred to have seen it used in the Sixth Edition, but it would have required another 2 years, I suspect.

The Sixth Edition lack accounts of subspecies, owing to practical considerations of time and space but not to a philosophical shift by the Committee concerning the validity or utility of the category. Thus, the right thing has been done for the wrong reason. The Preface makes it clear that the Committee would have preferred to have produced a Sixth Edition with

subspecies accounts included as in earlier editions. The intent can reasonably be termed foolhardy, for the likeliest consequence of such an effort would have been an expanded version of what the Fifth Edition contains. That approach is ineffective in delineating intraspecific variation in any meaningful way, for at least three reasons: (1) A great deal of intraspecific character variation is essentially continuous, not discontinuous, on a geographic ground, and therefore does not lend itself to typological manipulation. (2) The degree to which taxonomic characters reflect direct environmental effects as opposed to genetic effects is not known for most such characters in most species showing intraspecific variation; thus, assumptions about the genetic structure of populations underlying "subspecific variation" may well be wishful thinking. (3) Even if it were the case that taxonomic characters are under direct genetic control, it is known that some of them vary seasonally, yearly, or over longer periodicities, in local populations, without any necessary relationship to adjacent local populations. This is an untidy element to incorporate into the typology of subspecies.

The problem is thus identified as one of not knowing enough about intraspecific variation. Since this is not news, the problem has not heretofore hindered studying subspecies; I conclude that studying sub-

species and studying intraspecific variation are distinct enterprises. To put it another way, we probably have enough specimens to study subspecific artifacts of bird species in the new Check-list, but we lack anywhere near enough to study intraspecific character variation in the same taxa. Additionally, we surely lack both time and funding, not to mention collecting permits, to assemble the tens of thousands of point-locality samples necessary to enable intraspecific variation to be detailed for species of the avifaunas involved. I realize my remarks on subspecies are not wholly to the point of assessing what was done in the making of this volume, but I am gushy, and am disturbed at the near miss.

The real accomplishments in this book should not be minimized by anything I say about subspecies—the detail and accuracy with which the habitat and distributional information is presented is of high quality in the several dozen accounts I specifically read to check this out. The taxonomic comments, though brief, are frequently perceptive and introduce the notion of superspecies to the Check-list. An overall tone of zealous advocacy of evolutionary biology is readily detected, and most welcome. I like this book; we are fortunate to have it.—R. F. JOHNSTON.

The Sixth Edition of the "Check-list of North American birds," like the Fifth Edition before it, represents a massive amount of work and will probably become a standard authority and reference work. In addition to the area covered by earlier check-lists, this edition contains information on ranges, taxonomic levels, and relationships of Central American birds, including those of the Bahamas, the Greater, and most of the Lesser Antilles. The inclusion of these areas represents a major addition for which the Check-list Committee deserves commendation.

Because the "Check-list" is the work of a committee, it tends to be somewhat conservative. Not only are published decisions based on a majority vote of Committee members whose taxonomic philosophies vary greatly, but also the results of new research require some time and discussion before they become acceptable to the Committee as a whole. Consequently, we might expect a volume produced under these conditions to be solid and devoid of idiosyncrasies, but also not sparkling with innovation. The "Check-list" generally lives up to these expectations. Some aspects of the work seem definitive, but in other cases the character of the "Check-list" has become stagnant. In the following discussion, we will focus our comments on the underlying logic, that is, on the "deep structure" of the "Check-list." This approach is adopted because we believe the nature of its assumptions and reasoning will be the ultimate deter-

minant of the volume's stature as a scientific work and that, consequently, this aspect deserves as much, if not more, attention than do the details of the organization and species accounts.

Subspecies.—Subspecies are not listed in this edition. The Committee notes in the Preface that this is a matter of necessity, not choice—adequate time was not available to analyze Central American forms in terms of trinomials. This decision marks a significant departure from the format of past check-lists, but one not without salutary effects. For example, many of the previously listed subspecific taxa were arbitrary units, at best statistically distinguishable only when using large samples from breeding populations; others were arbitrary chunks of geographically continuously varying phenotypes. Thus, trinomial designations were biologically misleading in many cases. Nevertheless, because of lumpings at the species level associated with the interpretation of avian taxa in terms of the biological species concept, some taxa with unique evolutionary histories and allopatric ranges have now disappeared as discrete entities from the "Check-list." Thus, although some well-marked "subspecies" of such birds as the Dark-eyed Junco and Seaside Sparrow are mentioned in the species accounts, many others, such as those of the Horned Lark and Fox and Sharp-tailed sparrows, are not.

Species.—At the species level, the "Check-list" consists of a sequence of species accounts that include

information on the original description, a brief description of habitat, a fairly detailed statement of range, including breeding, wintering, migration, and accidental occurrences, and some notes on taxonomy, including vernacular names, synonymies, and superspecies status.

As is well known by now, numerous taxa of North American birds, listed as species in the 1957 (fifth) edition, are not given specific status in this volume. These changes were first published as supplements to the 1973 and 1982 volumes of *The Auk*. Unfortunately, the Committee did not publish its reasoning in making the more recent of these decisions for the individual cases. (In the 1973 and 1976 supplements, some citations were given.) In the Preface, however, they do indicate their belief that species are real, fundamental biological entities, and that they follow the biological species concept of Mayr in making decisions about species status. They point out (correctly, we believe) that the major interpretational problems with these decisions concern situations in which there are: (1) limited hybridization of formerly allopatric populations now in contact, or (2) completely isolated allopatric populations that are weakly differentiated. These are problems, because, in cases of hybridization, ornithologists (e.g. Short 1969) distinguish between specific and subspecific status on a qualitative basis using such indicators as extent of hybridization, width of hybrid zones, extent of assortative mating, existence of presumed isolating mechanisms, and presumed magnitude of gene flow. The little quantitative modeling that has been done on these phenomena makes us less than sanguine about the efficacy of such judgments; almost any detectable amount of gene flow will *eventually* result in complete mixing of gene pools in the absence of selection and environmental change, but even large amounts of interchange may take thousands of years to produce a noticeable effect of introgression over a substantial fraction of a "species" range. Hence, interpretations of species status based on qualitative estimates of gene flow at least require documentation of assumptions and logic.

Under the species concept used here, specific status of isolates is conferred depending upon the extent of phenotypic, vocal, and behavioral differences between the allopatric populations, relative to the extent of differences generally found among "good species" in the same genus and family. This is species status by innuendo. The Check-list Committee notes that there was internal disagreement in some of the cases, and alternative views of species status are briefly mentioned for especially difficult situations. The reasoning underlying even these contested cases is not described, however, and references are generally not provided. This is unfortunate, because species definitions are entering a new period of intense exploration. In particular, the biological species concept has recently been criticized from phylogeneti-

cal, population genetical, and ontological points of view. These problems, briefly summarized, concern the fact that, for the very situations that do involve interpretational difficulties associated with hybridization and differentiated isolates, the biological species concept, as it is usually applied, results in species taxa that lack status as evolutionary units, potentially comprise assemblages of non-monophyletic taxa, are hundreds of thousands of years removed from future equilibrium of gene pools (if environments do not change in the meantime), and are classes rather than individuals (in the philosophical sense) and hence cannot be the proper units of evolutionary theories or historical explanations. Many of the cases treated in the "Check-list" will figure prominently in future discussions of these issues. Furthermore, with the omission of subspecies, as described above, some of the actual evolutionary units of North American birds are now missing from the "Check-list," reducing its value to systematists and others interested in comparative evolutionary studies.

Superspecies.—The "superspecies" concept has been widely accepted within systematic ornithology, and the tradition is maintained in the Sixth Edition of the "Check-list." Undoubtedly, this acceptance has occurred because the ostensible purpose of superspecies—to facilitate biogeographic and evolutionary analysis—is so eminently desirable to all systematists. Yet, as generally understood and applied, the concept has several serious difficulties, and it is surprising that these have not been discussed within the ornithological literature. Because those problems have important consequences for interpreting the scientific content of the "Check-list," we wish to note some of them here.

The difficulties of the superspecies concept are direct manifestations of the definitions typically used by systematists; within ornithology, two are generally used:

1. A superspecies is "a monophyletic group of entirely or essentially allopatric species that are too distinct to be included in a single species" (Mayr 1963).
2. A superspecies is "a group of entirely or essentially allopatric taxa that were once races of a single species but which now have achieved specific status" (Amadon 1966).

Three elements are included in these definitions: a statement about relationships, one about distribution patterns, and another about the degree of phenotypic differentiation. These elements are not necessarily concordant, however, and this ensures that the superspecies concept can be applied only arbitrarily. Some potential problems for works such as the "Check-list" include:

1. If a differentiated taxon is broadly sympatric with one or more of its close relatives, that form might be excluded from a superspecies created for those taxa. In a check-list, this would disguise information about phylogenetic and biogeographic pattern.

2. If differentiated, allopatric taxa are not judged to be sufficiently distinct from one another, they might be united as subspecies in one species rather than being maintained as a species of a superspecies. Here the species and superspecies concepts suppress the fact that differentiation has occurred.

3. If a form exhibits a marked degree of differentiation relative to a group of its close relatives, the former taxon will likely be excluded from the super-species erected for those forms that more closely resemble each other. Again, phylogenetic and biogeographic patterns are being obscured.

We agree with the Committee that it is useful to recognize subsets of closely related taxa within a genus, and indeed we would advocate additional hierarchical levels to accomplish this. But the super-species concept adopted by the Committee, and ornithology in general, can easily obstruct biogeographic and evolutionary analysis rather than help it. An example is the one chosen by the Committee for discussion, the genus *Sphyrapicus* (pp. xiv-xv). In the "Check-list" proper, three species—*varius*, *ruber*, and *thyroideus*—are recognized. The Committee considers *varius* and *ruber* to constitute a superspecies. An important point, however, is that without the discussion in the Preface, the reader could not tell from the classification itself (pp. 387-389) that there are actually at least six differentiated taxa in this genus, two included in *thyroideus* and four (maybe five) different lineages within the *varius-ruber* complex (Johnson and Zink 1983). In this case, the species and super-species concepts of the Committee yield a classification obscuring part of the actual complex biogeographic and evolutionary pattern (i.e. there are at least four evolutionary units that must be accounted for in any biogeographical or speciation analysis of the *varius-ruber* complex, not two; Johnson and Zink did realize this in their analyses).

Generic concepts and limits.—The Committee extended its application of the principles of evolutionary systematics to decisions at the generic level. A modification of Mayr's (1969) definition was adopted: "a group of species of common phylogenetic origin that are more closely related to one another than to any others and that differ from others by a decided gap" (p. xv). But the Committee went further and proposed a criterion of its own (p. xv):

"We have sought particularly to recognize as genera those species or groups of species that have reached different adaptive plateaus with the potential for further diversification in other evolutionary directions. We have adopted a middle course, avoiding recognition of monotypic genera that do not appear to meet this criterion but also avoiding submergence of adaptively distinct forms into large genera, thus obscuring their distinctiveness."

