

## SCIENCE'S COMPASS

*Archaeopteryx* is the "missing link," poised to reveal how birds evolved. As a result, Shipman misses an opportunity to present the view that researchers seek to uncover the transformation and diversification of lineages through a long interval of time during which many features of modern birds appeared sequentially.

For similar reasons, although Shipman devotes many pages to discussing the flora of *Archaeopteryx*'s environment, the presence or absence of trees at the fossil site cannot distinguish between the trees down and ground up theories of the evolution of bird flight. *Archaeopteryx* is itself a member of a lineage that has evolved since branching away from the common ancestor it shared with later birds. This is not to say that we learn little about early flight from analysis of *Archaeopteryx*, but Shipman would serve her general readers well by more clearly distinguishing what can and what cannot be learned from these fossils.

Moreover, Shipman's original scientific contributions seem somewhat out of place in this book, which primarily concerns the history and critical review of a complex and often contradictory literature. By entering the discussion as a scientific contributor, Shipman tries to simultaneously adopt the perspectives of impartial outsider and of active participant, a difficult position at best. Her analyses are quite limited in scope. She compares the positions of *Archaeopteryx*, shorebirds, passeriforms, and ducks on plots of wing shape versus body mass. She also compares the ratio of limb to body length in *Archaeopteryx* with that of insect models previously analyzed to assess the relative importance of thermoregulatory and aerodynamic functions. This latter effort is particularly problematic. Even large flying insects such as dragonflies are far smaller—often two to three orders of magnitude smaller—than a 200- to 250-gram *Archaeopteryx*, and this size difference has a profound effect on both thermoregulation and locomotion. As a consequence, results of analyses of insect wings cannot be applied to an animal the size of *Archaeopteryx* without appropriate scaling.

The challenges confronted by the kind of synthesis required in a book like *Taking Wing* have also been multiplied by circumstance: this book has come out in the midst of a truly remarkable time in the study of bird origins and evolution. New fossil taxa closely related to *Archaeopteryx* and its nearest relatives are being uncovered at an unprecedented rate, and the evidence for furculae and feathers in unquestionably dinosaurian taxa grows continually stronger (2). Hence, parts of this book are already outdated, as Shipman notes in the concluding chapter. On the other hand, general in-

terest in these topics is certainly increasing as we learn more about *Archaeopteryx*'s extinct relatives. Shipman's discussion of these important and enigmatic fossils and their possible implications is, perhaps, all the more timely, and can serve as a starting point for readers unfamiliar with the territory.

In the end, this is a book about both the history of the *Archaeopteryx* fossils and complex and compelling issues in evolu-

tionary biology. Although it has mixed success in analyzing the controversies over the origins of flight, it is a pleasure to read for its vivid chronicle of the inquiries of paleontologists and comparative biologists.

### References

1. C. Darwin, *On the Origin of Species* (Murray, London, 1859), p. 182.
2. Q. Ji, P. J. Currie, M. A. Norell, S. A. Ji, *Nature* **393**, 753 (1998).

### BOOKS: ECOLOGY

## Mapping Natural Communities and Ecosystems

### A Classification of North American Biotic Communities

by David E. Brown, Frank Reichenbacher, and Susan E. Franson

University of Utah Press, Salt Lake City, 1998. 152 pp. Paper, \$19.95. ISBN 0-87480-562-7. With 1:10,000,000 map, \$34.95. ISBN 0-8748-0-568-6.

### Ecoregions

### The Ecosystem Geography of the Oceans and Continents

by Robert G. Bailey

Springer, New York, 1998. 186 pp. \$79.95. ISBN 0-387-98305-8. Paper, \$39.95. ISBN 0-387-98311-2.

Madrean Evergreen Woodland (on the west slopes of the Sierra Madre Occidental of Durango) and Rocky Mountain Subalpine Grasslands (in the White Mountains of Arizona) are two of the regional plant formations exquisitely illustrated in 118 black and white plates in Brown *et al.*'s *Classification*. The authors have used previous analyses and modified the existing terminology of ecologists and biogeographers to construct a new hierarchical classification system for biotic communities from the Arctic to Central America. They offer their system as a step toward a universal standard for biotic inventory, habitat assessment, and the identification of natural areas. It incorporates the limiting effects of moisture and temperature minima on the structure and composition of vegetation, and its validity

can be tested through statistical analysis of climate data and the distributions of plants and animals. In *Ecoregions*, Bailey takes a more generalized approach to mapping the world's ecosystems in which he stresses the importance of climate. He finds that latitude, relative continental or oceanic position, and altitude determine the type of regional ecosystem at a particular location, and that the patterns of sites within regions also recur predictably.

—SHERMAN SUTER



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