REVIEWS

EDITED BY WALTER BOCK

Bird Flight.—Georg Rüppell. 1977. New York, Van Nostrand Reinhold Co. 191 pp., numerous black-and-white photographs and illustrations, 10 color plates; (translated from "Vogelflug"). $18.95.—If you still possess a childlike wonder for the things of nature and bird flight specifically, this book is a must for you. Through his remarkable photographs, well placed figures, and authoritative descriptions, Rüppell gives us a stimulating glimpse of the how's and why's of bird flight. The book is written by a keen and perceptive observer of birds who continually expresses his enthusiasm for the beauty of wings in motion; refreshing words such as "enchanting," "impressive," "wonderful," and "beautiful" are used throughout the text. As we are given factual material relating to the problems of vertical take-off, landing, hovering, and turning, Rüppell keeps the text very much alive by generously interlacing accounts of bird natural history, primarily from his own observations.

The book is divided into six chapters. The first begins with considerations of gravity and body form and a general discussion of flight in the animal kingdom. A brief history of man's interest in developing and understanding flight follows, which reminds us of the ingenious observations and experiments of early investigators such as Leonardo da Vinci, Otto Lilienthal, and Etienne Jules Marey. The second chapter covers aspects of avian anatomy, from maximum and minimum size to the details of feather architecture. The avian skeleton is highlighted and often compared to the familiar mammalian condition, a style which helps to clarify and emphasize each anatomical feature. Though the discussion centers around considerations for flight, Rüppell is careful to point out that birds are more than just flying machines. The chapter ends with a detailed analysis of feathers and some problems associated with molt. This chapter, as are all, is quite effectively illustrated. The third chapter's first subtitle is "A short course in aerodynamics," which sums up the entire chapter well. By using examples familiar to all of us and those fine illustrations again, Rüppell effectively discusses Bernoulli's Law, dynamic and static pressure, the different kinds of lift and drag, the boundary layer, and the Reynolds number without, as is too often the case, confusing and discouraging the reader and leaving a sense of futility.

Chapters 4, 5, and 6 (about 110 pages) form the heart of the book. Chapter 4 deals with gliding and soaring as well as flapping flight, each in a variety of species under a multitude of conditions. Thus Rüppell gives us a glimpse of the aerodynamic achievements of such soaring champions as the albatross and frigatebird, compares and contrasts the flapping flight of both large and small birds, and finally explains and illustrates the redstart's ability to hover in place. The chapter ends discussing that most impressive hoverer, the hummingbird. Chapter 5 continues in the same delightful vein and centers around the why's and how's of take-off and landing. We learn some of the problems and solutions of landing on small bodies of water, cliffs, and small perches. Do you know why the auk approaches its nesting ledge on a cliff from below, whereas the Thick-billed Murre approaches the same ledge from above? Why do geese raise their wings high over their heads to form a positive dihedral as they glide in for a landing? These questions and more are discussed. The final portion of the chapter is devoted to flight maneuvers not precisely related to locomotion such as mobbing, defense, threat, predation, and courtship. Flight as an adaptation, or the interrelationship of flight, behavior, and the environment, is the subject of Chapter 6. This chapter is the least well focused, but here Rüppell explores such phenomena as the isolation of the Galapagos Islands and their population of flightless cormorants, the fact that often excellent diving species such as murres are the poorest flyers, and the structural and behavioral strategies for predation of the hawks, falcons, and owls.

A glossary of useful terms is included, as well as selected references that pinpoint many of the key technical scientific works done on bird flight. In addition, Rüppell lists some bird flight films that are available on loan. The translation of this book is excellent. The student of animal flight as well as the general ornithologist will find here a rare blend of technically correct and delightfully presented information. I highly recommend it.—G. E. GOSLOW, JR.

Granivorous Birds in Ecosystems.—J. Pinowski and S. C. Kendeigh (Eds.). 1977. Cambridge, England, Cambridge University Press. xxi + 431 pp. $41.00—I will start, rather than end, this review by noting that the price of this volume probably will limit purchase of a very useful and well-done synthesis to libraries, perhaps only well-endowed libraries.

This book is one of the synthesis volumes emerging from the International Biological Program (IBP). The book should be viewed, to a large extent, as a good example of what can be accomplished by dedicated scientists without the very large levels of funding that were made available to some of the other IBP efforts. The credit for the high quality of this volume goes to the various authors who have been in

sufficiently close communication that the resulting series of papers is generally organized around a central theme with a clear, logical progression through the book.

The title does not really reflect the basic theme of the book, the impact of granivorous birds as pests in agricultural systems. The discrepancy largely results from the very limited data available on non-pest species of granivores. This volume seems to have been produced primarily through cooperative writing efforts and not through an organized, cooperative research effort designed to investigate critical aspects of the influence of granivores on ecological systems. Most of the basic data sets, and, in fact, the model of total energy demands grew out of research efforts that appear to be relatively independent of the subject of this book. This may result from the limited research funds available to these investigators through the IBP. The lack of funding may also have precluded broadening the scope of the written version to include avian taxa such as columbids and psittacids. The extensive work of Murton and his group in England on the wood-pigeon is not included in as much detail as the data of particular authors of each chapter.