Given this philosophy, it is not surprising that the Committee often found the application of this generic concept to be "arbitrary," "subjective," and "inherently difficult," thus forcing them to exercise "practical judgment." Indeed, their definition unites two criteria that, within evolutionary systematics at least, are frequently antithetical to one another. On the one hand, the definition invokes a phylogenetic criterion, but on the other espouses a criterion based on perceived degrees of difference. For a taxonomist with a phylogenetic perspective (i.e. one who maintains strict monophyly), the two criteria can be applied in a way that minimizes subjectively defined genera. But, from an evolutionary systematic perspective, subjectivity is *increased* because the two criteria are not always used as compliments but sometimes as antagonists when the degree of difference criterion supercedes that of phylogenetic relationships (this point has been discussed repeatedly in the technical literature). That this is what the Committee had in mind is demonstrated by their decision to delimit genera on the basis of whether they had attained an "adaptive plateau [not defined] with the potential for further diversification in other evolutionary directions." Although we have not had first-hand experience with the prescient qualities of the members of the Committee (and both of us count them all as our good friends), they should have foreseen a logical difficulty with this criterion: because all species must be placed in a genus, and because these genera are said to be delimited on their future adaptive potential, the implication is that all the genera recognized by the Committee have the potential for future diversification, including presumably *Cochlearius*, *Gymnogyps*, *Pandion*, *Eurypyga*, and *Steatornis*, among many others. But what does this all mean, and what is its scientific justification? What is the scientific rationale for basing a classification on what *might* happen (as the Committee also did in making decisions at the species level; see above) rather than on best hypotheses about what has happened? In fact, of course, the Committee did not sit around a table prognosticating on the future potential of avian genera. Instead, they generally maintained the *status quo* or lumped (examples abound: *Phalaropus*, *Calidris*, *Sterna*, *Columbina*, *Athene*, *Melanerpes*, *Picoides*, and so on).

In the above examples, as elsewhere, justification or documentation often is not given for taxonomic decisions, and instead the reader is referred to "some authors," "recent studies," or similar statements. We recognize the enormity of the taxonomic issues confronted by the Committee, and we sympathize with the problems and practical decisions they repeatedly faced, yet in a scientific treatise that is supposed to be the standard reference volume for years to come, we deplore the absence of documentation that peppers this volume.

Higher taxa.—The Sixth "Check-list" generally follows the Fifth Edition with respect to the recognition of higher taxa (families, orders) and their sequence. The sole newly created order is the Phoenicopteriformes (flamingos), and two new additions are the Tinamiformes and Sphenisciformes, both the result of an expanded geographic coverage. A total of 23 orders (not 18 as misprinted in the Contents) and 93 families are recognized in the Sixth Edition, compared to the Fifth Edition figures of 20 and 85, respectively. This comparison is misleading, however, for although the Sixth Edition now includes many more families because of the addition of Middle American taxa, many families of the Fifth Edition have been reduced to subfamilies in the present volume. Inasmuch as this has increased the hierarchical structure, and thus the information content of the classification, we see this change as an advance. Again, however, the same persistent problem plagues these alterations: virtually no documentation is provided, and inconsistencies can be found. We note here a couple of examples.

In the Preface (pp. xviii-xix), the Committee lists 10 major changes, including the reallocation of genera from one higher taxon to another and the lowering of family-rank taxa to subfamilies of greatly expanded families. For example, genera such as *Attila*, *Rhytipterna*, and *Tityra*, among others, are removed from the Cotingidae and placed in the Tyrannidae, and in another instance, *Donacobius* is no longer referred to the Mimidae but to the Troglodytidae. Previously recognized families such as the Parulidae, Thraupidae, and Icteridae are now some of the subfamilies included in the Emberizidae. Sylviids, muscicapids, turdids, and timaliids are reclassified as subfamilies of the large family Muscicapidae.

Naturally, we accept rearrangements in principle, because such changes should represent more precise statements about phylogenetic relationships. In the case of the "Check-list," however, documentation for such changes is usually lacking. For example, we are unaware of any published evidence supporting the monophyly of the Emberizidae as accepted in the "Check-list." The only presently available phylogenetic analysis of the nine-primaried oscines (Raikow 1978) postulates a very different set of relationships than found in the "Check-list" (e.g. icterines, emberizines, and cardinalines are more closely related to fringillids than to thraupines or parulines). Perhaps the Committee followed the unpublished results of DNA hybridization analysis, which appear to support more closely the monophyly of the Emberizidae *sensu* the Committee (Sibley and Ahlquist in press); one cannot know: the reasoning is not documented.

Sequencing.—We noted above the conflict between using phylogenetic relationships and degree of difference when establishing generic limits. The Committee compounded this confusion when they ap-

plied those same criteria to determining sequences. Although they state that the "Check-list" is supposed to represent our best estimate of phylogenetic relationships (e.g. p. xix), this can hardly be so because the Committee not only rejects that goal in principle but also in actual practice. Thus, they state (p. xvi) that "In the course of avian evolution there have been numerous and repeated branchings; even if these were all perfectly known, they could not be clearly represented by a linear sequence of names." This conclusion is, however, a myth: classificatory procedures designed to reflect a branching sequence precisely have been discussed repeatedly in the systematic literature, and, given that the Committee desires their classification to be as phylogenetic as possible, it is disappointing that this literature was not considered seriously. In fact, in their example of *Sphyrapicus* (p. xvi), they ignore the general procedures of phylogenetic classification by placing a more distantly related taxon after the closest sister-species, thus precisely reversing the sequence-subordination scheme devised to deal with this very problem.

This same general problem reoccurs at all levels of the "Check-list." It is not possible to infer the within-taxon phylogenetic relationships of subordinate taxa from the listed sequence. In any given case, the sequence may reflect phenetic similarity, phylogenetic relationship, or inferred phenotype of an unknown common ancestor (e.g. the case of *Sphyrapicus*, p. xvi).

It may seem churlish to dwell on a few perceived shortcomings given the obvious exemplary scholarship of much of the "Check-list." As we mentioned above, the inclusion of Central America and Caribbean forms represents a major advance, and the species accounts, including the habitat and range statements, will be an important source document for scientists, government officials, and birdwatchers. However, as a scientific document, the "Check-list" suffers from two major deficiencies. First, the sources, logic, and reasoning behind decisions are not documented—this is true of species status, of the level and membership of higher taxa, and of sequencing within taxa. This makes at least some of the results nonreproducible. Second, the concepts comprising the epistemological basis for the taxonomic levels (especially species) and their sequence result in a set of "species" and a sequence of taxa that obscures evolutionary units and phylogenetic relationships. Consequently, at the present time there is no summary document to which a researcher can turn in seeking a list of the units of North American birds with discrete evolutionary histories. Nor will the proposed Check-list Committee's volume on geographical variation (p. xiii) meet the need if it follows the subspecies philosophy of the fifth "Check-list." Taxa with their own unique evolutionary histories ("evolutionary species") will have to be carefully distinguished from the arbitrary populations of continuously vary-

ing phenotypes that have frequently been dignified with subspecies status. Likewise, there is no summary available of our best current estimate of the phylogenetic relationships of members of our avifauna. We believe a check-list with such a list of species and a phylogenetic sequence, with documentation, is desirable. We hope the "Check-list" will continue to be refined and oriented in such a direction.—
 GEORGE F. BARROWCLOUGH AND JOEL CRACRAFT. (Authorship arranged alphabetically.)

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The Sixth Edition of the American Ornithologists' Union's (1983) "Check-list of North American birds" features numerous changes from previous editions in this series, most notably in taxonomy. One aspect of the taxonomic approach has changed very little, however, having remained much the same since the publication of the First Edition of the check-list in 1886. As is traditional, the A.O.U. has published its views on taxonomy essentially as *faits accomplis*, with little or no effort being made to provide the rationale for them. This was a dubious practice even a century ago, and it certainly is one that needs to be corrected as we near the twenty-first century. The provision of such rationale is essential for the proper evaluation of A.O.U. taxonomy, and without it such views lack the credibility that they deserve.

I realize that there are arguments against the publication of the rationale for A.O.U. Check-list taxonomy. For example, the provision of such could require a significant amount of additional space, which would be an added expense. This argument seems especially telling for those cases in which the views are based on unpublished evidence, the presentation of which would indeed require more space. Another argument is that the rationale for these views is available from the Check-list Committee (Committee on Classification and Nomenclature), and it can be had on proper inquiry. One might also argue that the rationale is obvious enough to anyone who is properly versed in avian taxonomy, thereby making its provision unnecessary. Perhaps there is even some feeling that, given that the Check-list Committee is made up of some of our most respected taxonomists, their involvement alone is sufficient rationale for the views.

In many cases, the provision of the rationale for A.O.U. views on taxonomy should involve little more than the citation of relevant publications. As an ex-

ample, the Sixth Edition of the check-list contains the statement (p. 149) that the sequence and placement of genera in the Rallidae largely follow Olson (1973). This approach could have been used throughout that check-list, but it was not. Instead, where any statement at all is made on taxonomic treatment, it is likely to be some nonexplanation (e.g. "considered a separate species by some authors" or "formerly placed in the genus . . ."). Even where more definitive statements are made, there is often no specific citation of the source of that evidence—as in the reference to "recent studies of vocalizations" as a basis for splitting the Brown Creeper (*Certhia americana*) from its Old World relatives (p. 520). In some cases, of course, the provision of the necessary rationale would require extended discussion (as to sort out conflicting points of view or to review unpublished evidence); this would indeed require more space. In spite of such considerations, however, the reader's "need to know" should be reason enough for the A.O.U. to provide the rationale for its views. I would go so far as to suggest that, if means cannot be made available to publish the necessary rationale—either in the check-list or other appropriate outlets—then no attendant changes in taxonomy are warranted. In essence, if the evidence does not merit enough consideration to be published, then it does not warrant use in generating taxonomic views.

I believe that the A.O.U.'s provision of the rationale for its taxonomic views would have substantial benefits. First, it would place firmly on record the evidence that forms the bases for these views. Secondly, it would help elucidate the contexts in which the Check-list Committee generates these views. Thirdly, by providing such information, the A.O.U. would enhance the credibility of these views—which now may easily be mistaken for edict rather than the product of objective deliberations. As a side benefit,

the need to provide such rationale should in fact reinforce the use of the scientific method in the generation of these views.

