

BOOKS

Bringing the Earth Down to Earth: The Geology and Geologists of the Lower 48

Annals of the Former World

▶ John McPhee
Farrar, Straus, and Giroux,
New York, 1998. 696 pp.
\$35.00 hc ISBN 0-374-10520-0

Reviewed by W. Gary Ernst

James A. Michener opened many of his epic novels, such as *Centennial*, *Alaska*, *Hawaii*, and *Chesapeake*, with short but illuminating accounts of the regional geology; in some, he even described scenes of the area's prehistoric life. The hook in Michener's books, of course, is the riveting drama of human history unfolding through the context of the inextricably interlinked lives of individual people—good, bad, and indifferent, but all memorable.

John McPhee has turned this technique around in his literary works dealing with the geologic development of the lower 48 United States. In these books, in the company of one or another noted American geologist: Ken Deffeyes, Anita Harris, Karen Kleinspehn, Dave Love, Eldridge Moores, and Randy van Schmus, he travels across the land—generally not far from Interstate 80—and describes the geology of the regions he is crossing. We are treated to aspects of his companions' personal histories, and, in a real sense, the account is as much about what makes geologists tick as it is about their terrestrial subjects. We also learn historical facts associated with the regions being described (the California gold rush, environmental conservation versus land development, the vineyards of Napa Valley, and the like). McPhee's latest effort, *Annals of the Former World*, is actually a splicing together of four earlier books (all from Farrar, Straus, and Giroux) dealing with specific regions of the country, plus a minor amount of add-on connective material: *Basin and Range* (1981); *In Suspect Terrain* (1983); *Rising from the Plains* (1986); and *Assembling California* (1993).

The plate-tectonic revolution in the Earth sciences began in the 1960s, and McPhee uses it as a framework for the geologic development of the continent.

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Otherwise, just about all the science he touches on has been well known for more than a century, but the paradigm of plate tectonics made it possible to fit together seemingly unrelated geologic observations and data as parts of an integrated whole. Earth scientists around the world exulted over this satisfying new quantitative understanding of the planet, and many laypersons "got the picture" from articles published in newspapers, magazines, and popular books. In *Annals of the Former World*, McPhee has chronicled this intellectual advance, still on a popular level, but in far greater detail and comprehensiveness.

Annals is divided naturally and sequentially into five parts—one for each of the four previously published books, with their titles retained, and a new fifth part, a connector, called "Crossing the Craton." "Basin and Range" deals with the Great Basin of the western US, a region in which Earth's crust is gradually, imperceptibly being stretched and thinned because of inferred extensional flow in the hot, ductile mantle beneath this segment of the continent. This beginning part also includes primers on plate-tectonic principles and on the enormity of geologic time. "In Suspect Terrain" documents the growth of continents and the mountain-building process, as well as the intensely debated controversies surrounding these topics, with examples from the Appalachians to the Pacific Rim. "Rising from the Plains" uses the spectacular geology of Wyoming as the springboard for treatises concerning the evolution of the crust and mantle plumes (hot spots) as well as care of the land. "Assembling California" describes the amalgamation of the present collage of juxtaposed terranes (that's right, McPhee now recognizes "terranes" as blocks of Earth's crust, "terrains" as topographic features). The assembly was produced by geologically recent plate-tectonic motions, and it is still going on, as emphatically indicated by seismic activity along some of the many anastomosing faults that transect California.

The newly conceived section, "Crossing the Craton" mentions the ho-hum geology of the High Plains, but of much more interest, describes in some detail the geologic history locked

up in the ancient Precambrian basement beneath the surface cover strata. Most of the evolution of North America took place during the great sweep of Precambrian time, so this is a fitting conclusion to the peek-a-boo look at the better-preserved younger geologic terrains presented in the first four parts of *Annals of the Former World*. For easy reference, the book contains 22 simple but elegant relief maps and a rather complete subject index.

This book represents a very readable compendium of McPhee's earlier works, with modest updating. He has done the Earth sciences as well as the general public a truly remarkable service in popularizing the concepts of geology and the doings of Earth scientists. I recommend it to anyone who wishes to better understand our planet—not a bad idea, inasmuch as it is the only one we are likely to inhabit for the foreseeable future.

String Theory

▶ Joseph Polchinski
Vol. 1. An Introduction to the Bosonic String. 402 pp. \$49.95 hc
ISBN 0-521-63303-6

Vol. 2. Superstring Theory and Beyond. 531 pp. \$49.95 hc
ISBN 0-521-63304-4
Cambridge U. P., New York, 1998.

String theory is a theory of remarkable depth and intricacy and is a strong candidate for a unified description of all the forces of nature. On the way to this exalted status, it has done service in a variety of other roles.

It started out in the late 1960s as a theory of hadrons, and then it provided the foundations for supersymmetry, as a by-product of the inclusion of fermions into the theory. When it became clear in the early 1970s that quantum chromodynamics was the theory of the strong interactions, string theory found employment as a theory of quantum gravity, albeit in ten spacetime dimensions. When theorists realized in 1984 that string theory could also incorporate the gauge interactions and chiral fermions of the standard model in four dimensions, it found its current position as a "theory of everything." During the last few years, progress in string theory has occurred at a frantic pace, leading to