skilled mechanics (Oliver Evans, for example) and others were more skilled at promotion (Samuel F. B. Morse). The resulting story is the hoariest tale of Progress, a steady march from one improvement to another with only winners, no losers: American technology is one great free lunch. An entire generation of scholarship providing rich contextual complexity and a cautionary balancing of costs and benefits is missing.

Written in a folksy style, decorated with citations and issued by a trade publisher, *Nuts and Bolts of the Past* will find an undeserved audience and contribute to our continuing misunderstanding of the source, cost, and meaning of our technology. We deserve better.

CARROLL PURSELL
History Department,
Case Western Reserve University,
Cleveland, OH 44106

Evaporite Geology

Evaporite Sedimentology. Importance in Hydrocarbon Accumulation. JOHN K. WARREN. Prentice Hall, Englewood Cliffs, NJ, 1989. xvi, 285 pp., illus. $50. Prentice Hall Advanced Reference Series.

Evaporites and Hydrocarbons. B. CHARLOTTE SCHREIBER, Ed. Columbia University Press, New York, 1988. viii, 475 pp., illus. $57.

Gypsum, rock salt, and potash deposits have recently become targets of greater attention at geological conferences both in Europe and in North America. These two books on the subject, a textbook and a collection of papers, are thus timely. Both books are products of a growing realization that there may be a close relationship between evaporite occurrence and many pools of hydrocarbon accumulation.

Warren's textbook is a sorely needed addition to evaporite literature, a concise introduction to all aspects of evaporite geology, including shoreline and offshore textures in both marine and lacustrine settings, dolomites and dolomitization, and post-depositional salt movements. Warren deals with general concepts, such as mineralogy, diagenesis, environmental factors, or models of shoreline and lagunal deposits, and also with specific examples from various parts of the world. He interprets each topic in terms of significance for oil accumulation. The book is suitable for the petroleum geologist as well as the graduate student and provides a lengthy list of references.

Schreiber's book contains eight contributions of varying styles and impact. One chapter that deserves wide circulation is R. Evans and D. W. Kirkland's review of evaporitic environments as habitats of algae, bacteria, and other productive organisms. This chapter is most welcome because it is generally not appreciated that in rate of organic matter generation evaporitic environments vie with even the most productive terrestrial environments. In several examples, the authors demonstrate that this organic matter can be a source of petroleum generation. C. Pierre complements this review by discussing the application of stable isotope studies to evaporitic brine concentration and carbon and sulfur fractionation in the evaporitic brine pool. She gives a stimulating insight into what interpretations can be attempted with a judicious use of stable isotope chemistry.

In another chapter, A. C. Kendall suggests a model of evaporite genesis by seepage through a barrier, an idea proposed by K. R. Cercone, who is not cited. Also, Kendall does not document his claim that Ochsenius's silled basin model has been discredited. C. G. St. C. Kendall and J. K. Warren review peritidal evaporites, giving an excellent concise overview of settings along the Persian Gulf, in South Australia, and corresponding ancient examples. Regrettably the authors omit the substantial amount of French and Spanish literature of the last decade on very different North African and Mediterranean settings. C. R. Handford expands on the topic with a review of coastal sand flats in an evaporitic setting, where gypsum may accumulate but halite is only of ephemeral significance, as it blows away or redissolves.

In purporting to deal with subaqueous evaporite deposition, Schreiber discusses primarily gypsum and halite. She touches only very briefly upon potassic salts as expressions of desiccation and omits the hygroscopic K-Mg-, K-Fe-, Mg-, and Ca-Mg-chlorides, which are apt to decompose in their crystal water when exposed to the atmosphere. She also ignores the many other sulfatic K-Mg minerals abundant in Neogene, Permian, and other marine evaporite sequences and does not mention coarse siliciclastics in halite sequences such as the Vaca Triste intercalation in the Permian Basin of Texas.