The book is basically organized around attempts to quantify the level of energy requirements of well-studied avian pest species, especially the House Sparrow (*Passer domesticus*). The approach is to provide sufficiently detailed information to be able to estimate seasonal patterns of energy requirements for a standard population of a species under conditions that are specified for particular localities. The simulation model of seasonal energy requirements was developed by John Wiens and George Innis as part of the grassland biome studies of IBP. Three chapters provide basic information on population dynamics, biomass and production rates, and a multitude of predictive equations for metabolic costs associated with virtually every aspect of avian existence. Chapter 6 uses this information to produce expected levels of energy consumption for various granivore species at several localities.

Two other chapters deal with the history of bird-human coexistence through early agricultural societies and with character constellations that appear to be associated with a high probability of a bird's becoming a pest species. The latter chapter is interesting for the attempt to differentiate pest and non-pest species on three principal component axes that summarize 21 variables dealing with morphology, diet, distributional opportunism, reproductive biology, and social organization. A final chapter suggests directions for future studies, many of which will be directed toward filling gaps that exist in data even for a species as closely associated with humans as the House Sparrow.

A very interesting chapter by Dyer and Ward was written to bridge the gap between the research scientist and the manager who must make recommendations for applied problems. The authors detail research priorities and outline a general scheme for making management recommendations. This chapter should serve as an important focus of research efforts aimed at elucidating practical problems in economically and politically realistic periods of time. The chapter also underscores the tremendous need for cooperative efforts that transcend political boundaries, at least for non-sedentary pest populations.

Two primary shortcomings of the book point out some of the work that remains to be done. The authors recognize that the energetics models they employ are limited to the requirement and consumption aspects of pest existence. The data on availability and degree of depletion of food supplies are much less detailed. In fact, there is some evidence from earlier work by Dyer that an apparent pest species, the Red-winged Blackbird, may actually *increase* yield of corn ears if the damage is not too great. To round out the story of the impact of pest species we now need a concerted effort to measure what is actually consumed and see how that compares with the predicted consumption from the energetics equations. This leads to the second problem, which is the reliability of the model estimates. Innis and Wiens have done some sensitivity analysis of their model, but did not look in detail at the sensitivity to values of constants in the energetic equations that comprise the basic framework of the model. A recent paper by Furniss (1978. J. Anim. Ecol. 47: 39–53) provides some insight into this problem.

It will be apparent to anyone who reads this book that the basic population biology and energetics of virtually no pest species, excluding perhaps the House Sparrow, are sufficiently well documented to make the model output more than a preliminary estimate of food requirements. The authors also recognize that energetics is but one aspect of food requirements and the role of nutrient requirements remains nearly unstudied, especially as they influence food intake and diet choice. What progress has been made is largely due to the perserverance of a few dedicated workers who are beginning to amass the long term data records that will be needed to make accurate predictions of potential pest impacts on human-oriented ecosystems. The present wide gaps in our knowledge probably reflect the inability of persons in managerial positions to perceive the importance of long-term data collection on a wide range of topics dealing with basic biology of pest species. Some of the topics, such as molt timing, may seem fairly far removed from management questions.

I think this book is an excellent example of the possible accomplishments of long-term cooperative

ventures bringing together investigators in applied and basic research areas. It also points out what a few dedicated scientists can do with limited funding, but with integrated efforts focused on a common goal. The success of this venture probably is due partly to the fairly restricted goal that was addressed in this joint effort. Perhaps there is a lesson here in optimal research group size and optimal question breadth.—LARRY L. WOLF.

The Behavior of Communicating: An Ethological Approach.—W. John Smith. 1977. Cambridge, Massachusetts, Harvard Univ. Press. viii + 545 pp., line drawings. $20.00.—Why is it, one of my students once asked me with an ironic smirk, that those who write about communication have such difficulty communicating? Having done a bit of such writing myself, I think I have a partial answer: the subject of communication is enormously complicated. In order to discuss it we require a vocabulary of terms, which often we must beg, borrow and steal from others—or, upon occasion, invent from whole cloth. Therein lies a major difficulty, which plagues W. John Smith as well as others. I shall argue that Smith has very important things to say about communication; however, some of these things are difficult to understand because he explains them with terms that have other, commoner definitions both in common parlance and in other technical writing on communication.

It has been more than a century since Darwin opened the subject of social communication with his *Expression of Emotions*. Any reasonably objective assessment of literature since then must admit that progress has moved as a snail, despite admirable contributions by Julian Huxley, Karl von Frisch, Niko Tinbergen, and a host of other brilliant investigators. Darwin perceived that when an animal, including a human animal, experiences particular emotions such as "anger" these emotions have outward expressions by which social companions can read the inward emotions. Subsequent research has made it plain that natural selection may enhance these expressions of emotion in various ways to make them more readable as social signals, the evolutionary process Huxley termed "ritualization." Some signals are so highly evolved that their evolutionary origins are obscure, and one of Tinbergen's many contributions to ethology has been clarification of these origins and the evolutionary processes of ritualization that led to the signals we observe today. For roughly the first half of his volume, Smith returns to the basically Darwinian theme of the emotions that lead to the expressive signals.

