Book Review

Quaternary Environments. Martin Williams, David Dunkerley, Patrick De Deckker, Peter Kershaw, and John Chappell, 1998, Second Edition, Arnold Publishers, London, xvi + 329 pp., $45.00.

Finding a single authoritative and comprehensive textbook for inclusive courses on Quaternary science is a challenge, especially for a mixed audience of geologists, geographers, archaeologists, ecologists, and engineers. Thus, *Quaternary Environments*, a revised and expanded version of the authors' 1993 edition, is a welcome addition. Two new chapters and a very good appendix on dating methods have been added, in addition to upgrading throughout. The comprehensive bibliography (38 pages) is up to date, as of the time of publication. Although the authors are all Australians, they have succeeded in covering Quaternary phenomena globally.

One might quibble that *Quaternary Environments* is not the most appropriate title for this work. The coverage is broader than just discussions of environments. It includes major chapters on techniques and assorted topics—pollen analysis, dating, causes of glaciation, a separate chapter on Milankovitch, interpretation of the deep-sea record, and human origins. Environments are covered explicitly in just four (of 13) chapters—on glaciation, sea level, rivers–lakes–groundwater, and deserts.

Moreover, coverage of various topics and environments is by no means uniform. The chapter on "Evidence from Terrestrial Flora and Fauna" devotes some 18 pages to pollen analytical methods, but only three pages to invertebrates and vertebrates, undoubtedly reflecting the fact that one author is a palynologist. The chapter on "Quaternary Glaciations: Extent and Chronology" includes only three pages on glacial processes and landforms, but the coverage of the extent and chronology of ice sheets and glaciers around the world is well done, including ice core and oxygen isotope records. Causes of glaciation (19 pages) and "The Milankovitch Hypothesis" chapter (34 pages) account for a whopping 53 pages (>20%) of the total 248 pages of text.

Of the chapters explicitly dealing with environments, Chapter 8 on "Rivers, Lakes and Groundwater" reviews the characteristics of fluvial systems and uses extended examples—Nile, Amazon, and Murray–Murrumbidgee–Darling—to illustrate three different systems. This is followed by discussion of lake morphology, hydrology, and various lake histories. Groundwater, however, is not treated in any detail. Chapter 9 on deserts is comprehensive, as one might expect from Australian practitioners. Causes of aridity, increasing Cenozoic desiccation, and aridity during glaciations are discussed, followed by description of desert and loessic (especially China) environments. The sea level chapter goes into great detail on causes of sea level change, including eustasy and isostasy, but does not describe coastal environments.

Quaternary Environments does not include any description or discussion of soils, other than to note their occurrence in the Chinese loess record. Nor is any space given to stratigraphic theory or concepts. The lack of discussion of soils in a book on environments seems a serious oversight.

Throughout the book, there runs a theme of the importance of Quaternary environmental change and processes on humans and, vice versa, the human impact on environments. The chapter on "Human Origins, Innovations, and Migrations" focuses first on the early emergence of hominids from Miocene origins through *Homo erectus*, before proceeding through the Early, Middle, and Late Stone ages, and concluding with the rise of domestication and its impacts in the Neolithic period. One omission concerning the spread of early hominids into Europe is lack of any mention of the important site of Atapuerca in Spain where the first occurrence of humans in western Europe is now dated at or near the Brunhes/Matayama reversal some 780,000 years ago. Overall this is a excellent chapter with surprisingly

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good coverage, given that none of the authors is primarily an archaeologist or anthropologist. It is clearly written for the reader who is not an archaeological specialist. Discussion of the human-environment impact is fully developed in the final chapter on "Environmental Changes: Past, Present, Future" which treats human population, biota, desertification, irrigation and salinization, and human effects on the atmosphere, that is, the enhanced greenhouse effect and global warming, and what might be done about these problems.

In spite of its unevenness, *Quaternary Environments* has broad, global coverage of environments, techniques, and topics that should be included in a well-rounded first course on Quaternary science. I would gladly use it. The writing style is very approachable, the text is nearly free of errors, the illustrations are well produced, and the price is affordable.

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