By placing on record the evidence for its taxonomic views, the A.O.U. would facilitate their evaluation and, hopefully, increase their acceptability. In the absence of this rationale, such views are difficult to evaluate and therefore are apt to be questioned or rejected. For example, a statement of rationale would have been helpful in regard to the treatment of the genus *Aimophila* (*sensu lato*) in the Sixth Edition. Instead, we are greeted by the rather vague statement that "Relationships within this genus are poorly understood, and it is probably polyphyletic as now constituted" (p. 695). This in effect ignores the fine work on the genus by Wolf (1977), even though the latter is among the most comprehensive treatments (including taxonomic) to date on any group of emberizine finches. Furthermore, the check-list departs from Wolf's treatment in several respects—all without benefit of citing any supporting rationale. For example, if Wolf's preferred sequence of species were rendered 1-2-3-4-5-6-7-8-9-10-11-12, that of the Sixth Edition would be 4-3-1-2-9-10-11-5-6-7-8 (pp. 695-698)—with the Five-striped Sparrow (*quinquestriata*) transferred to the genus *Amphispiza* (pp. 704-705). While the check-list treatment generally adheres to Wolf's species groupings, it differs in its dissociation of *A. carpalis* from the "*Haemophila*" group—a move unsupported by any evidence known to me. The A.O.U.'s treatment of these sparrows also differs in regard to perceptions about the level of the relationships between the genera *Aimophila* and *Amphispiza*. In the Fifth Edition of the check-list the two are side-by-side (American Ornithologists' Union 1957: 603), and Phillips et al. (1964: 201) actually merge the two. On the other hand, not only does the new check-list retain the two genera, but it separates them by *Oriturus*, *Torreornis*, *Spizella*, *Poocetes*, and *Chondestes* (pp. 698-703)—again with no rationale being provided.

The general failure of the A.O.U. to provide the rationale for its taxonomy applies to the contexts in which these views are generated, as well as to the evidence on which they are based. Nonetheless, any objective evaluation of that taxonomy requires that some attempt be made to understand these contexts, even if this must be done after the fact and without a complete understanding of the rationale that might have been used. To do this, I followed several approaches with regard to the Sixth Edition, including examination of statements relevant to the generative processes used by the Check-list Committee (pp. i-xxx). A more valuable source of insight into contexts was gained, however, from scrutinizing the taxonomic treatments themselves—especially as contrasted with the possible rationale that might underlie them.

As an example of the latter approach, I examined the assignment of species at the generic level in or-

der to discern the context in which this taxon might be applied. From this, I concluded that the genus is applied in a broader context in the new check-list than in past editions. For example, compared to its treatment in the Fifth Edition (American Ornithologists' Union 1957), the "average" genus in the Sixth Edition is more inclusive, e.g. in the Anatidae, Scolopacidae, Picidae, and Carduelinae (American Ornithologists' Union 1983). On the other hand, there are cases in which this perceived context does not appear to hold, such as in the Parulinae and the Emberizinae—which are as generically split (or overly split) as ever. In such cases, I can only assume that the generic treatment is out of context, i.e. not consistent with its general application elsewhere in the check-list. While such an assessment may not be correct, the Check-list Committee has not provided evidence that would mitigate against this view. Until such evidence is forthcoming, I am left essentially to interpret the situation as I may.

There are also other apparent departures from context in the new check-list, as in regard to the assessment of the taxonomic status of sympatrically breeding forms. For example, one might examine the treatments afforded to the Western Grebe (*Aechmophorus occidentalis*), on one hand, and the Blue-winged and Golden-winged warblers (*Vermivora pinus* and *V. chrysoptera*), on the other. In the first case, two "color morphs" of grebes overlap without significant interbreeding, yet they are considered by the Check-list Committee to be a single species. The two warblers, however, are known to hybridize and backcross wherever their breeding ranges overlap, yet they are retained as distinct species. Granted, these are complex situations, but the two treatments afforded them strike me as being inconsistent. In most similar situations in the check-list, the lack of interbreeding between sympatric taxa leads to their being treated as distinct species, whereas extensive interbreeding elicits a treatment of conspecificity. Based on this context, it would appear that if either of these groups is to be regarded as comprising two species, it should be that of the grebes rather than of the warblers.

Another situation in which the check-list seems inconsistent is in regard to assessment of the taxonomic status of allopatric forms. For example, the Check-list Committee recognizes the Least Tern (*Sterna antillarum*) as a species separate from the Old World *S. albifrons*, based mainly on differences in vocalizations (p. 233). On the other hand, it retains as a single species the crows *Corvus imparatus* and *C. "sinaloae"* (p. 510), in spite of their marked vocal differences. While I know little about the importance of vocalizations in species discrimination in terns, I suspect that this character is quite significant in all-black species of *Corvus*. Thus, a more consistent treatment might have been to treat both crows as distinct species, as well as the two terns.

In the absence of additional information, I certain-

ly cannot claim that these examples actually do represent inconsistencies in the ways that taxonomic contexts have been applied in the new check-list. However, there is one matter that I believe unquestionably contains such examples, and that is in the "superspecies" concept. There inconsistency exists even in definition, in which the superspecies is stated to be "a group of entirely or essentially allopatric populations that have differentiated into distinct biological species from a common ancestor" (p. xiv). I submit that it is virtually impossible for members of a superspecies to be both "entirely or essentially allopatric" and "distinct biological species"—given that biological species are characteristically reproductively isolated from each other, which is a condition that is typically obvious only in sympatry. If one actually adheres to this definition, then very few of the taxa designated as superspecies in the new check-list would actually qualify as such.

Semantics aside, I believe that there are other problems that contribute to making consistent application of the superspecies concept difficult. All taxonomic categories are characterized by some degree of subjectivity, particularly those above and below the level of species. In the delineation of superspecies, however, this subjectivity is further compounded by the use of the "character" of distribution, or, to be specific, the requirement that members of such a taxon be entirely or essentially allopatric. In my opinion, the use of this criterion for delineating a taxonomic category is questionable at best, given the mutable nature of distribution. The fact is that many species have fluctuated between allopatry and sympatry over time, and from this perspective the two types of distribution are not fundamentally different. Given this assessment, perhaps even the Check-list Committee at times found difficulty in adhering to allopatric considerations in its application of the superspecies concept in the new check-list. We are told, for example, that the Eastern and Western meadowlarks (*Sturnella magna* and *S. neglecta*) "appear to constitute a superspecies" (p. 725). Considered only phylogenetically, of course, they do constitute a superspecies. However, on the bases of both definition and context, these widely sympatric species are not a superspecies and their being so labelled is thus a matter of inconsistency.

In summary, I see the taxonomy of the Sixth Edition of the check-list as flawed by the general failure of the A.O.U. to provide the underlying rationale for the views presented therein. In order to remedy this, I recommend that the Check-list Committee henceforth provide such information, beginning with the next supplement to the check-list. From an operational standpoint, it would be reasonable to adopt the taxonomy of the Sixth Edition as the standard. Thus, the need for providing rationale would be predicated on whether or not future A.O.U. views were to rep-

resent changes from those of the Sixth Edition. If they did, then the rationale underlying them would clearly need to be given. Whether this rationale would be part of a check-list or published in a separate outlet is unimportant, as long as the information were timely and readily available. In addition, I believe that the A.O.U. should also make a greater effort to provide continuity in those cases in which changes occur in taxonomic treatments from one version of the check-list to the next. To accomplish this, each change should be accompanied by a citation of the previous A.O.U. treatment. Such continuity has been lacking in the past, to the point in the new check-list that past A.O.U. views assume an unprecedented level of anonymity.

I hope that I have made a case for the A.O.U. to institute a policy of publishing comprehensive rationale for its taxonomic views. My recommendations are intended as a call for change, not an assault on the Union, the Committee on Classification and Nomenclature, or the Sixth Edition of the Check-list of North American Birds. I realize the immensity of producing a work as comprehensive as the check-list, and I also recognize that the current Check-list Committee has made progress toward providing the rationale that I feel is needed. Nonetheless, more progress is needed, if for no other reason than to respond to the committee's own call that A.O.U. views on avian taxonomy be "evaluated as a working hypothesis—a set of proposals to be challenged and vigorously tested, then supported, modified, or rejected and replaced, all to the ultimate advancement of ornithological knowledge" (p. xix). If we are indeed to provide such evaluation, then we must also be provided with the information that is needed to do so.—JOHN P. HUBBARD.

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The Sixth Edition of the AOU Check-list has nearly the same size, format, and type face as its predecessor—but here the resemblance ends. The new Check-list has a broader geographic scope (it includes “Middle” America, the West Indies, and Hawaii but excludes Greenland) and less taxonomic depth (subspecies are not treated). These changes reflect a shift in the interests of much of the AOU membership, away from a strictly Holarctic orientation and toward the New World tropics, and away from beta taxonomy toward studies of behavior and ecology, in which subspecies are routinely (but not always wisely) ignored. This Check-list represents the first complete, one-volume list of the species of birds of the northern New World, including English names, detailed statements of distribution, brief descriptions of habitats, and mention of alternate names and taxonomic arrangements. As such, it is really a new work rather than a mere updating of the Fifth Edition, and should be judged as such. In this review I shall try to evaluate the terminology, taxonomic judgments, factual accuracy, and completeness of the new Check-list with particular reference to the area I know best, Costa Rica. I emphasize at the outset that my overall impression of the new Check-list is decidedly favorable; were I filling out a typical reviewers’ form, I would unhesitatingly tick the box marked “highly publishable: an important contribution to knowledge.” However, the work is not without its minor flaws and controversial aspects as well, and I should also have ticked the box marked “publishable after minor revisions.”

Several aspects of the terminology used in the Check-list deserve comment. Use of the term “Middle America” as essentially a synonym for “Central America” is not in accord with popular usage in this country, or with the almost universal use of the latter in the countries of the isthmus. Ridgway’s more inclusive use of the term (including Mexico, Central America, and the West Indies) seems to be more appropriate, such that the title of the present work could have read, “Check-list of North and Middle American Birds”—a neat little diplomatic gesture, if nothing else! As it is, we are left without a single convenient term covering all the tropical and subtropical lands between the North and South American continents. The adoption of Chapman’s scheme of altitudinal zonation (tropical, subtropical, temperate, alpine) also causes confusion when a wide range of latitudes as well as altitudes is treated: thus, one gets the impression that the House Wren is a montane species in North America. A simpler altitudinal scheme like Eisenmann’s own “lowland-highland-montane” would have avoided such ambiguities. On the other hand, the English names are mostly useful and informative, although the obligatory hyphenation is occasionally a bit jarring (e.g. Common Barn-Owl).

