Book Reviews

Ornithology

Collected Papers in Avian Paleontology Honoring the 90th Birthday of Alexander Wetmore. Storrs L. Olson, Ed. Smithsonian Institution Press, Washington, D.C., 1976. xxvi, 212 pp., illus. Paper. Smithsonian Contributions to Paleobiology, No. 27.

This festschrift for Alexander Wetmore begins with two "Appreciations," from S. Dillon Ripley and Jean Delacour; Storrs Olson then gives an account of Wetmore's work on fossil birds, outlining his main areas of study. Also included in the introduction are a bibliography of Wetmore's paleo-ornithological publications and an index of all the taxa he erected, with references to the relevant publications.

The volume contains 18 papers covering a diversity of subjects ranging from the evolution of avian flight (considered in the light of evidence taken from *Archaeopteryx*) to subfossil birds such as moas and flightless ducks. Several new taxa are described; these include a new order, the Alexornithiformes, which Brodkorb erects for a new Cretaceous land bird apparently ancestral to the Coraciiformes and the Piciformes, and a new family, the Primobucconidae, which Feduccia and Martin propose for some of their piciform birds. Other papers raise interesting taxonomic and zoogeographic questions that indicate that certain hypotheses may have to be rethought. Ostrom's paper "Some hypothetical anatomical stages in the evolution of avian flight" takes up a topic that, as he notes, has never been discussed in detail. He traces what he believes must have been the anatomical modifications that occurred from the forelimb of coelurosaurian dinosaurs, through the *Archaeopteryx* stage, to the wing of the modern bird capable of true powered flight. It is difficult to assess this well-presented paper without undertaking the research oneself, but I have two minor criticisms. First, though some degree of attachment of the remiges to the wing skeleton is doubtless necessary if the animal is to use them for powered flight (or indeed for any other purpose), their firm attachment is not invariably indicated by the presence of quill nodes on the ulna. The absence of such quill nodes in *Archaeopteryx*, therefore, should not be employed to support the idea that the animal was incapable of flapping flight, whatever other evidence there may be for that theory. Second, Ostrom's suggestion (first made in *Q. Rev. Biol.* **49**, 27 [1974]) that the forelimb could have been used as an insect trap is open to objection. Harrison (*Nature* **263**, 762 [1976]) makes it quite clear that if the wings had been used as a flyswatter the feathers would soon have become so abraded that they would have been rendered useless for that purpose; yet the specimens with feathers show no evidence of the type of damage. I therefore prefer Harrison's belief that the well-developed remex feathers probably served to increase the wing area and enabled the bird to glide; this would have been advantageous when it attempted to escape from predators.

I would also like to comment on the paper by Collins concerning the affinities of the "swiftlike" family Aegialornithidae, which he places within the nightjars (Caprimulgiformes). This family has hitherto been placed with the swifts (Apodiformes); as recently as 1975 Harrison, using all the wing elements attributed to *Aegialornis gallicus* in the British Museum, produced apparently satisfactory evidence that the group had more affinities with the swifts, particularly the tree swifts, than with the nightjars (*Ibis* **117**, 164 [1975]). Collins, on the other hand, bases his conclusions on the humerus alone, believing that the coracoids, the proximal phalanges of digit 2, and the tarsometatarsi (not seen by Harrison) are not correctly associated with the humerus and belong to the orders Charadriiformes and Coraciiformes. This may be true, for there is no record of any two elements' having been found in articulation; Harrison, however, does show that the nonhumeral wing elements are of commensurate size and possess characters that would allow at least a tentative association. Collins's arguments would have been more convincing if supported by detailed comparative drawings.

This collection of papers is a fitting tribute to one of the greatest ornithologists of our time, who has helped to keep alive the interest in fossil birds during a period when they were virtually ignored by most other workers. Olson must be congratulated for helping to produce a fine collection of papers, covering such a wide range of topics as to be of interest to all ornithologists.

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Noctuidae

Legion of Night. The Underwing Moths. Theodore D. Sargent. Photographs by Harold J. Vermes. Drawings by Katherine A. Doktor Sargent. University of Massachusetts Press, Amherst, 1976. xiv, 222 pp. $15.

Noctuid moths compose one of the largest families of animals, including more than 2500 species in North America. Among Temperate Zone noctuids, the largest and most spectacular are the underwing moths of the genus *Catocala*. With 71 species in the eastern United States and 33 to 37 species at individual localities, the *Catocala* provide rich material for studies of diversity, seasonal fluctuations in abundance, isolating mechanisms, and trapping methods. Moreover, their remarkable color variation, long a challenge to the naming abilities of even the industrious lepidopterists and a nightmare to nomenclaturists and bibliographers, has added to the popularity of the *Catocala*.

This volume surveys the species that occur in the eastern United States, summarizes biological information about them, and gives an introduction to research on their behavior, their relationship to predators, their seasonal abundances, and the like. Sargent's principal innovation is to present in layman's terms the status of and the opportunities for scientific research by all kinds of biologists and amateur collectors. His logic and some of the techniques he discusses can be applied to other kinds of insects in addition to the *Catocala*.

Underwings are so called because their forewings are cryptically colored, resembling the tree bark where they rest by day, while their hindwings, which are hidden when folded, are brightly colored—red, orange, or white banded with black. The hindwings are suddenly flashed when the moth is disturbed, and this is believed to function to deflect attacks or to startle potential predators. In addition to the antipredator function of the wings, the book examines such associated behavior as the moths' selection of backgrounds similar in reflectance to their wings and their choice of an appropriate orientation on barklike substrates. The theory that polymorphism is a means of preventing the presentation of a predictable image to predators is examined in connection with a study of damage patterns (beak marks) on moths that escaped attacks by caged birds.