We cannot observe emotions or other internal "motivational" states of animals directly, of course, so we are constrained to describe them in terms of the behavioral situations in which they occur. Smith terms this motivational-situational description of signals the "message" of communication. The reader can find an outline of his message categories on pages 85–86, which provide a guide to the next 100 or so pages of the text. Smith conceives of messages in a behavioral/nonbehavioral dichotomy, in which the first division is itself partitioned into "widespread behavioral selection" and "widespread behavioral supplemental" messages. Examples of the first include attempts to inflict injury, to escape, to copulate, to locomote, and so on; the supplements include the likelihood of carrying through the qualitative motivation (e.g. the probability of attacking), the direction (of, say, locomoting), and so on. The nonbehavioral messages include those that identify the species, sex, or other attribute of the behaver, or locate its position in space.

This initial half of the book raises two difficulties in terminology, both of which have important conceptual consequences. First, the use of "message" to denote the motivational-situational circumstances in which a signal is given goes counter to both common parlance and a large technical literature. A "message" is generally considered to be that thing which is transferred in communication, such as the word "victory" uttered by the unknown runner from Marathon as he fell dead in Athens in 490 B.C. It is all too easy to read such a notion into Smith's usage, and the reader may do well to substitute Darwin's "emotion" whenever encountering Smith's "message." (Smith might object. See chapter 8, where he attempts to distinguish his message analysis from ethological approaches to motivation.)

The substitution of emotion for message helps lay bare some of the difficulties in Smith's conceptual framework. For example, one of his widespread behavioral selection messages is the "general set of behavior patterns." In this category an expression or signal occurs "when the range of possible alternatives (of subsequent actions of the behaver) appears to include *anything* in a species' behavioral repertoire" (p. 113, emphasis author's). How one could decide whether or not a given kind of behavior falls into such a category I have been unable to discern. Indeed, throughout the first half of the book (despite the numerous and often fascinating examples), one is left without any operational criteria for assigning behavior to Smith's message categories. In fact, the entire analysis is strikingly similar to the intuitive motivational categories used by ethologists such as Moynihan during the 1950's and early 1960's when modern operational treatments of motivational problems had yet to emerge.

The other major difficulty with the first half of this volume is Smith's unusual use of "information." Actually, there are two difficulties: a minor and a major one. The minor difficulty is that Smith uses "information" synonomously with the notion of entropy in information theory: namely, as the uncertainty inherent in an array of entities from which one makes a selection. This usage is in fact widespread in the literature and engenders no real problem when it is understood; but in order to understand it, we must first consider the major problem.

The major problem with Smith's "information" is best illustrated by the research of von Frisch on the honey bee's dancing behavior. After returning from a food source the honey bee worker may move in a "figure 8" that is oriented with respect to upward on the vertical hive as the horizontal direction to the food source is oriented with respect to the sun's azimuth in the environment. Thus, if the bee moves upward in the hive, it has come from a food source that is toward the sun; if downward, away from the sun; and so on. Smith believes that "to imply that this behavior . . . encodes information about sites (about entities in the world external to the communicator) complicates its interpretation unnecessarily" (p. 144). He states that instead, "the information in the dance . . . is about characteristics of the next flight that the dancing communicator will make." The crux of the argument here is the definition of "information." Because this term derives from Claude Shannon's *Mathematical Theory of Communication,* a diversion into its meaning is required to clarify the issue.

Shannon showed that the uncertainty or diversity among items of a specified array could be measured conveniently by an equation that delivers a quantity called entropy. If a receiver is initially faced with a certain amount of uncertainty and becomes less uncertain as the result of receiving a signal, then the difference between the initial and subsequent uncertainties (entropies) is the information communicated by the signal. When a signal removes all uncertainty, the information received is numerically equal to the initial uncertainty, and it is in this sense that authors frequently use entropy and information synonymously—the minor problem referred to previously.

To return to the major problem, the real question becomes: who is the receiver in Smith's use of "information?" Because Smith uses "information" to express the diversity of motivational-situational states that *he* perceives, the communication is implicity with him. It is an unusual, but technically justifiable, use of the information concept. Regardless of whether other honey bees attend to the dance, however, a different human investigator can extract different information from the dance. Indeed, each year I have my students watch honey bee dances and using the orientational information inherent in them, go out on campus and find the feeding station I have set up for the bees. Whether Smith likes it or not, the bee's dance does in fact encode "information about sites (about entities in the world external to the communicator)."

It might then be asked *why* Smith refuses to recognize the simple fact that bee dancing encodes information about referents external to the animal. The answer is his belief that "the common claim that a honeybee dance provides information about the location of a source of food . . . is a functional interpretation" (p. 144). I maintain that it becomes a functional interpretation only when one crosses the line of saying that the dance has been selected in evolution to provide such information to other honey bees. Even if other bees do utilize the directional information, that fact alone is still merely descriptive of what happens in nature, and does not prove that the dance has been selected for because of its signal value. Smith is admirably cautious about making premature functional interpretations, but he inadvertently narrows the notion of information almost to oblivion.

