

Phanerozoic Geology

Paleomagnetism of the Atlantic, Tethys and Iapetus Oceans. ROB VAN DER VOO. Cambridge University Press, New York, 1993. x, 411 pp., illus. \$89.95 or £60.

While hiking in the high country or cruising on Interstate 95, you probably have crossed paths with a paleomagnetician or two without knowing it. In the opening passages of John McPhee's *Basin and Range*, morning traffic in New Jersey moves slowly eastward along the western approach to the George Washington Bridge and the Palisades Sill is exposed in massive roadcuts. A glance to the side reveals that "everywhere, in profusion along this half mile of diabase, there are small, neatly cored holes, in no way resembling the shot holes and guide holes of the roadblasters, which are larger and vertical, but small horizontal borings that would be snug to a roll of coins. These were made by geologists taking paleomagnetic samples."

Thousands of small core samples taken by hundreds of scientists and graduate students around the world each year form the foundation for Rob Van der Voo's *Paleomagnetism of the Atlantic, Tethys and Iapetus Oceans*. The clearly visible successes of paleomagnetic research include the confirmation of continental drift and the advance of plate tectonic theory, cornerstone issues that were developed in classic but now dated texts on paleomagnetism by Irving (1961) and McElhinny (1974). Although several other books on the subject have been published in recent years, Van der Voo's stands out because it distills and refines almost 30 years of research and scholarship devoted to the application of paleomagnetism to tectonics in general and to the geological evolution of the Atlantic-bordering continents in particular.

Van der Voo reminds us with an anagram that Paleomagnetism is also Not A Simple Game. Though a few introductory remarks about experimental technique and data interpretation are presented, those with little or no prior experience in paleomagnetism would do well to begin by reviewing R. Butler's introductory text *Paleomagnetism* (1992). The remainder of Van der Voo's book is a comprehensive and balanced paleomagnetic view of the evolution of the supercontinent Pangea, the Mesozoic opening of the Atlantic Ocean, and the closure of the Tethys to form the Alpine-Himalayan mountain chain. Van der Voo has painstakingly ranked and winnowed vast quantities of published data of variable quality, casting out less reliable information and merging the best paleo-

magnetic results with an informed structural and tectonic opinion. His book includes not only an extensive bibliography but a 73-page appendix where readers will find paleomagnetic data for Pangea and Gondwana neatly summarized, ranked for reliability, and referenced. The numerical rankings given in the appendix and justified earlier in the text are an excellent starting point but should not be substituted for careful reading of the original works and informed personal judgment.

The clever artwork on the cover of the book made me hope that equivalent attention had been given to the design of the 188 figures and photos found inside. Eighty figures are original but frequently not well done (the hand-drawn decaying sinusoid depicting alternating-field demagnetization is perhaps the least attractive), and the remainder are either taken as is or redrawn from previous publications. Some of the photographs seem to have little point, such as a picturesque Alpine village near a place where some interesting paleomagnetic data were collected, and the mixture of graphical styles is often rather jarring to the eye.

These deficiencies of appearance in no way detract from the wisdom, insight, and occasional wit contained in the text. Van der Voo's book is *de rigueur* for the paleomagnetician's bookshelf along with the classic works by Irving and McElhinny, and tectonics specialists will find it an invaluable reference in the use and interpretation of paleomagnetic data for continental reconstruction, paleogeography, and relative plate motion. Other readers on their way to the beach or the mountains this summer will now know why those little holes are there in the rock.

Michael McWilliams
Department of Geophysics,
Stanford University,
Stanford, CA 94305-2215, USA

Structural Materials

Biology of Fibrous Composites. Development Beyond the Cell Membrane. A. C. NEVILLE. Cambridge University Press, New York, 1993. viii, 214 pp., illus. \$64.95 or £35.

Charles Neville has been studying liquid crystalline structures in nature since he first recognized them in the early 1960s. He has been collecting beer bottles (full as well as empty) for even longer and has in his garage the biggest collection of them I have ever seen, including some exhibition ales nearly 100 years old. Neville has collected scientific references with the same glee, so I was



"Electron micrograph of a section through the cornea of an amphibian eye (common frog, *Rana temporaria*). The collagen fibrils form a neat orthogonal plywood. Micrograph courtesy of the late Dr. J. N. Lythgoe." [From *Biology of Fibrous Composites*]

not surprised to find over 500 in this slim volume. And I bet you Neville can quote them all, down to the volume and page number of the journal!

This type of tenacity and enthusiasm makes all Neville's publications interesting and useful, and this book is no exception. Neville wants to know what happens to structural biological materials once they leave the confines of the cell. He does not, therefore, deal with keratins, but includes all plant materials, collagen, bone, insect cuticle, and so on. The underlying theme is the self-assembly (which Neville convincingly differentiates from crystallization) of biological composites into structures with the morphology of liquid crystals, more particularly with twisted nematic (that is, cholesteric) architecture. If you have not met helicoids before, you cannot fail to be charmed by their morphology and amazed by their pervasiveness. There is hardly a corner of the biotic world that does not harbor a helicoid.

With the words "fibrous components" in the title, I was expecting to find an exposition of the application of composite theory to these materials, but what little mathematics there is concerns the fascinating optical properties of beetle cuticle, which can appear metallic and mirror-like owing to its structure. What I did find was a selection of excellent photographs and diagrams and a large number of useful and exhaustive tables, which together show