The information summarized in the book is based on the work of Sargent and his associates published during the past decade and on new data accumulated by Sargent, C. G. Kellogg, and S. A. Hessel at three sites in Massachusetts and Connecticut. The percentages of the total catch made up by individual species showed seasonal fluctuations of great magnitude, varying from 5 to 35 percent in one case, and samples that were analyzed at five-year intervals were misleading indicators of scarcity, decline, or increase. Thus, many years were required to demonstrate the nature of the fluctuations among species. In other sections, Sargent urges that representative moths be kept—unsightly specimens as well as the immaculate ones commonly kept by lepidopterists—to document extremes of variation, seasonal occurrence, and other phenomena. In surveying sampling techniques, Sargent found that in 1970 a mercury vapor trap was 6 to 10 times more effective in attracting individual underwings than was black light, white light, or sugar bait, but that in 1971 it was only 1.8 times as effective as sugar. He also found that sugaring, the legendary, favored method for collecting *Catocala*, samples differentially: some species are partial to bait and would be judged rare without the use of it (one species was six times more abundant at sugar bait than at lights), but seven species never came to bait, including two which were among the 10 most common when light was used.

Although there are 20 times as many kinds of moths as there are of butterflies, there are probably 10 times as many collectors and students of butterflies in the United States as there are collectors of moths, and an important aim of this book is to provide a guide for identification. The text gives detailed accounts of 71 species and contains color plates depicting 126 specimens. Although a number of authoritative lepidopterists and major museums are acknowledged, this reader is unable to perceive the basis for the species determinations or for the distributional and biological data given. It appears that Sargent accepted existing taxonomic decisions and the associated literature, which generally with Lepidoptera means perpetuation of wholesale errors. Unfortunately, too, the color plates are mediocre, in part because a black background was used. Therefore the innovative goal, to communicate scientific research in terms understandable to laymen and to encourage their participation in it, may be blunted by the disappointing identification manual component of the book.

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Cell Biology

Calcium in Biological Systems. Papers from a symposium, Englefield Green, Surrey, England, Sept. 1975. Published for the Society for Experimental Biology by Cambridge University Press, New York, 1976. viii, 486 pp., illus., + plates. $42.50. Symposia of the Society for Experimental Biology, no. 30.

Almost a century has passed since Ringer first described the requirement of the bivalent cation Ca^{2+} for the maintenance of the contractility of dissected muscle. Following the sensational experiment of Heilbrunn and Wiercinski in 1947, which showed that injection of Ca^{2+} into muscle causes contraction, Sandow postulated that Ca^{2+} serves as a link between excitation and contraction, a theory that became widely accepted after it was shown that the sarcoplasmic reticulum stores Ca^{2+} in the muscle. Soon it was realized that Ca^{2+} is a central regulatory substance controlling various cellular activities. Thereupon, the Ca^{2+} ion was promoted to the level of a second messenger of animal cells, a rank previously given to the cyclic nucleotides.

Calcium in Biological Systems is a collection of 21 papers dealing with the chemistry of calcium, its homeostasis, and the many cellular events it triggers. The coverage of the chemical aspects includes papers on the coordination geometry of calcium complexes (R. J. P. Williams), the calcium ionophores (M. R. Truter), and the detection of minute amounts of Ca^{2+} in the cytoplasm by use of the photoprotein aequorin (O. Shimomura and F. H. Johnson).

An important biochemical feature of calcium is its low intracellular concentration, which is controlled by established processes involving mitochondrial calcium uptake and the calcium pump of the plasma membrane (P. F. Baker; E. Carafoli and M. Crompton; A. B. Borle and J. H. Anderson; R. W. Meech). A. R. Terepka and collaborators, however, propose that calcium may be transported through cell membranes while sequestered in vesicles. This would be a new mechanism with two apparent advantages: "protection of mitochondria from exposure to high concentrations of calcium, and the avoidance of wide and potentially toxic fluctuations in cytosol ionic calcium levels." This idea is supported by K. Simkiss, who has found in invertebrate tissue intracellular granules that are often rich in calcium.

J. C. Foreman and collaborators report that rat peritoneal mast cells release histamine when stimulated by an antigen-antibody reaction or by dextran, provided calcium is present. The movement of ^{45}Ca and experiments with the calcium ionophore, A 23187, suggest that the entry of calcium into the cell is a primary event in the secretory mechanism. Cyclic AMP inhibits calcium transport across the cell membrane through the physiological calcium channels. The authors suggest the possibility that changes in cyclic AMP concentrations within the cell control the degree of secretion by limiting calcium entry. The involvement of both cyclic nucleotides and calcium in the control of cell division is described by M. J. Berridge, who builds a model around the feedback interactions that operate between these different second messengers.

The molecular basis of the calcium-induced contraction of the primitive organelle of *Zoothamnium* is analyzed by W. B. Amos and collaborators. The contractile apparatus, named spasmoneme, runs longitudinally within the stalk. During contraction, the spasmoneme equals striated muscle in power output per unit mass, although the basic elements of myofibrillar and flagellar motility, actin and tubulin, are lacking. The high power output is likely to be produced by a direct interaction between calcium and spasmin, the major protein component of the spasmoneme. Amos and his colleagues suggest that "the basic contractile event is a conformational change which the characteristic protein, spasmin, undergoes when it binds calcium ions."

Pioneers of muscle biochemistry (S. Ebashi, A. G. Szent-Györgyi) and physiology (R. Niedergerke, C. C. Ashley) evaluate the current state of knowledge concerning the interaction of Ca^{2+} with regulatory proteins and the events occurring during contractile activation of muscle. The concluding synopsis by A. Weber is essentially a broad perspective of calcium biology.