A similar misunderstanding of information theory arises in chapter 8, where Smith equates the Haldane-Spurway informational analysis of honey bee dances with the Hazlett-Bossert-Altmann analyses of sequential interactive behavior. The former type of analysis delivers the information passed to the honey bee receiver of the dance signal, whereas the latter analysis really measures the information passed to the investigator concerning what action will follow next. It should be pointed out in Smith's defense that a large fraction of the ethological community fails to perceive the difference, including E. O. Wilson, who used the Haldane-Spurway method in analyzing chemical trails of ants.

Moving to the second half of this important volume, we find an excellent discussion of context: "sources of information that are available to a recipient *in addition to* some particular display source" (p. 225, emphases author's). Here I think Smith dismisses the possibility of "metacommunicational" signals too quickly. Bekoff showed, for example, that canids have a signal that means something like "the next display is not serious." When threat display is preceded by such a "play" signal the receiver responds differently than when threat alone is given. Bekoff's paper appears in the bibliography but is not cited here, where it could provide critical quantitative evidence for metacommunication. Smith also makes the useful distinction between "constructions" (signal structures built by animals) and "tokens" (things given by one animal to another)—a distinction I failed to grasp when treating extrinsic optical signals.

The book then goes on to show how the signal and the context in which it is given provide information to the receiver such that together these constitute the "meaning" of communication. The meaning, in turn, leads to responses of the receiver, which establish the function served by the sender's communication. The text then proceeds to the evolutionary origins of signals—the "differentiation of displays from their precursor acts" (p. 326)—and usefully identifies five processes of "formalization." These are (1) the alteration of the origin's physical form to provide novel signal elements, (2) selection of a portion of the origin to use as a signal element, (3) prolongation or repetition of an entire act, (4) change in timing to provide special sequences relative to other acts or events, and (5) modification of how the act is performed in space. Some of the examples are already outdated (e.g. Lorenz's interpretation of mallard inciting, which Stillwell and I recently showed to be incorrect), but Smith's categories are an original contribution that helps understand ritualization processes.

When moving to the "effects of evolution on the forms of displays and accoutrements" the text once again betrays confusion about information theory. On page 349 distortion is said to create equivocation in the receiver, but in fact noise does this, whereas distortion is merely the alteration of signals that recodes but does not change their informational content. Here there is also the implication that redundancy merely "repeats information," whereas in fact redundancy is a sophisticated measure of how inefficiently a communication channel is utilized (and hence includes repetition as a special case). In all, however, this is a strong chapter on the relation of displays to the environments in which species live.

"Redefining the display concept is the main goal" of chapter 13, and although there is a useful discussion of problems, no real redefinition is forthcoming. In the end (p. 424) Smith merely recommends certain descriptive aspects: a display is specialized for communication, it may vary, and different units may be recombined in various ways. The real contribution of Smith's thinking here strikes me as the distinction between ritualized behavior (evolved for signal function) and conventionalized behavior (signal function that is imposed by culture or individual learning experiences), which together make up formalized behavior. Smith goes on in the following chapter to describe formalized interactions, characterized by particular sequences of movements, constraints on the progress of interaction, orientations of the interactants, and specializations of timing and sequencing of interactive behavior. Ethologists have paid too little attention to the structure of interactions, and Smith usefully reviews a number of studies on human interaction to help derive his characterizations. Here one wishes that he had had access to the perceptive studies of Jeffrey Baylis on courtship interactions in fishes.

If this were not an important volume one would obviously dismiss it with a couple of sentences of review summary. Promoting it through analysis, as I have done, almost prevents sensible summary. Smith's position as an original and productive contributor to the understanding of animal communication is secure without this book. Along with Marler and Sebeok and then later Gordon Stephenson and Timothy Johnston, Smith helped introduce semiotic notions into ethology (although he seems unaware of contributions of the latter two colleagues). Smith also forcibly drew our attention to the role of context in providing information in communication, although he still treats this as an empirically established generalization rather than the logical necessity that I believe it to be. The value of this book lies in its bringing together Smith's various ideas and in laying bare the framework that he finds useful for studying communication.

Smith has done a first-class job in presenting his framework, and only because he has done so was it possible for me to specify the reservations I have concerning it. I feel in summary that Smith's conceptions have not grown as fully as they might with the expansion of studies about animal behavior and communication. The ethological outlook on behavioral control seems lodged in the approaches of a decade or two ago, and this book pays too little attention to modern, quantitatively and cybernetically oriented studies pioneered by Nelson, Heiligenberg, and other highly creative investigators. The semiotic input is almost directly from Colin Cherry's *On Human Communication,* and it might be worth going back to Charles Sanders Peirce himself, then C. W. Morris to obtain a fuller appreciation of semiotic notions. This volume clearly misrepresents Shannon's mathematical theory of communication at several junctures, I think because Smith sees Shannon through the pen of Warren Weaver. Weaver tried to find a place for Shannon's studies of telecommunication in a more general framework of communication, but Weaver's outlook was basically that of conscious, human communication. Shannon's theory dealt with a known, closed channel (which applies to precious little animal signalling) so that considerable mental maneuvers are required to make Shannon and Weaver relevant to animal communication. Finally, the book shows throughout the mark of the author's own expertise, which is at once a strength and weakness: when encountering each new conception of Smith's, I nearly always hear a bird faintly vocalizing in the distance.

