

Quaternary Environments

Late-Quaternary Environments of the United States. H. E. WRIGHT, JR., Ed. University of Minnesota Press, Minneapolis, 1983. In two volumes. Vol. 1, *The Late Pleistocene*. Stephen C. Porter, Ed. xiv, 407 pp., illus. Vol. 2, *The Holocene*. H. E. Wright, Jr., Ed. xviii, 277 pp., illus. Each volume, \$45.

Don't throw away your copy of *The Quaternary of the United States* from 1965. The volumes reviewed here replace the earlier work, which was edited by Wright and D. G. Frey, in part, but they are very different both in temporal coverage and in perspective. The key words in the title are "late-Quaternary" and "environments." The present volumes stem from a 1972 U.S./U.S.S.R. Cooperative Agreement in the field of environmental protection, and they will be complemented by a forthcoming volume, *Late-Quaternary Environments of the Soviet Union*. The volumes were intended for publication at the time of the 1982 Congress of the International Quaternary Union in Moscow but saw the light of day only early in 1984.

The present synthesis explicitly emphasizes environmental reconstruction and does so by contrasting full glacial conditions (mainly the late Wisconsinan) with full interglacial conditions of the Holocene. The time frame is, in general, from 25,000 to 10,000 B.P. for the late Pleistocene (volume 1) and from 10,000 B.P. to the present for the Holocene (volume 2), although some papers cover events earlier in time. The date of 10,000 B.P. for the Pleistocene-Holocene limit appears to have been tacitly and informally accepted by the authors, and no debate on that subject is found in this work.

The justification for the division of the subject matter into two volumes is largely the common assumption in paleoclimatic work that the Holocene is a representative interglaciation. However, the splitting of certain topics between the two volumes seems artificial, given that the Pleistocene-Holocene limit was transitional, not abrupt. At 10,000 B.P. the southern margin of the Laurentide ice sheet still lay in Lake Superior, sea level was still 40 meters or so below its present level, and a periglacial influence was still strongly felt by much of the biota. Certain chapters found in the sep-

arate volumes are much more satisfying when read together, for example, A. L. Bloom's contributions on sea-level and coastal changes.

The material is not presented with a stratigraphic or chronologic emphasis. There is a geographic subdivision, of course, but not one so highly fragmented as that in *The Quaternary of the United States*, in which the subject matter is divided along state lines in many cases. The chapters range from lengthy syntheses accompanied by extensive bibliographies, in some cases seven pages or so of fine print, to relatively short statements on circumscribed topics. Many chapters have brought together long, annotated lists of all available radiocarbon dates. Others have similar lists of important sites or occurrences of fossils. On the whole, these volumes are gold mines of information and bibliography on almost all Quaternary topics from glaciation to climatic modeling.

The first quarter of volume 1 is devoted to glaciation. Chapter 1, by Mickelson and others, is a particularly useful synthesis, including a series of maps that I predict will be widely used in future publications. From Montana to Maine these cover ice lobation and flow directions, drift textures, lithologies, and

thickness, and moraines and isochrons. The maps show an increasing use of formal lithostratigraphic names and an impressive synchronicity among the multiplicity of interstadial events now recognized. On the other hand, there is no presentation or discussion of the history of the glacial Great Lakes or of isostatic rebound to be found anywhere in either volume, which is the only major oversight that I have detected in the entire work.

Subsequent chapters in volume 1 treat non-glacial environments: fluvial systems, loess, soils, periglacial areas, and pluvial lakes. These are followed by discussions of sea level and of the characteristics of the oceans around North America and then by a lengthy section on Pleistocene biota, including humans.

Volume 2 begins with a very useful introduction by Wright, who encapsulates in some six pages the essence of the contributions that follow and, more important, summarizes the tripartite character of the Holocene epoch. The Early Holocene was a time of numerous adjustments as our continent passed from a glacial to an interglacial mode; the Middle Holocene was the time of maximum interglacial expression; and the Late Holocene has seen the beginning of climatic degradation, presumably leading into the oncoming Next Glaciation.