The greatest taxonomic innovation of the present

Check-list is the free use of superspecies. The great advantage of this quasi-official category is that it provides a scientifically respectable way of begging the question of whether two closely-related taxa are species or subspecies when the critical data are conflicting, inadequate, or unobtainable. I feel strongly, however, that the Committee should have defined its criteria for superspecies in more detail: a passing reference to a paper by Amadon and the rather equivocal example (*Sphyrapicus*) and its resolution (a non-unanimous vote on “a mass of complex evidence”) do not leave one with the impression that well-defined guidelines were being followed. This impression was heightened by the fact that, while a wide variety of cases were considered to represent superspecies, many other seemingly identical ones were not (e.g. *Phœticus ludovicianus-melanocephalus* but not *Vermivora pinus-chrysoptera* or *Amazilia cyanura-beryllina*).

Seemingly similar inconsistency exists in the treatment of higher taxonomic levels: the changes from “traditional” classifications vary widely in their degree of prior acceptance. Adoption of the enormous families Emberizidae and Muscipidae represents the extremes of various lumping proposals (and recent evidence suggests that at least the latter is polyphyletic). However, the more modest lumping of the Dendrocolaptidae and Furnariidae, equally well supported by evidence from morphology and behavior, was not adopted. Union of the tityras and becards with the Tyrannidae is also increasingly controversial—although a similarly broad family concept might have joined not only these but also the cotingas, manakins, and sharpbill into another gigantic family. Adoption of the such still-tentative proposals seems particularly inopportune since we may now be on the threshold of a veritable revolution in family-level taxonomy, given the wealth of new data and techniques (new fossils, DNA hybridization, cladistics, etc.) now being brought to bear. Under the circumstances, some attention might better have been focused upon the “other” function of taxonomy, information retrieval. One can make some useful generalizations about behavior and ecology for groups like the Parulidae and the Icteridae, but this is hardly the case for the all-inclusive Emberizidae. The loss of this traditional function of bird families might have been contemplated with more circumspection, given the phylogenetic uncertainties of the moment—especially as no superfamilies were recognized among the oscines. Other questionable cases concern monotypic (sub)family status for the Bananaquit but not for the Wren-thrush, which is at least as strongly differentiated in ecology, behavior, and morphology from the emberizine-paruline “stem.” Perhaps such inconsistencies are an inevitable consequence of a committee effort, especially when few or no members have extensive field experience with all of the taxa in question. In any case, these are matters of

judgment, in which no decision adopted could possibly have satisfied every reviewer.

Information on distribution and ecology is generally well presented, but there are numerous minor exceptions and a few errors, at least with respect to Costa Rican birds. Few members of the Committee have conducted long-term fieldwork in Middle America, and contacts with current field workers seem rather haphazard, if my own case is typical. I am bemused at being listed as a "major geographic reviewer" when my only reviewing of Check-list manuscript was a rather frantic overnight effort, the result of a chance encounter with the penultimate draft on a committee member's desk! Several notable experts on Middle American birds are not listed as reviewers, nor are any Latin American ornithologists. Doubtless, contributions from some of these found their way into the Check-list via correspondence, as, for example, did my revision of southern *Selasphorus*. In particular, Eisenmann long served as an informal communications center for field ornithologists in the Neotropics—an important niche unfilled since his death. In any case, the Check-list would have benefited from a more exhaustive examination than I was able to give it: one error I missed was the omission of Costa Rica from the range of *Hylophilus flavipes*, and a number of habitat statements are at best misleading, for instance "semiarid areas" for the cloud-forest becard *Pachyrhamphus albogriseus*. A number of statements on distribution could have been simplified or clarified had it been taken into account that Volcán Barú (Chiriquí) is but the southernmost massif of the Cordillera de Talamanca, or that Puntarenas Province extends along most of the Pacific coast of Costa Rica and includes the interior valleys of the southwest as well.

The most serious defect of the new Check-list is, in my opinion, its failure to cite its sources in full, at least for novel or controversial taxonomic arrangements. One rarely has any direct indication whether a given taxonomic change or opinion was generated within the Committee itself or reflects the published

(or unpublished) contribution of others. Conversely, when a published taxonomic opinion is not mentioned, even as an alternative (e.g. the lumping of *Trogon aurantiiventris* into *T. collaris*), one does not know whether it was deemed unworthy of consideration by the Committee or simply escaped their notice. Although admittedly a break from tradition, a numbered system of references would have added only 10–20 pages to the Check-list and would have provided a very valuable service to field workers in Middle America, many of whom do not have easy access to the bibliographic resources of a major North American institution. This would have helped enormously to fulfill one of the Committee's avowed aims, the stimulation and orientation of further work. More explicit attention to sources might also have avoided errors like that of the Costa Rican range of *Hylophilus flavipes*, clearly described in Slud's "Birds of Costa Rica" (1964. Bull. Amer. Mus. Nat. Hist., vol. 128).

Although this review has dwelt largely upon what I perceive to be the shortcomings of the new Check-list (and many will doubtlessly disagree with my assessments), I do not wish to leave the impression that my overall evaluation of it is negative—far from it! The Committee has done a very good job indeed, and my only lament is that with rather little additional effort it could have been better still. Indeed, I feel that we must consciously avoid letting the overall excellence of the Check-list blind us to its faults, since (despite the disclaimers of the Committee) it will undoubtedly be widely cited as the authority on classification and nomenclature by many with no taxonomic experience: birders, editors and writers, government officials, even many avian biologists. By approaching the new Check-list in a critical spirit, we are in reality reaffirming the Committee's own viewpoint, including its desire to promote further studies of avian systematics and distribution. Now for a similarly comprehensive, critical treatment of the subspecies of North and Middle American birds—hopefully well before the turn of the century!—F. GARY STILES.

Wildlife and wildlife habitat of American Samoa.—A. Binion Amerson, Jr., W. Arthur Whistler, Terry D. Schwaner. Edited by Richard C. Banks. 1982. Washington, D.C., U.S. Fish and Wildlife Service. **Vol. I: Environment and ecology.** ii + 119 pp, 31 tables, 43 figures, 1 appendix. **Vol. II: Accounts of flora and fauna.** ii + 151 pp., 77 tables, 26 figures. No price given.—These volumes describe the biota on five of Samoa's seven islands plus two distant islets. The reasons for choosing such an unnatural biogeographic unit stem from a geopolitical atrocity perpetrated over 80 yr ago. During the 1880's and 1890's, imperialist powers blustered, wheeled, and dealt to partition Africa and the Pacific, oblivious to problems

that 19th-century colonial boundaries would create for 20th-century successor states. Because Holland, Germany, and England agreed to partition New Guinea at longitude 141°E, the inhabitants of west New Guinea today speak Indonesian and are governed from Jakarta, those of east New Guinea speak English and are an independent nation, and the most feasible way to make the 1,000-km flight between the capitals of the two halves is to detour 11,000 km via Sydney and Java. On 18 September 1898, General Sir Herbert Kitchener faced down Major Jean-Baptiste Marchand at Fashoda in the Sudan, with the consequence that the map of Africa acquired an unbroken red (= English-governed) stripe from north to south

instead of an unbroken purple (= French-governed) stripe from west to east. The border between Botswana and Zambia is only a few hundred meters long, because these countries are otherwise separated by a gerrymandering cartoonist's fantasy called the Caprivi Strip, a 450-km-long strip of land that England permitted the German chancellor Caprivi to annex to the corner of German Southwest Africa (now Namibia) in 1890.

The partitioning of Samoa goes back to a similar tragicomedy. In 1899 Germany, England, and the United States reconciled their conflicting interests, but not those of the Samoans, by agreeing that Germany would administer the two largest Samoan islands, the U.S. would administer the five smaller ones, and Britain would enjoy a free hand in helping herself to certain other pieces of the globe. The German islands ultimately became the independent nation of Western Samoa, while the other five islands are still a U.S. territory administered by our Department of the Interior. Swains Island, 320 km to the north, also became part of American Samoa because of an equally weighty geopolitical consideration: an American trader and his Samoan wife settled on Swains in 1856 to grow coconuts. The island roster of American Samoa is completed by Rose Atoll, a tiny (5-ha) scrap of land 100 km east of Samoa, administered as a National Wildlife Refuge.

In 1973 the U.S. Fish and Wildlife Service called for a wildlife survey of American Samoa. The survey was carried out in 1975 and 1976 by the Dallas-based firm Environmental Consultants, Inc., with A. B. Amerson, Jr., as principal investigator. Amerson, Whistler, and Schwaner produced a report of 1,200 pages, 200 figures, and 110 tables, which Richard C. Banks of the Fish and Wildlife Service edited into its published, shorter, 2-volume form. The first volume reviews the scientific history, geography, geology, and climate of American Samoa; summarizes the habitat types, flora, and vertebrate fauna; discusses threatened and endangered species and habitats; and offers proposals for their conservation. The second volume describes 42 study plots and then gives species-by-species accounts for all vascular plants and vertebrates. In the following paragraphs I summarize some of the contents of these volumes.

The five main islands of American Samoa are recent volcanoes, with some activity in historic times. Among these islands the largest is Tutuila (142 km²), with the capital and famous port city of Pago Pago; the highest island, Ta'u (966 m high), site of Margaret Mead's controversial study, forms the Manu'a group together with the nearby small islands Ofu and Olosega; and the smallest island is Aunu'u near Tutuila. The dominant natural vegetation of these islands is tropical rain forest, but about two-thirds of the land area has been disturbed by human activities. The heaviest brunt of development in these steep islands has fallen on those few flat areas around the coasts

and stream valleys: 80% of the land surface consists of slopes exceeding 30%. Cloud forest occurs at high elevation on Ta'u and Olosega, montane scrub on peaks of Tutuila and on steep, wind-exposed terrain of Ta'u. Swains, a low island of only 3 km², is covered almost entirely by abandoned coconut plantations. Tiny Rose Island, possibly the world's most isolated and least disturbed wildlife refuge, supports only *Pisonia* forest and strand vegetation.

American Samoa's native vascular plants number 454 species, of which about 94 are endemic to Samoa. (Only 13 of these are endemic to American Samoa; the rest are shared with Western Samoa.) Most of these native plant species belong to the Indo-Malaysian flora, and most of them are shared with Fiji. Despite centuries of blessings from western civilization that began in 1722 when the Dutch explorer Jacob Roggeveen discovered Samoa a few months after his discovery of Easter Island, the flora of American Samoa is in surprisingly good shape today—especially in comparison with biological disaster islands like Hawaii. Amerson's team found almost all species of flowering plants that had been recorded previously. Thirty-six exotic plant species have become established, but 93% of the plant individuals found in undisturbed habitat still belong to native species.