These sources of constraint on Smith's conceptualization of communication are not crippling. However,

one obtains the feeling that he developed the framework as a pioneering effort years ago, using it without revision in the ensuing years as a base for empirical research. One might hope that in the next increment of his studies Smith will consider some revisions that will render his framework more operational and responsive to other viewpoints, while retaining his own important and original points throughout. As we wait and watch, however, we should also read this milepost. Somerset Maugham said that "people ask you for criticism, but they only want praise." Yet those who really understand the sociology of science know that considered criticism springs only from implicit praise, and praise is the appropriate note on which to end.—JACK P. HAILMAN.

The Biogeochemistry of Blue, Snow and Ross' Geese.—Harold C. Hanson and Robert L. Jones. 1976. Carbondale, Illinois, Southern Illinois University Press. xvii + 281 pp., 266 figures, 45 tables, 17 maps. $15.00—Biogeochemistry, "a study . . . of the relationships of mineral concentration in the various trophic levels of the ecosystem, the mode of transfer of these minerals from one trophic level to the next above, the mechanisms and factors involved in mineral transfers, the metabolic relationships of the concerned minerals to each other in each trophic level, and factors relating to their deposition in feather keratin," provides the intellectual framework for the work. The ultimate goal, as indicated above, is to use the mineral content found in feathers of birds of unknown origin to establish their breeding grounds. Reliable results would depend on the existence of a series of absolutely accurate and dependable values for all populations and firm experimental evidence that the distribution of minerals in the feathers of the reference population is constant over long periods of time and relatively insensitive to fluctuations due to variables such as dietary conditions or unusual weather conditions during or preceding feather growth. They must also be consistent from year to year and the system must accommodate factors such as differences in age, sex, and color. Hanson and Jones try to estimate most of these factors. Unfortunately, each step of the data gathering, analysis, and interpretation is surrounded by numerous real or potential pitfalls. As a result the presentation is liberally interspersed with caveats, circular arguments, speculation, and excuses (e.g. p. 198). They state early (p. 7) that ". . . because of the variability of the analytical techniques employed, the variable nature of avian metabolism, and the place-to-place variability of the mineralogy of the breeding ground environment of any given population, this report cannot be considered definitive or final." I agree.

Hanson and Jones make a valiant attempt to encompass and relate a tremendous quantity of data. By their own admission, they suffered inconsistencies in sampling, lost samples, "inherent uncertainty of the instrument," problems with reproducibility in replicate samples, inadequate statistical procedures, and, in some places, poor editorial review. They attempted, with samples from known localities, to establish variation between sexes, within populations, colonies, and specific geographic localities. To be fair, certain of the correlations seem to be valid. However, when it was possible to correlate a specific pattern with a given locality and relate it to the major soil features, patterns were not necessarily duplicated from year to year. Distribution of certain elements differed in molting and flying birds from the same population. Differences appeared in some elements regardless of absolute level of concentration and variability. In the analysis of the various colonies (chapter 4), subpatterns were a constant source of confusion. Often these results reflected individual variation or a pattern shared by a small number of individuals. The authors remain conservative in their interpretation, firm in their belief that the variation was non-genetic in character. Yet the results are equivocal and the existence, and thus the significance, of subpatterns as illustrated by figures 51 through 59 is never adequately confronted. The question resolves itself as to whether the patterns represent an important difference related to the local physiography and thus play a potentially important role in the analysis of origin or if they simply represent noise in the system.

This work faces at least one critical question, and it permeates the entire book. Namely, precisely how, if at all, does the level of a given element in the feather reflect its level in the environment. An adequate answer must consider at least three parameters: the non-biological environmental level and availability, the movement and levels in the food chain leading to its consumption by the geese, and then the degree and intensity of its physiological regulation by the individual. The geese considered here breed and molt in a relatively simple plant environment. The geological situation, which determines the types and relative abundance of the minerals, is complex. The rock structure is not the only factor involved, as other environmental processes such as the amounts and distribution of precipitation and local geomorphology must have an effect. The plants on which the animals feed are well known as are aspects of their mineral metabolism. There is somewhat less information on their distribution in the environment and their distribution in the diet; e.g. do animals select specific plants for consumption. We also know relatively

little regarding the variability in mineral levels in the specific plants involved. Finally, next to nothing is known about mineral metabolism of birds. The authors were faced with the horrendous task of sorting the interrelationships among these, and other, parameters.

One important dilemma with which the authors deal is the possible mechanisms that determine the level of mineral elements in the body. After suggesting strongly that "feather mineral patterns are primarily a result of metabolic interactions with the environment and are not a result of genetic processes" they return repeatedly to consideration of the factors presumably responsible for the patterns. Their conclusions, based on consideration of soil type, diet, and information on absorption, utilization, and excretion of individual elements are weak. Exceptions are rampant and the different distributional patterns of the element, the variation in absolute levels, and the variability all combine to undermine most of the conclusions that probably should only be thought of as trends. Total mineral levels, correlation with other elements, solubility in both soil and the gut, influence of sex, growth, and time of collection after molt are all factors that need to be dealt with. Hanson and Jones admit that ". . . due to many elemental contradictions within and between various components of the environment and to metabolic controls and ion interactions (particularly those directly and indirectly related to sodium intake) within the body of the goose, elemental levels in the feathers are not wholly (in some cases indirectly) related to environmental levels."