The subsequent chapters of volume 2 cover many of the same topics as are found in volume 1, with the main exception of ice sheet glaciation. Holocene volcanism is an important additional topic covered in volume 2, by Sarna-Woj-



"Sitka spruce characteristic of the lower Hoh River valley of western Washington." [From C. J. Heusser's paper in *Late-Quaternary Environments of the United States*]



"Polygonal pattern of underlying ice-wedge casts exposed along U.S. Interstate 80 about 24 km east of Rawlins and 100 km northwest of Laramie, Wyoming." [From T. L. Péwé's paper in *Late-Quaternary Environments of the United States*; photo by Brainerd Mears, Jr.]

cicki and others. They discuss volcanism in relation to geothermal data and plate tectonics and provide detailed information on and maps of the major tephrochronological markers that are proving so useful in the northwestern United States. Moreover, I would single out Knox's outstanding contribution on fluvial response to climatic change. This difficult topic is treated with clarity as Knox sorts out the relative roles of vegetation cover and flood frequencies on sediment yield and water discharge across different climatic regions, all of this in the face of changing circulation patterns. A standard response to the question "aggradation or incision?" cannot easily be transferred from one climatic region to another.

Also worthy of special mention is Stoltman and Baerreis's chapter on the evolution of human ecosystems in the eastern United States. The ecosystem concept is introduced as a new perspective on human prehistory based on the simultaneous evaluation of five variables (subsystems): environment, subsistence, population, technology, and social organization. This approach preempts the oversimplified analysis of cause and effect within a two-component system of "culture" and "environment." It is apparent that this chapter was written prior to the appearance of K. W. Butzer's *Archaeology as Human Ecology* (Cambridge University Press, 1982), with which there are some strong parallels.

Finally, the pervasive theme of climatic factors and climatic change throughout these volumes makes it clear that one cannot "do" Quaternary science these days without a good understanding of climate and its intricacies. The final chapter of each volume addresses the climatic system directly. Volume 2 ends with a summary by Kutzbach of climatic modeling, especially utilizing earth-orbital parameters as deterministic external forcing. His own experiment involving the 9000 B.P. insolation maximum, enhanced monsoonal precipitation and high-level tropical lakes is aptly reviewed. Barry concludes volume 1 with an outstanding summary of late Cenozoic climatic history; he focuses stepwise on progressively finer detail in passing from late Tertiary to late Wisconsinan time, the latter being treated region by region across the country. This account should be read by anyone who is looking for an authoritative thumbnail sketch of what we understand and don't understand about ice-age climates.

Late-Quaternary Environments of the United States is indispensable for any practicing Quaternary scientist. All of us will find several chapters of immediate interest. It is likely to be the standard reference on the interpretation of Quaternary environments for the next decade.

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Behavioral Neurobiology

Neuroethology and Behavioral Physiology. Roots and Growing Points. FRANZ HUBER and HUBERT MARKL, Eds. Springer-Verlag, New York, 1983. xviii, 412 pp., illus. \$33. From a symposium, Mainz, Germany, Sept. 1982.

Animal Behavior. Neurophysiological and Ethological Approaches. KIYOSHI AOKI, SUSUMU ISHII, and HIROMICHI MORITA, Eds. Japan Scientific Societies Press, Tokyo, and Springer-Verlag, New York, 1984. xx, 274 pp., illus. \$39.50. From five symposia, 1979–1982.

The two volumes reviewed here are part of a small but growing literature in a relatively newly defined subdiscipline of neuroscience called neuroethology. Neuroethology refers to the neural analysis of behaviors that occur under natural conditions, evoking names like Tinbergen, Lorenz, and von Frisch. These pioneer field behaviorists explained the mechanisms of behavior by means of such concepts as key stimuli, releasers, search images, innate releasing mechanisms, and fixed action patterns. Most neuroethologists take their marching orders from the ideas of classical ethology and probe the nervous systems of their animals for neural correlates of fixed action patterns, releasers, and the rest. The bestiary of neuroethology would gladden the heart of any zookeeper—bats, frogs, electric fish, exotic songbirds, owls, walkingsticks, and crickets, to name a few. The study of mechanisms of behavior remains important, and neuroethology has inherited the mantle from classical ethology. This reflects a split in ethology. Nowadays, field behaviorists draw less from classical ethology and more from population genetics and evolution and are more comfortable being called behavioral ecologists or sociobiologists; the emphasis has shifted to a different level of analysis—the evolution of behavior.

The volume edited by Huber and Markl is dedicated to one of the founding fathers of neuroethology, K. D. Roeder, whose death at age 71 in 1979 prevented him from seeing the growth of a field in which his visionary and brilliant studies set the style and tone; he was doing neuroethology long before there was a word for it, and his work on the evasive mechanisms of moths in relation to predacious bats is still one of the best examples of neuroethological research. The contributors to the volume are drawn from friends, collaborators, and students of Roeder's. Since he was an experimental entomologist, the volume is heavy on insects and light on the vertebrates.