The most abundant vertebrates of American Samoa are herps: two species of marine turtles, one toad, one snake, and 12 skinks and geckoes. The toad, *Bufo marinus*, is a blessing introduced by the U.S. Department of Agriculture in 1953 to control insect pests. Evidence for the hoped-for benefits is lacking; instead, the toads may contribute to the high incidence of polluted drinking water and dysentery on Tutuila. One of the geckoes is also considered a recent introduction and is still confined to an Air Force barracks near Pago Pago airport. The snake and remaining lizard species are presumed by the authors to be native, but P. J. Darlington in his treatise "Zoogeography" (1957, New York, Wiley) guesses that they may have arrived as commensals of man, either with early European visitors or with the earlier Polynesian colonists. All or almost all of the snake and lizard species extend to Fiji and Tonga and are not endemic to Samoa. If land reptiles really had been able to reach Samoa unassisted, one might have expected to find distinctive endemic species, as is true for lizards on Pacific islands from Fiji westwards, and as is also true for Samoan birds.

Of native mammals, American Samoa has only one frugivorous bat (the flying fox, *Pteropus samoensis*) and one insectivorous bat (*Emballonura semicaudata*); Western Samoa has an additional species of flying fox. Introduced mammals are four rodents and the feral pig.

The birds of American Samoa number 54 species: 24 seabird species, of which 19 breed; 20 native breeding landbirds; 1 vagrant (the Cattle Egret, *Bubulcus ibis*); 7 migrants (6 arctic waders that arrive via

the Hawaiian Flyway and the New Zealand cuckoo, *Eudynamis taitensis*); and 2 introduced species (Red-vented Bulbul, *Pycnonotus cafer*, and Rock Dove, *Columba livia*). Thirteen additional species of native land birds breed in Western Samoa, but only three land-bird species of American Samoa fail to reach Western Samoa. For each species of American Samoa, Amerson, Whistler, and Schwaner briefly summarize the habitat preference, diet, breeding biology, estimated population size, and Samoan name.

American Samoa's breeding seabirds are dominated numerically by terns, specially by the population of about 300,000 Sooty Tern (*Sterna fuscata*) on Rose Atoll. Breeding petrels and shearwaters of 4–6 species are confined to the cloud forests and montane scrub on top of Ta'u Island (possibly also on Tutuila Island). Until paleontologists have explored Samoa, one can only speculate whether the seabird colonies of the Samoan islands other than pristine Rose Atoll are just a small remnant of those that existed before Polynesians arrived, as is known to be true for the Chat-ham Islands.

Samoa's 33 breeding landbird species (lumping Western and American Samoa) are overwhelmingly derived from New Guinea, except for the robin *Petroica multicolor* from Australia. By far the most distinctive Samoan bird, and the only endemic genus, is the Tooth-billed Pigeon (*Didunculus strigirostris*), which is confined to Western Samoa. (The Samoan Wood Rail, *Pareudiastes pacificus*, was formerly placed in an endemic genus but is now considered congeneric with the San Cristobal Rail, *P. silvestris*; Olson 1975, *Wilson Bull.* 87: 1.) Besides the Tooth-billed Pigeon there are 10 other bird species endemic to Samoa, but only two of these (the starling *Aplonis atrifusca* and the honeyeater *Gymnomyza samoensis*) reach American Samoa, where the latter species is now extinct.

The distribution of Samoan kingfishers proves interesting. The White-collared Kingfisher (*Halcyon chloris*) occupies a variety of habitats on thousands of islands in an enormous geographic range from the Red Sea to Fiji and Tonga. It skips over the two islands of Western Samoa, then reappears to the east on all five main islands of American Samoa. *Mirabile dictu*, on both islands of Western Samoa dwells a similar-sized endemic kingfisher, the Flat-billed Kingfisher (*Halcyon recurvirostris*). These ranges constitute strong distributional evidence for competitive exclusion.

Regarding bird conservation in American Samoa, only one species (*Gymnomyza samoensis*) has disappeared there in modern times; it survives in Western Samoa. However, four other species (the duck *Anas superciliosa*, the pigeons *Ptilinopus perousii* and *Gallinula stairii*, and the rail *Porphyrio porphyrio*) are now rare in American Samoa, and the swiftlet *Collocalia spodiopygia* is vulnerable. Some of the seabird populations also surely would be considered rare or en-

dangered if more were known about them. Compared to Hawaii, we should be grateful that the situation is not worse and that so little "enrichment" of the avifauna with exotic species has taken place in Samoa. The authors point out several areas crucial for conservation. Prime among these are American Samoa's only surviving intact coastal marsh, on Aunu'u Island, and the uninhabited southern half of Ta'u Island, which contains the mountaintop breeding colonies of petrels and shearwaters as well as what is apparently the only surviving population of the endemic Samoan race of the flycatcher *Clytorhynchus vitiensis*.

Lest readers misunderstand my account of these volumes, I should mention that they do not attempt to be a field guide to Samoan vertebrates: there are no descriptions or pictures. For bird identification, readers can instead choose among four field guides: Dick Watling's "Birds of Fiji, Tonga, and Samoa" (1982, Wellington, Millwood Press); John duPont's "South Pacific Birds" (1975, Greenville, Delaware Museum of Natural History); Ernst Mayr's "Birds of the Southwest Pacific" (1945, New York, Macmillan); and Corey and Shirley Muse's "The Birds and Birdlore of Samoa" (1982, Seattle, University of Washington Press). For the relative emphases and merits of these four guides, see my reviews in *Auk* 100: 543 and 1013 (1983). I wish that Amerson, Whistler, and Schwaner had prepared a separate paper of field observations on birds, to include information on songs, which are not discussed in the volumes under review. However, Amerson, Whistler, and Schwaner fulfilled admirably their assigned tasks of defining, inventorying, and mapping major ecosystems, identifying threatened species, and recommending wildlife management steps. For any scientist concerned with the flora or vertebrate fauna of American Samoa, these volumes now constitute the definitive summary.—JARED M. DIAMOND.

Wading birds of the world.—Eric and Richard Soothill. 1982. Poole, Dorset, England, Blandford Press. 334 pp. 96 color plates, 72 line drawings. \$29.95.—Books summarizing our knowledge of various bird taxa have secure and in many cases honored places on the bookshelves of ornithologists, naturalists, and birders. In this example, a father-and-son team has set out to summarize information on birds that wade in water. At least this is what I infer they had set out to do, as they fail to reveal their intentions explicitly, or to describe their desired audience. The introduction, to which a prospective reader might first turn for guidance, is primarily a defense of what is omitted, along with a few obligatory words on conservation. A defense of their omission of jacanas (a penalty for standing on lily pads instead of in the water) takes up 10% of the introduction. A discussion

of why phalaropes are included is allocated equal space.

The authors define wading birds broadly "... as all birds which actually do wade at some time of year, especially in their search for food." The authors' definition of "wading birds," although unevenly executed, is understandable in view of the publisher's search for the widest possible audience. It seems that the intercontinental struggle over propriety rights for the term remains under an armed truce. North Americans claim their inalienable right to use it for long-legged waders, while Europeans, needing only to contend with *the heron*, *the bittern*, *the stork*, and *the spoonbill*, find it more useful for their lot of short-legged waders. Thus the present authors are free to use the term as they see fit. The authors note that they include "... several families from the order Ciconiiformes and Gruiformes along with those of the order Charadriiformes." In that every ciconiiform family is included, this statement seems to reveal a special interest in shorebirds, the species accounts for which seem generally more extensive and complete. They have chosen to include accounts of 307 herons, storks, ibises, spoonbills, flamingos, cranes, limpkin, sunbittern, avocets, painted snipes, plovers, oystercatchers, sandpipers, crab plover, thick knees, a couple of coursers, and phalaropes.

Having delineated the book's coverage, I find it more difficult to define its character. It is not a definitive bird-taxa book, as it is incomprehensive, nor is it a field guide, as only about one-third of the species are illustrated in color. The format suggests a reference, but it is clearly tertiary, supported by a bibliography of only 35 secondary references. It is not a citable reference, and for definitive information one would need to turn to the faunistic works or to taxa monographs such as Hancock and Elliott's "Hérons of the world" (London Editions Ltd., 1978), Walkinshaw's "Cranes of the world" (Winchester Press, 1973), or Johnsgard's "The plovers, sandpipers, and snipes of the world" (University of Nebraska Press, 1983).

Unfortunately, the breadth of the book inhibits its depth. The species accounts begin immediately after the introduction. There are no introductory sections on the character, habits, habitats, or behavior of wading birds, nor is there an index. The full species accounts consist of paragraphs covering a species' description, characteristics and behavior, habitat, food, voice, display, breeding, and distribution. Fewer than half of the accounts are this complete, however; the rest include only two paragraphs covering the species description and its habitat and distribution. The descriptions are thorough but un compelling reading—the style is semi-telegraphic. Information in other sections appears to depend on the contents of the secondary sources used, none of which are cited in text. Material that is included is competently summarized, and the authors have found snatches of in-

formation not widely known. Thus, the text is broadly correct but not infrequently misleading in its generalizations or omissions. To state that the display of the Great Egret is not fully documented overlooks several very thorough studies. Similarly, to state that the display of the Cattle Egret is "not recorded" slights this well-studied species. What was meant, perhaps, is that the displays were not described in the reference books consulted.

The 96 color photographs are attractive portraits of 98 species. Half of the photographs are by Eric Hosking; one-third are by the senior author. A few poor choices, such as a Boat-billed Heron with a protruding lower mandible, mar the series. Seventy-two line drawings depict subjects ranging from Royal Spoonbills at their nests to the tail feathers of an African snipe.

"Wading birds of the world" is well produced, having clear printing, strong binding, and pleasant composition, and an important-looking cover. It would look good on the coffee table, with its dust cover on, or on the bookshelf, with its dust cover off. As a popularized reference it is quite adequate for those wishing an introduction to a specific species before seeking out more definitive information elsewhere. It might be particularly useful to those without ready access to the primary literature or secondary monographs. Even those knowledgeable about these particular birds will, in an initial browse, unearth a few new tidbits. It might be well received in public libraries and could make an acceptable gift for a well-chosen recipient, but it cannot be regarded as an essential text for either the professional or for the institutional library.—JAMES A. KUSHLAN.