R. O. Kehle writes about the origin of salt structures. Unfortunately Lerche and O'Brien's *Dynamic Geology of Salt and Related Structures*, Baar's *Applied Salt Rock Mechanics*, and the voluminous German literature on halokinetic movements and their causes do not seem to have been consulted.

In the final paper, R. D. Nurmi discusses seismic and well log signatures of reefs, grainstones, eolian sandstones, and salts under the North Sea, and potential pitfalls in data acquisition and processing. This chapter and the one by Evans and Kirkland should be compulsory reading for any petroleum geologist.

PETER SONNENFELD
Department of Geology,
University of Windsor,
Windsor, Ontario N9B 3PA, Canada

Outpourings of Lava

Continental Flood Basalts. J. D. MACDOUGALL, Ed. Kluwer, Norwell, MA, 1988. viii, 341 pp., illus. $96. Petrology and Structural Geology.

Flood basalts represent great outpourings of lava on dry land. They are surprising, because it is easier for magma to come out through thin ocean crust than through tens of kilometers of continental crust. Some magmas that emerge through continental crust show the expected mineralogical, chemical, and isotopic effects of crustal contamination. More surprising to some people are many flows that do not show contamination, evidently rising from the mantle through self-armored pathways that exclude contaminating crustal materials. The flood basalts are therefore of interest for what they teach us of processes in the earth, not to mention the structure and composition of the heterogeneous mantle beneath the crust.

Flood basalts range in age from Precambrian to a few million years, but examples older than 1200 million years are rarely preserved except in their dike roots. Some younger examples are in the news as possible causes for the catastrophic extinctions at the Cretaceous-Tertiary (K-T) boundary, in opposition to the asteroid impact hypothesis. The Deccan eruptions straddled this boundary in age and could perhaps have contributed to a darkening of the skies at that time.

Basalt floods produce spectacular landscapes over huge areas. People familiar with the U.S. Pacific Northwest may be surprised to learn that the vast basalts of the Columbia Plateau rank only tenth on the list of great flood basalts. The list, ranked by volume, is: Karoo, Siberia, Parana, Coppermine, Deccan, North Atlantic, Keweenawan, North Australia, Ethiopia, and Columbia. Many of the lava piles are associated with continental rifting, so they represent spillovers from small, early oceans. Others, like Columbia, are not far from subducting slabs at active continental margins.

Because of size and chemistry alone, these rocks are worth reporting. This book does it well, and about time. The 25 authors provide regional physical descriptions, ages, and petrographic and chemical data, and they discuss niceties and problems of origin

in a uniform, orderly way. The editor provides a concluding discussion and a comparison with oceanic basalts. Those who seek to carve into their gateposts a definitive statement on the origins of these rocks will look here in vain. The essential volcanology of magma delivery is also missing. Nevertheless, we find some gifted integrations of magma genesis, geochemistry, and isotopic chemistry, particularly for the North Atlantic Tertiary Province. We also find very welcome accounts of remote occurrences not often discussed in our literature, particularly those of Brazil, Ethiopia, Siberia, and China. Specialists will be interested to know that the Ethiopian basalts are not in fact mostly alkaline but tholeiitic except at upper levels. Others will be interested to learn that felsic (acid) lavas commonly occur among the basaltic lavas.

Most of all, readers will welcome the wealth of modern chemical and isotopic data of high quality (a special interest of the editor) and the good critical interpretation throughout this volume. They will deplore the absence of an index and a pooled list of references, and, most curiously of all, the lack of a table listing the sizes, ages, and effusion rates of the major flood basalts; I had to find the list above in a recent paper by H. Yoder (*S. Afr. J. Geol.* **91** [2], 139–56 [1988]). Comparison of his list and the contents shows some gaps in each; the book omits the older occurrences. But it tells most of us what we needed to know, in compact form.

STEARNS A. MORSE
Department of Geology and Geography, University of Massachusetts, Amherst, MA 01003

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