In yet another direction the contribution of the skeletal system, particularly the mineral reserves of the bone, are essentially ignored. No evidence is presented that discusses the level of medullary bone preceding or during the molt, the levels of free and bound minerals in plasma whose origin is the bone, or the rate of flux of the various minerals between bone and plasma. It is conceivable that the contribution here, especially of calcium and phosphate, may be significant. There is also no discussion of the hormonal systems that regulate these ions during the period of feather formation and growth.

I am somewhat uneasy about this presentation and feel it may be premature. It could have been reduced considerably and published as a preliminary report to be followed by the longer presentation. The interpretations should be subjected to extensive review and will certainly stimulate discussion. A more direct presentation would have set the speculation into better perspective, and the portions given to literature review and value judgements might reflect better their real value. Nevertheless, the volume represents a great deal of work and thought. It points out an area of research with a great deal of potential as well as indicating significant gaps in our present understanding of the physiology, ecology, and biogeochemistry of birds. Regardless of the feasibility of reaching the potential goals, many of the ideas the authors suggest can be tested and will certainly serve as impetus for investigators to move in new and perhaps significant directions.—ALAN H. BRUSH.

The Screech Owl: Its Life History and Population Ecology in Northern Ohio.—Laurel F. VanCamp and Charles J. Henny. 1975. North American Fauna No. 71. v + 65 pp. Obtainable free of charge from the junior author at U.S. Fish and Wildlife Service, 480 Southwest Airport Road, Corvallis, Oregon 97330.—This report presents basic life history and population information about Screech Owls in northern Ohio over a 30-year period. The owls studied were nesting in boxes established for Wood Ducks along rivers, creeks, and marshes near Lake Erie. No special trapping techniques were required as the Screech Owls readily used these nesting boxes and could be easily captured while in them. More than 3,000 owls were captured and banded; 500 were recaptured after the initial banding, some 10 or 15 times. Over 500 nesting attempts by the Screech Owls were recorded.

The senior author initiated the study in 1944 and collected the field data through 1973. His meticulous records may well be the finest body of data known for a population of a single bird species, enhanced as it is by the time span of 30 years. The junior author analyzed those data and wrote the report. He conducted a pesticide study on the eggshells in 1973.

The owls used the boxes for nesting, roosting, and feeding. They carried their prey into the cavity to eat it and also to store it there. Screech Owls did not use the boxes during late summer and early fall when the leaves of deciduous trees are present. Their nesting commenced earlier than that of the Wood Ducks; in fact Wood Ducks were found nesting in boxes after young Screech Owls had fledged. Screech Owls kept Starlings, which sometimes usurp Wood Duck nests, out of the nest boxes within their feeding areas. Therefore Wood Duck nesting success is enhanced by the presence of Screech Owl nesting.

The Screech Owl is an opportunistic feeder. The diet changes with the seasons of the year, i.e. during the nesting season migrant birds replace mammals in importance, and during the late summer insects become important. Nesting is timed so that the Screech Owl can take advantage of the spring migration of small birds to feed its young. Most of the prey were stored in the nests during the first 2 weeks after

the young hatched (late April and early May); over 53 species of birds were recorded as stored food items. "A nest box containing four young screech owls at the Winous Point Shooting Club had 40 dead birds stored on 5 May 1972. When the nest was revisited on 22 May 1972 to band the four young, no food was left in the box."

There is no evidence from the banding data to suggest that Screech Owls in the northeastern United States migrate. Adult birds remain close to the area where they previously nested. Young Screech Owls dispersing from their natal areas in late summer and early fall comprise two groups: about one-fourth remain within 10 km of the banding site; the rest wander considerable distances, at random directions.

Pairs of Screech Owls were noted in the nest boxes in early February, but egg laying did not peak until about 15 March. The mean clutch size was 4.43 with a mean of 3.80 young fledged per *successful* nest. An estimated 69.2% of the nesting attempts were successful; raccoon predation was implicated in a number of unsuccessful nesting attempts. No significant eggshell thinning was detected in 1973. The sex ratio of the population did not differ significantly from 50:50. The first year mortality rate of the Screech Owl was estimated at 69.5%, adult mortality at 33.9%. Male and female Screech Owls banded as nestlings were known to nest successfully as 1-year-olds. Two estimates of the average proportion of 1-year-olds nesting ranged from 77 to 83%.

In northern Ohio, the Screech Owl population consists mainly of gray- and red-phased birds but about 2–3% of the birds are intermediate in color. A significant change in the ratio of red- to gray-phased birds occurred in December 1951, coinciding with the lowest temperatures and heaviest snowfall during the 30-year study. Red-phased birds decreased from 23.3% of the population to 14.7%. The ratio of reds in the population failed to increase to pre-1951 levels during the next 20 years. An index to annual abundance suggests that the Screech Owl population fluctuated in northern Ohio during the last 30 years, but with no apparent long-term trend.

Since publication of North American Fauna No. 71, the observation that the red phase is less able to withstand cold than the gray has been further documented by Mosher and Henny (1976, Auk 93: 614–619). VanCamp meanwhile has continued to observe a decrease of red-phase owls in the Wood Duck boxes and finds that as of mid-1978 the proportion has dropped to 10%.—JOE T. MARSHALL.