Birds of prey of southern Africa.—Peter Steyn; illustrated by Graeme Arnott. 1982. Cape Town and Johannesburg, David Philip Publisher (Pty) Ltd. (published in 1983 in the United States by Tanager Books, Washington Street, Dover, New Hampshire 03820, and in the United Kingdom by Croom Helm, Beckenham, Kent). xxiii + 309 pp. 24 Plates, numerous maps, black-and-white sketches and black-and-white photographs. ISBN 0-908396-64-3 (Tanager Books, ISBN 0-88072-025-5; Croom Helm, ISBN 0-7099-2382-1). \$39.50.—This comprehensive, informative guide to the birds of prey of southern Africa aids the birdwatcher with identification, outlines the present distribution and status of southern African raptors, and gives an account of their life histories. Printed with easy-to-read type on good-quality paper and with a sturdy binding, this compact book of 17 × 24.5 × 2.2 cm is a handy reference for anyone interested in field work. It deals with 68 species of vultures, hawks, eagles, and falcons and 12 species of owls that occur in southern Africa south of the Cune, Okavango, and Zambezi rivers in Namibia,

Botswana, Zimbabwe, Mozambique (part), South Africa, Lesotho, and Swaziland.

In reading the introduction, one learns that much thought and effort have gone into the preparation of the book. For example, one is told that every effort was made to check the authenticity of all records and those of doubtful validity were rejected. The reader is informed that all important literature on southern African birds of prey was located and that generous use was made of unpublished observations and drafts of papers from numerous individuals. A particularly important addition is the information the author obtained from the nest record card collection of the Southern African Ornithological Society, a rich source of breeding data.

Not all ornithologists will agree with the author's use of taxonomy and scientific names, as he tends to "split" rather than "lump" species such as Tawny and Steppe eagles (*Aquila rapax* and *A. nipalensis* rather than *A. r. rapax* and *A. r. nipalensis*) and Jackal and Augur buzzards (*Buteo rufofuscus* and *B. augur* rather than *B. r. rufofuscus* and *B. r. augur*). The author normally does not deal with subspecies, however, although he uses trinomials in the species headings of Black Kite and Peregrine Falcon, giving separate accounts for *Milvus migrans parasitius*, *M. m. migrans*, *Falco peregrinus minor*, and *F. p. calidus*.

In his use of English names the author is to be commended for using hyphens and not compound names; thus, it is Black-shouldered Kite and not Blackshouldered Kite. Since the book has been written primarily for individuals living in southern Africa, I understand the author's reasons for including in the heading of a species account only English names used most commonly in southern Africa. Nevertheless, especially since individuals from many other parts of the world will refer to this book, I wish the author had included in the species heading the English name used most commonly outside southern Africa. This would have been especially appreciated by those striving for universal agreement of English common names.

In the section of the introduction on conservation, one reads about the threatened status of several species of raptors in southern Africa due to loss of habitat, poisoning, and direct persecution. It is especially distressing to learn that some, like Bateleur (*Terathopius ecaudatus*) and Cape Vulture (*Gyps coprotheres*), are declining at such an alarming rate that they are destined to be seen but rarely outside game reserves over most of southern Africa. Also discomfiting are the author's comments on the behavior of some egg-collectors and falconers. Although written for southern Africa, this section is applicable to much of Africa and comprises an important part of the book.

Each species account begins with the derivations of the scientific name, a refreshing addition which relied heavily on Richard Brooke's classical knowledge. For example, the reader finds that the English

name "secretary bird" does not originate because of the resemblance of the bird to a secretary with a quill pen stuck behind his ear, but derives from the Arabic *saqr et-tair* of which "saqr" means hunter or hawk and "tair" refers to flight or is a collective term for bird. Interestingly, it is suggested that the Arabic name was corrupted into French as *secrétaire*.

The identification section of each account usually is divided into two headings, *Adult* and *Juvenile and Immature*. Salient features of the bird when perched and in flight are given, as are colors of soft parts. Feather-to-feather descriptions, shapes of bills, types of feet, measurements, weights, and moults are not included; rather, the reader is referred to standard handbooks such as "The Birds of Africa" (L. Brown et al., Vol. 1, 1982). Following this section is one on habitat, which is often brief because, according to the author, many birds of prey are highly mobile and thus it is difficult to define their habitats with any precision. Just the same, I wish the author had given more details.

Included in the status and distribution portion of the species account are the species' status as resident, nomad, or migrant; its abundance; and its distribution in Africa. A map usually accompanies this section. Unfortunately, the author does not define what he means by abundant, common, rare, and so on, and thus leaves the reader to make his own interpretation of how common a species may be. Some of the maps could have been prepared in more detail to show accurately the species' distribution. This is particularly true of the vague and very general breeding range maps of some species (e.g. Booted Eagle, *Hieraetus pennatus*).

The last two sections on general habits and breeding are packed with much interesting information. General habits emphasizes the manner in which the species hunts and eats but also gives other details, including renderings of voice and migratory habits. Again, I wish a few more details could have been included on migratory patterns elsewhere in Africa. The section on breeding is very thorough and includes detailed comments on nuptial behavior and displays, nest-site and nest, breeding season, clutch size, egg description, incubation period, nestling and post-nestling periods, and breeding productivity.

The colored plates, prepared by Graeme Arnott, are particularly pleasing, clear, usable, and accurate, and their printing is of high standard. They include typical juvenal and adult plumages of almost all species perched and in flight. The flight plates—all in color—are outstanding and an important part (perhaps the most important part) of the book. They unquestionably will assist in the identification of birds of prey in the field. Individual species are located by means of numbers on a reduced half-tone on the page facing each plate. The plates are not overcrowded, making the birds easy to spot on the half-tones.

Included in each account are black-and-white pho-

tographs illustrating nesting habitat, nest, eggs, and varying stages of nestling development. The quality of the photographs varies considerably, some being clear and others being poorly reproduced. For example, the deformity of the nestling Cape Vulture is not at all clear to me, and the nest of Black-breasted Snake Eagle (*Circaetus pectoralis*) in the crown of euphorbia is difficult to spot. Sometimes two pictures of eggs of a species are given when one would have been sufficient.

Also included are a few black-and-white sketches that usually illustrate behavioral features characteristic of a species. Some, such as the greeting display of Pygmy Falcon (*Polihierax semitorquatus*), are very appropriate, while others, such as Barn Owl (*Tyto alba*) emerging from a roost, do not add much.

The reference section is organized into "general" and "species" references. Some of the species references have a special number in brackets to inform the reader that the paper has a particular number of citations that also should be referred to. This method enables the author to avoid listing all references for a species, saving much space. The literature appears to be covered thoroughly for most of Africa except for West Africa, where the author seems to have missed some French papers.

The index, I suspect, was condensed to save space, but it is difficult to use. Only common names are listed for the 80 raptors dealt with in the book; however, scientific names of other animals and plants appear in conjunction with their common names, but not separately. General topics are alphabetized among the other entries. Information from the introductory section has been included, but plate numbers on which species are found are not. It is difficult to distinguish the page numbers of cross-references from the main account of a species in the text.

Considered as a whole, the book is well prepared and of high academic standard, and the author and artist are to be congratulated for it. Besides providing a mine of information about African diurnal birds of prey, this book provides as many up-to-date details on African owls as one can find in any published source. It is a book that all who are interested in the African avifauna should have on their library shelves.—EMIL K. URBAN.

Animal architecture.—Karl von Frisch, with the collaboration of Otto von Frisch; translated by Lisbeth Gombrich. 1983. New York, Van Nostrand Reinhold Co. 306 pp., 114 "plates," 105 text figures. ISBN 0-442-29057-8. \$10.25 paperback.—Although the late Austrian biologist Karl von Frisch is best known for his discovery of dance communication in the honey bee, for which work he shared the 1973 Nobel Prize in Physiology or Medicine, his accomplishments were far broader. If he had never studied bees he would still be remembered for his pioneering work on sen-

sory capacities of fishes, for example. He was also an avid collector and student of nests, and from his collection housed at his home at Brunnwinkl grew this volume about the structures built by animals.

The history of the present volume appears involved. Von Frisch's Foreword states that the idea arose in 1963 when he was visited by publishing friends Helen and Kurt Wolff, and in a 1973 autobiography ("Erinnerungen eines Biologen," Springer-Verlag, Heidelberg) von Frisch lists a book in preparation under the title "Animal Architectonic," to be published as a "Helen and Kurt Wolff Book" by Harcourt Brace Jovanovich. Also listed as in preparation is a German title, "Tiere als Baumeister." The present book states that it was "first published 1974 by Harcourt Brace Jovanovich," presumably a translation of the German edition, with a third title. So the book as it stands is at least a decade out of date, which shows through failure to reflect such literature as Robert L. Jeanne's careful comparative work on wasp nests. In fact, an annoying feature of this book is the total lack of references, the only authorities cited being those mentioned by name in passing, the favorite of whom appears to be the great nature photographer Heinz Sielmann. And the mention of photographs brings to mind the fact that the "plates" (so designated) in this edition are printed on ordinary paper, some so darkly that one must accept the caption on faith (e.g. the "squirrel's nest" of plate 111 on p. 272).

Still, in all this is a marvelous romp through the structures of animals and the lives of the biological engineers. Here you will find the beautiful body structures of forams, sponges and snail shells; the antlion's pits and the spider's webs; and the larval homes of caddis flies, the famous nests of stickleback fishes, the bubble-nests of labyrinth fishes, and foam nests of certain frogs, the burrows of wasps and moles, and of course the lodges and dams of beavers. Many of the photographs are good, despite my misgivings about their reproduction, and the text drawings by Turid Hölldobler are simply superb. Most of the book, as one might imagine, is devoted to the homes of social insects and the incredible diversity of nests among birds.

The section on birds includes almost everything anyone could expect: incubating nests of the megapodes, simple nests, woven nests, domed nests, hanging nests, plastered nests, and even (presumably for sake of completeness) birds that incubate without building any nests at all. You will also find here the holes of woodpeckers and hornbills, the burrows of kingfishers, and of course the pinnacle of avian architecture, the display bowers of bowerbirds. Here are the familiar studies of William Dilger, Nicholas Collias, A. J. Marshall, and many others paraded, distilled, and simplified—although without the credit that is their due.

Emphasis throughout the book is naturally on Eu-

ropean animals, often with the American counterpart mentioned at the end of a section as a sort of afterthought. This is a nice concession to interest New World readers, I suppose, but certainly unnecessary and inappropriately placed. The effort would have been more useful, and certainly less transparent, if integrated at the beginning of sections. And the Latin names of American animals might have been given more attention to prevent "*Malanerpes*" for the Red-headed Woodpecker (p. 221), "*Selurus*" for our Ovenbird (p. 225), and so on. The Table of Metric Equivalents (p. 289) seems another concession to backwards America, but defining a millimeter as "0.03937 inch" certainly tosses out everything about significant digits that we try to teach in science.

What I particularly enjoyed was the bits and pieces of text with asides that were new to me. Did you know that the soft nests of penduline tits (*Remizidae*) "are so strong that in eastern Europe, where these birds are common, children sometimes wear the nests instead of slippers" (p. 204)? (I do not recommend using the thorny nests of our only remizid, the Verdin, in such a fashion.) Further, "Because of its swimming skills and because of the scales that cover its tail, the beaver was regarded, for dietary purposes, as 'fish' by the Roman Catholic Church, which permitted consumption of its palatable flesh during Lent" (p. 267). And on the Jefferson River in Montana there is a beaver dam "seven hundred meters long and (it) can bear not only the weight of a man but also that of a rider on horseback" (p. 274).