ALSO RECEIVED

The Ohio Country from 1750 to 1977—A Naturalist's View.—Milton B. Trautman. 1977. Ohio Biological Survey Biological Notes No. 10. 25 pp. $2.75. (Available from Ohio Biological Survey, 484 W. 12th Ave., Columbus, Ohio 43210).—A capsule account of the changes in habitat and fauna accompanying the transformation of Ohio "from what some believe to have been a 'howling wilderness' into what others consider the epitome of civilization." Changes in the distribution and abundance of several bird species are discussed in a qualitative manner, drawing from published and unpublished accounts and from Trautman's 60 years of field work in the state.—J.A.W.

Colorado Bird Distribution: Latilong Study.—Colorado Field Ornithologists in cooperation with the Colorado Division of Wildlife. 1978. 58 pp. $2.00. (Available from Colorado Field Ornithologists, Judd Sundine, Treasurer, 5325 Garland, Arvada, Colorado 80002).—This report summarizes the distribution, abundance, and habitat preferences of the birds of Colorado as of January 1978. The information is presented on a regional basis, using a plotting system based on latitudes and longitudes ("latilong" blocks). Codes are employed to indicate the status of species in particular latilong blocks, as well as their relative abundances and the habitats in which they most frequently occur. The survey is intended to stimulate field workers in Colorado to gather additional information on particular species or regions.—J.A.W.

Pilgrimsfalk. Report from a Peregrine Conference held at Grimsö Wildlife Research Station, Sweden.—Peter Lindbert (Ed.). 1977. Stockholm, Swedish Society for the Conservation of Nature. 70 pp. 10.85 SW CR. (excl. handling and postage). (Available from SNF, Kungsholms strand 125, S-11234, Stockholm, Sweden).—This report contains 12 short papers (10 in Swedish, with English summaries) delivered at a conference held in Sweden in April 1977 to review the status of Peregrine Falcons in northern Europe. The contributions review national Peregrine projects, population trends, banding studies, food habits, and pesticide effects; many of the reports are preliminary.—J.A.W.

Roberts Birds of South Africa.—Revised by G. R. McLachlan and R. Liversidge. Fourth ed., 1978. Cape Town, South Africa, John Voelcker Bird Book Fund. 660 pp., 72 color plates, numerous black-and-white sketches, end maps. R 12,00.—This new edition of the basic reference on South African birds features a complete rearrangement of the color plates, including 31 new plates by Ken Newman. The species accounts give common names in English, Afrikaans, and native names, and describe the identifying features, distribution (range maps accompany each account), behavior and vocalizations, breeding, and food habits. Local races are briefly documented where appropriate. While a bit bulky for a field guide, the illustrations and accounts are clear and concise, and this revision increases the usefulness of this already essential handbook.—J.A.W.

The English Sparrow in the American Landscape: A Paradox in Nineteenth Century Wildlife Conservation.—Robin Doughty. 1978. Oxford, England, School of Geography, Univ. of Oxford Research Paper 19. 36 pp. No price given.—This short essay attempts to review the formulation and development of attitudes toward the "English" (House) Sparrow (*Passer domesticus*) in the United States "by an examination of the reactions of expert and popular opinion to the new bird in the expanding urban milieu." The emphasis is thus not on documenting the spread of the species following its introductions in biological terms, but in exploring sociological reactions to the species. Thus: "It is not difficult to interpret the public's dislike of the English sparrow as more than anger over economic losses. The animal was a foreigner who thrived in congested city areas just as immigrants did. It utilized the resources of native birds as foreigners were taking jobs away from Americans. Its clannishness was one of its strengths and permitted it to colonise new areas" (p. 28). As none of the papers published in Ornithological Monographs No. 14, "A Symposium on the House Sparrow (*Passer domesticus*) and European Tree Sparrow (*P. montanus*) in North America," is cited, one must wonder how extensive the author's sociological research was as well, and just how much of this to believe.—J.A.W.

The paintings of Norman Lighton for Roberts Birds of South Africa.—A. V. Bird (Ed.). 1977. South African Natural History Publication Co., Cape Town. vii + 56 plates (no price available).—This book was published to honor the artist Norman Charles Kingsley Lighton. The 56 plates, illustrating 1,032 birds, are those he painted for *Roberts Birds of South Africa* but are presented here in much larger format. The reproduction of the plates is excellent and exhibits the quality of Lighton's artistry. It was pointed out in the introduction that the original book has sold over 100,000 copies, which is an astounding figure and a tribute to both Roberts and Lighton. Those persons interested in bird paintings or in the birds of Africa will find this book of value.—JOEL CRACRAFT.

Why Big Fierce Animals are Rare. An Ecologist's Perspective.—Paul Colinvaux. 1978. Princeton, New Jersey, Princeton Univ. Press. viii + 256 pp. $9.50.—Paul Colinvaux has a certain flair in his writing, and this is nowhere more evident than in this book, a collection of essays on various ecological topics directed toward the general public. The essays deal with such topics as niche relationships, species abundance and diversity patterns, population cycles, social spacing systems, succession, ecological energetics, and foraging, to name but a few. While the writing and the superficialities may cause professional ecologists to wince at times, non-scientists will find the approach refreshingly stripped of the abstractions that characterize much of the current thinking in ecology. For non-professionals interested in natural systems, it should be interesting reading.—J.A.W.