Von Frisch ends this, surely his last, book with philosophical musings (pp. 286-287). Although we achieve great satisfaction in understanding what at first seemed incomprehensible "the sum total of unsolved mysteries will always remain immeasurably greater than the sum of our discoveries." Von Frisch eschews the scientific route toward understanding "the key to life" and says of biologists who follow it: "They are to be pitied." Without debating the merits of von Frisch's mystical "sense of profound awe" in nature, it might be pointed out that those "unsolved mysteries" will always be greater than the sum of discoveries because it is the discoveries themselves that identify the new mysteries that fascinate us. Whether you ultimately shelve this volume among your books on science, or nature writing, or even philosophy is problematical; but I do think you will want to keep "Animal Architecture" after reading it cover to cover.—JACK P. HAILMAN.

Costa Rican natural history.—Daniel H. Janzen (ed.). 1983. Chicago, Illinois, University of Chicago Press. xi + 816 pp. ISBN 0-226-393321. Cloth \$50.00, paper \$30.00.—For 20 yr the Organization for Tropical Studies has coordinated teaching and research programs in Costa Rica. The result has been the pro-

duction of a cadre of experienced tropical biologists and accumulation of considerable natural-history information on the Costa Rican biota. The limited distribution of "course books" and publication in a diverse array of scientific journals has limited the availability of that knowledge. While no single volume could contain all that is known, "Costa Rican Natural History" is impressive in both content and presentation. Dan Janzen, editor of this volume and a leader in tropical biology for two decades, demonstrates his insight and energy by the fact that he could convince 174 authors to write knowledgeably and concisely about their specialties.

In the first five chapters, contributors trace the history of biology in Costa Rica (Chapter 1: 11 pages), discuss the role of Central America as a dispersal route (2: 23), and provide introductions to Costa Rican climate (3: 12), geology (4: 16) and soils (5: 3). While these chapters vary somewhat in detail and rigor, all introduce their subjects and provide references to which the reader can refer for more detailed information.

Biological subjects dominate other chapters. Chapter 6 (52 pages) treats agriculture, and five chapters are concerned with various taxa: plants (7: 234), reptiles and amphibians (8: 75), mammals (9: 77), birds (10: 103), and insects (11: 163). Each has three major sections: introduction, checklists, and species accounts. Addresses of contributors occupy 9 pages, and a 28-page index completes the volume.

The first five chapters plus the introductory section of each of the biologically oriented chapters were written as introductory lectures to "interested but naive graduate students." The agriculture chapter outlines agricultural history in Costa Rica and the geography of modern agriculture. Major modern agriculture systems (small farm, plantation, pasture) are described. The authors of this chapter note, for example, that the evolution of agriculture may be viewed as the development of techniques to remedy the nutrient imbalance resulting from erosion and leaching. Species accounts in the agriculture chapter treat 21 crops. A detailed table on vegetable crops outlines their uses, problems with pests, and planting and harvest recommendations.

The plant chapter introduction (40 pages, 150 references), written by Gary Hartshorn, reviews Costa Rican life zones, vegetation of major OTS field sites, physiognomic features and patterns, and community ecology. Mammal and insect chapters are introduced by discussions of selected questions: How do tropical mammals cope with seasonal stress? Why are so many Costa Rican carnivores frugivorous? Who do rat trappers become bat netters in the tropics? Why do moths come to lights? Do Costa Rican insect arrays display seasonality? Major sections on reptiles and amphibians treat subjects such as breeding biology of amphibians, anuran defense adaptations, and lizard food and feeding habits.

Gary Stiles' introduction to the bird chapter is a masterful summary of knowledge of Costa Rican (tropical) birds. The composition and affinities of the avifauna and the zoogeography of Costa Rican birds are described in text, tables, and figures. Major sections on communities, seasonal patterns, social systems, and the role of birds in ecosystems provide excellent state-of-the-art reviews. Most of the 100 references cited by Stiles were published since 1975, indicating the rapid growth of knowledge of tropical birds.

The title belies the volume's value to areas outside Costa Rica. Only the checklists are narrowly applicable to Costa Rica. Reptile, amphibian and mammal checklists note presence or absence at six or seven major field sites in Costa Rica. Checklists of insects are provided for Sphingidae, army ants, acridoid grasshoppers, and butterflies. A detailed tree checklist lists species present at seven major field sites in Costa Rica with codes to indicate typical physiognomic position, abundance, and habitat at each site. A detailed bird checklist for eight sites most frequently visited by OTS courses includes codes to identify abundance, status, and preferred habitat(s) for 820 species.

The final segment of each chapter is composed of accounts of common species written by specialists. These vary in content as a function of information available and the peculiarities of biology of the species. Individually and collectively they contain a wealth of information. Their lengths vary from ½ page to 3 pages; invariably they include 2 to 15 key references. The bird chapter, for example, has accounts of over 50 species, such as *Ara macao*, *Buteo magnirostris*, *Cathartes aura*, *Chiroxiphia linearis*, *Cochlearius cochlearius*, *Crax rubra*, *Otus choliba*, and *Zeledonia coronata*. Species accounts are sequenced alphabetically by scientific name. This approach has some disadvantages for one familiar with standard taxonomic sequences.

About 30 tables and 350 figures (including over 500 photos, most of which are credited to Janzen) complement and extend information conveyed in the well-edited text. Fifteen color photos of superior quality adorn the front and back covers.

With a volume like this, other content and approaches to organization could easily be suggested. Debate about such issues, however, would not change the fact that this is an excellent volume. It will no doubt remain an indispensable source of information and insight for students of tropical biology for many years. Like Janzen, I hope this book will be "out of date in ten or twenty years," and I look forward to the insights produced as a result of the general availability of this excellent volume. Dan Janzen deserves praise for his perseverance in seeing it through to publication.—JAMES R. KARR.

Avian endocrinology.—Shin-ichi Mikami, Kazutaka Homma and Masaru Wada (Eds.). 1983. Tokyo, Japan, Scientific Societies Press, and Berlin, Heidelberg and New York, Springer-Verlag. xv + 334 pp. \$50.90.—The contributions to this book are largely based on presentations at a satellite symposium on Avian Endocrinology, which was held in Tokyo in December, 1981, before the International Congress on Comparative Endocrinology. The inevitable question raised by this volume is whether or not it is worthwhile to publish another collection of papers on avian endocrinology, considering that there have been four recent publications in this field since 1980 ["Avian endocrinology," A. Epple and M. H. Stetson (Eds.), 1980; "Biological rhythms in birds: neural and endocrine aspects," Y. Tanabe, K. Tanaka, and T. Ookawa (Eds.), 1980; "Recent advances of avian endocrinology," G. Pethes, P. Péczely, and P. Rudas (Eds.), 1981; "Aspects of avian endocrinology: practical and theoretical implications," C. G. Scanes, M. A. Ottinger, A. D. Kenny, J. Balthazart, J. Cronshaw, and I. Chester Jones (Eds.), 1982].

After careful evaluation of its contents, I am convinced that this book is indeed worth being published. Although its title is unfortunately identical with that of the proceedings of the Second International Symposium on Avian Endocrinology, this bibliographical sin cannot detract from its value. Whereas the previous "Avian endocrinology" gives an overview of virtually every endocrine gland or system of birds, the volume of Mikami et al. provides a limited selection of topics that are often masterpieces of concise presentation. Well selected key references and brief summaries at the end of each chapter are particularly strong features of this publication, and so is the number of Japanese references, largely unknown to foreigners.

The book is divided into three subdivisions. The first, entitled "Anatomical and Hormonal Basis for Avian Endocrine Functions," consists of 12 chapters. Of these, 10 deal with structural aspects of various endocrines and of the ovaries, and they complement and update the information in the above-mentioned recent publications. The same can be said about the remaining two chapters, one of which deals with the radioimmunoassay of avian FSH, while the other one compiles data on avian peptide hormones. The second division, on "Environmental Manipulation of Endocrine Function," comprises nine chapters, all of which (with one exception) emphasize aspects of photoperiod or reproduction-related phenomena. The three chapters of the third division are combined under the heading "Ecological Aspects of Avian Endocrinology."

In the first chapter, entitled "Reflections on the Structural Basis of Avian Neuroendocrine Systems," A. Oksche gives a concise progress report on the distribution of both peptidergic and aminergic neurons,

which should be a useful introduction for anyone interested in avian or comparative neuroendocrinology. The following chapter, by S. Blähser, summarizes the immunohistological information on peptidergic neurons in the central nervous tissue of the chicken, and her data are supplemented in a chapter by S. Mikami and S. Yamada on the localization of immunoreactive neurotensin, VIP, and somatostatin in the quail hypothalamus. Blähser points out that her studies are an initial step in the complicated area of neuro-peptidergic studies. Considering the almost daily growing glut of pertinent data from mammalian studies, one cannot agree more.

The following progress report on immunocytochemical studies on the avian adenohypophysis by S. Mikami deserves particular attention. It appears that at least some of the major cell types have now been clearly identified. However, the tantalizing problem of the differentiation between two types of gonadotropes remains unsolved. The next chapter on neuroendocrine structure, which deals with the afferent and sympathetic innervation of the avian pineal gland, is a well-written mini-review by T. Sato and K. Wake. The three following chapters deal with the gastro-entero-pancreatic endocrine system. J. Yamada, N. Kitamura, and T. Yamashita summarize the current knowledge on avian gastrointestinal endocrine cells. At the time of this report, only 10 different cell types had been identified, and the physiology of their hormones remained largely unknown. Again, when compared with the mammalian situation, avian studies in this field also lag far behind.

T. Iwanaga, R. Yui, and T. Fujita present new data on the chicken pancreas. The most important findings include the demonstration of larger precursor molecules of glucagon (glicentin) and somatostatin (somatostatin 28) in A and D cells, respectively, and of a mammalian-like insulo-acinar portal system. T. Watanabe's subsequent chapter deals with the ultrastructure of the islets of the chicken, particularly with respect to their neural control. Not surprisingly, he is able to identify a probably new, but uncommon, type of islet cell and another "ECL cell," which is scattered in the exocrine pancreas. Together with the A, B, D, and PP cells, he thus finds a total of six pancreatic endocrine cells. He also makes a strong point in favor of a direct innervation of the islet cells. Therefore, it is unfortunate that his electron micrographs of synapses are not of sufficient quality to support his contention. Even in mammals, the exact nature of the histological changes preceding ovulation is still a matter of discussion. Much less is known on the preovulatory changes in the avian ovary. Thus, a short review by Y. Yoshimura and O. Koga on the changes in the stigma of the chicken ovary is a useful source of information. The authors' own interpretations are supported by a number of good microphotographs, both of light microscopic and ultrastruc-

tural preparations. Just like the final mechanisms of ovulation, the preceding maturation processes of the ovarian follicles also leave us with many unanswered questions.

Because of their extremely rapid growth and the maintenance of a strict "size hierarchy" during their maturation (which assures that a larger follicle is not overtaken by a faster growing smaller one), the pre-ovulatory follicles of the chicken have drawn the interest of numerous investigators. In a review of this subject, K. Imai supplies his new data on the effects of age and clutch size on the rapid maturation phase of chicken ovarian follicles. A great obstacle to the understanding of the hypothalamo-hypophysial control of avian reproduction has been the lack of reliable radioimmunoassays. During the past decade, however, improved techniques made the determination of LH (luteinizing hormone) titers a routine procedure in several laboratories, while the specific measurement of avian FSH (follicle stimulating hormone) remained a most difficult task. Therefore, one hopes that a newly developed and highly specific radioimmunoassay for avian FSH, reported by H. Sakai and S. Ishii, will finally lead to a breakthrough in our understanding of the precise role of this hormone in birds. The last chapter of the first subdivision summarizes the information on the chemistry of avian peptide hormones. From this report by N. Yanaihara, T. Mochizuki, and C. Yanaihara, it appears that at the time of their writing pertinent data were only available on insulin, secretin, gastrin releasing peptide, glucagon, pancreatic polypeptide, vasoactive intestinal peptide, ACTH, and angiotensin II.

The following series of chapters on "Environmental Manipulation of Endocrine Function" begins with a review by D. S. Farner, R. S. Donham, K. S. Matt, P. W. Mattocks, Jr., M. C. Moore, and J. C. Wingfield entitled "The Nature of Photorefractoriness." This scholarly summary provides a comprehensive overview of the timing mechanisms of avian reproduction and lists 136 references. The in-depth discussion of the situation in *Zonotrichia leucophrys gambelii*, and a comparison of photorefractoriness (or the absence thereof) among members of five well-selected families of birds illustrates the obviously multi-evolutionary origin of this phenomenon. The authors reconfirm that the primary site of photorefractoriness must be at the hypothalamic or higher level. While the chapters by Yoshimura and Koga and by Imai emphasize structural aspects of avian ovulation, the contribution by M. Kamyoshi and K. Tanaka discusses the "Endocrine Control of Ovulatory Sequence in Domestic Fowl." The chapter deals mainly with the role of LH, and the authors propose an hypothesis for the endocrine control of the ovulatory sequence, which mainly involves this hormone. Ever since Benoit's pioneer studies almost 50 yr ago, the

neuroendocrine pathways of photoperiodic control in photosensitive birds have been the subject of study, and also often of controversy. Although the issue is far from settled, the chapter of H. Konishi and K. Homma provides new information on the relative roles of the eyes and of the hypothalamic photoreceptors. For a number of years, Homma's laboratory has used Japanese quail in studies on photoperiodic responses, and while findings for this useful laboratory bird may not allow generalizations to distantly related species, the species has yielded many important data. This paper leaves little doubt that, at least in the quail, the eyes are "an important regulator in preventing overrun in avian photoperiodic response." The following chapter by M. Wada deals with environmental cycles, the circadian clock, and androgen-dependent behavior. As in Homma's laboratory, this author uses quail, and he places particular emphasis on the calling frequency as a criterion. Wada's findings are clear-cut and show the dependence of calling on the gonadal state. In addition, they show that the rhythms of calling and motor activity are highly correlated.

The subsequent chapter, by M. Ueck and H. Umar, covers functions, controls, and structural aspects of the avian pineal gland. While some overlap with Sato and Wake's chapter is inevitable, the importance of this contribution lies in the excellent integration of structural and functional aspects and in the clear definition of unresolved problems. Y. Tanabe, O. Doi, and T. Nakamura cover a related topic, the impact of different photoperiods on the developing pineal of the chicken. Of particular interest appears the conclusion of these authors concerning the control of the enzyme NAT (which mediates the conversion of serotonin to the melatonin precursor N-acetylserotonin). Based on the effects of pinealocyte nuclei from chickens (exposed to different photoperiods) on cytosol fractions, they suggest that the NAT activity of the pinealocyte is controlled by the nucleus, which, in turn, is probably the direct site of photoreception.

Considering the scarcity of information on the environmental control of breeding cycles in birds of lower latitudes, studies by A. Chandola, D. Bhatt, and V. K. Patakh on Indian birds are of particular interest. A brief summary of the breeding cycles of various species observed at Varanasi is followed by detailed information on the reproduction of the munias, particularly of *Lonchura punctulata*. One of the most interesting facets of this report is the important role of nutrition in the timing of reproduction of some Indian birds. Species whose association with the human assures them of almost constant food supply show a tendency to breed twice a year, during spring and autumn.

Despite a considerable amount of work carried out in the last decade, the interactions between the adrenal "cortex" and the reproductive functions of birds leave us with many important questions. P. Dev-

iche's review of this subject in male birds summarizes the progress made and points out the problems faced in pertinent investigations. While the study of the physiology of "neuropeptides" is burgeoning in mammals, pertinent work on birds is scarce. Therefore, one is pleased to see that at least one contribution deals with this subject. In continuation of their previous work on the role of angiotensin in drinking behavior, H. Uemura, H. Kobayashi, Y. Okawara, and K. Yamaguchi now report their findings on the effects of exogenous enkephalin and substance P in birds. Both peptides seem to suppress drinking, and it appears well possible that this is part of a physiological mechanism.

The three chapters of the last subdivision of the book deal with the relationships of ecological and endocrine factors. In the first, J. C. Wingfield discusses the complex issues of environmental, behavioral, and endocrine interactions that ultimately may lead to successful nesting. This well-written account lists 174 references and provides a useful foundation for future research in this area. The next chapter summarizes an in-depth study on the same parameters in the male Pied Flycatcher (*Ficedula hypoleuca*) by B. Silverin. This author defines "population endocrinology" as "the study of the endocrine status and dynamics of organisms in free-living populations," and emphasizes that the student in this field must have both a good ecological and physiological background. The report proves that Silverin lives up to his own standards, and one regrets that his studies only cover the short period that the Pied Flycatcher spends at its Swedish breeding ground. The final chapter of the book is a comprehensive review by C. G. Scanes, T. J. Lauterio, and F. C. Buonomo of virtually all aspects of the physiology of growth hormone and luteinizing hormone in birds. The progress in this area is indeed impressive, and much of the credit goes to Scanes' laboratory. It appears that one of the major challenges is now the precise identification of the neuroendocrine pathways involved in the control of the release of both hormones in birds.

In summary, this book is an important state-of-the-art report on many areas of avian endocrinology. Until the proceedings of the Third International Symposium on Avian Endocrinology (to be held in June 1984) are available, it will serve as an important source of information for everyone interested in this field.—AUGUST EPPLE.

Watching birds with Roger Tory Peterson.—Written by Allen H. Morgan, produced and directed by Bill Sweney. 1981. New York, Metromedia Producers Corp. and Houghton Mifflin Co. Video cassette tape, 52 min. ISBN 0-395-34417-4. \$59.95.—There is both an art and a method to watching birds, whether one does it as an idle pasttime, a serious hobby, or a sci-

entific study. The aim of this video cassette tape is to convey to beginning birdwatchers some feeling for how to look at birds and what to look for—aspects of birdwatching that can make it a more rewarding and satisfying activity. In large part, the attempt is successful.

Following an introduction that describes some general aspects of the diversity of birds and emphasizes the importance of listening and looking carefully when observing birds, Roger Peterson comes on to tell us about the basic requirements for beginning birdwatching: binoculars, a good field guide (guess which one), and a competent friend who can help with identification. The main emphasis of the first 25 min or so of the tape is on identification, and Peterson and an anonymous narrator call attention to the importance of looking for distinctive field marks and using them to identify species by a process of elimination. By categorizing species by time of year, part of the country, size and shape of the bird, bill shape, tail shape, features of behavior, song, habitat, and so on, one can narrow an identification down to a small number of possibilities. This is how most practiced birdwatchers go about identification, more or less intuitively, but the tape does a good job of making this approach clear to the beginner. In this section, the photography is generally quite good and appropriate to what is being discussed, although a great many species are shown without actually being identified for the viewer.

Following this section, some aspects of attracting and feeding birds are briefly reviewed, and features of adaptations to environments are mentioned even more briefly (about 1 min). The tape then presents a module of identification hints and tidbits of information about 52 "common backyard birds," some of which (e.g. Barn Owl) seem rather unlikely to occur in a backyard the size of mine. Most of these are eastern species, although a few western forms are included; virtually all are shown in full breeding plumage. Curiously, no warblers are included. In general, these vignettes are informative and nicely done, but there are some problems. For most species, the critical field marks are reviewed far too quickly,

and the emphasis is perhaps too exclusively on coloration patterns alone—little is said, for example, about the importance of size and outline as identification aids. The tail-flick of phoebes is mentioned but not shown, and as the narrator talks about the color patterns of adult Barn Owls we are shown young birds. Use of small arrows pointing out key identifying features (a device one would expect of Peterson) would have helped make some identifications clearer.

I gathered together a group of amateur birdwatchers and graduate students to view the tape and evaluate it. Here, in no particular order, are the group's responses: (1) The photography is generally excellent. (2) The background music, however, is frequently distracting. (3) The importance of field marks is emphasized throughout, but often they are not really shown or highlighted, especially in the first section of the presentation. (4) Virtually nothing is presented about the behavior, ecology, life history, etc. of the birds—about what birds actually *do*. Peterson often comments about how important birdwatching is as an avenue to the environment, so it would seem that a good opportunity to link birds and environments together more forcefully has been missed. (5) Peterson himself does rather little of the narration, and appears mostly during the first section. The presentation would probably have been more effective if he had handled the entire narration. (6) It is a bit disconcerting to be told about birds in backyard birdbaths while we are watching a Golden Eagle bathing. (7) Overall, the group gave the tape high marks for accuracy, clarity, and style.

For beginning birdwatchers, this tape can be a valuable aid, especially if one has stop-action capabilities so that individual frames can be held for close study of identification features. Once one has progressed beyond the beginning level, however, the usefulness of the tape is limited. I doubt that many individuals would profit enough from it to justify owning a personal copy, but local bird clubs and libraries could certainly benefit from it, and could use it effectively in workshops for beginners.—JOHN A. WIENS.