Ornithological Gazetteer of Bolivia.—R. A. Paynter, Jr., M. A. Traylor, Jr., and B. Winter. 1975. Cambridge, Mass., Harvard College. vi + 81 pp. $1.75; **Ornithological Gazetteer of Ecuador.**—R. A. Paynter, Jr. and M. A. Traylor, Jr. 1977. viii + 152 pp. $5.00; **Ornithological Gazetteer of Paraguay.**—R. A. Paynter, Jr., and A. M. G. Gaperton. 1977. iv + 43 pp. $1.75 (all obtainable from Bird Department, MCZ, Harvard University, Cambridge, Mass. 02138 or Bird Division, Field Museum of Natural History, Chicago, Ill. 60605).—These gazetteers, each with a map of the country, should be invaluable to students of South American avian systematics and biogeography. Information following each locality includes habitat, altitude, and references to papers in which the locality is cited. Reference is made to standard maps or a major work such as Gyldenstolpe's 1945 paper on the birds of northern Bolivia. I agree with the recommendation of Parkes that inclusion of latitude and longitude would be a valuable addition to the information contained in these gazetteers. These small volumes should be in the library of any ornithologist working with South American birds. Paynter and Traylor are to be congratulated for their efforts and encouraged to continue this series of gazetteers.—W.J.B.

The birds of the Ligonier Valley.—Robert C. Leberman. 1976. Pittsburgh, Carnegie Museum of Natural History, Spec. Publ. No. 3. x + 67 pp, 6 color plates by H. Jon Janosik. $5.00.—Ligonier Valley lies about 65 km east of Pittsburgh, Pennsylvania and contains the Powdermill Nature Reserve, a 730-ha reserve and research station of the Carnegie Museum of Natural History. This work deals with the distribution of the 254 species of birds reported from the Ligonier Valley, an area of almost 260 km^2 between the two westernmost ridges of the Allegheny Mountains. The work is based mainly on observations made since 1956 when the museum acquired the Powdermill Reserve. Work by Leberman started in 1961 when he established the bird banding program. He was resident from early March to mid November until 1974, but in 1975 became a permanent resident of the area. Hence, the observations suffer from a 4-month gap in the winter. The species accounts are brief, about five per page, but are very well written and contain maximum information, emphasizing the current status of each species.

The volume is of special interest because all the contributors are self-taught and amateurs, as pointed out by Mary Clench in the preface. This study and published report is an excellent example of the valuable contribution that can be made to ornithology by amateur workers, especially with the active support and encouragement of professionals.—W.J.B.

Ornithologie.—Einhard Bezzel. 1977. Stuttgart, Eugen Ulmer, (UTB 681). 303 pp. 19.80 DM.—The red-covered Uni-Taschenbücher are familiar introductory books on the college level on many subjects in Germany. This ornithological text has its greatest strengths in ecological and behavioral areas. A bibliography of 726 titles is included with a surprisingly large number of works in English (at least 30% and perhaps as much as 40%). This volume is not a replacement for ornithological texts available in English, but is a good supplementary volume for material to present in lectures and references to recent non-English literature.—W. J. B.

Birdlife of the Adirondack Park.—Bruce McP. Beehler. 1978. Glens Falls, N. Y., Adirondack Mountain Club. xi + 210 pp.—The Adirondack Park is a huge area of about six million acres in northeastern New York State, one of the largest preserves in the United States. Mr. Beehler has written an excellent summary of the birdlife of this region including historical comments. The latter are especially interesting because they draw heavily on the survey of C. Hart Merriam published in the early 1880's. Beehler presents a good summary of the topography and habitats of the Adirondacks and a short history of changes since the beginning of the last century. The species accounts are concise, containing much information. My only objection is to the inclusion of "Field Marks" which every author of a regional avifauna feels required to include, but are absolutely unessential in these days of excellent field guides. This work started as an undergraduate honors thesis at Williams College and was completed when the author was engaged in ornithological studies in Wau, New Guinea. It is an excellent example of what a dedicated student can accomplish when encouraged properly. Mr. Beehler is to be congratulated for his excellent summary of Adirondack birdlife.—W. J. B.

Where to Watch Birds in Europe.—John Gooders. 1978. New York, Taplinger Publishing Company, 2nd edition, 299 pp. $10.95.—This is a guide to places to see birds in Europe, including eastern Europe up to the U.S.S.R.; arrangement is by country. Each country account opens with a simple map showing the approximate location of each birding area discussed. Only a limited number of areas, about a dozen, could be included per country. Each area is described with details of the habitat and the birds that can be seen at different seasons. Maps are included for larger areas such as the Camargue and Texel. Instructions to reach the area are given when necessary as well as comments on hotels, camping, etc. Names and addresses of ornithological and conservation societies and literature are given. This book would be a valuable guide to any bird watcher planning a visit to Europe and wishing to look at birds in addition to art museums and cathedrals.—W. J. B.