On Geological Time

The Abyss of Time. Changing Conceptions of the Earth's Antiquity after the Sixteenth Century. CLAUDE C. ALBRITTON, JR. Freeman, Cooper, San Francisco, 1980. 252 pp., illus. $12.75.

"I am confident," writes Albritton, "that someday the concept of geological time will be acclaimed as one of the more wonderful contributions from natural science to general thought." His confidence is surely justified: it is a story that deserves to be as well known as the analogous history of the concept of astronomical space. Albritton has adapted some earlier lectures into a readable popular account of some of the more striking episodes in the history of ideas about the age and development of the earth. He has read many of the original publications for himself and quotes from them effectively; he is also familiar with at least some of the relevant historical research of the past decade. His book is one that can be recommended to that convenient figure the general reader if he or she wants a first taste of the historical story.

After the first taste, however, the general reader ought to feel somewhat dissatisfied. This is history of science by a scientist, not a historian, and it is cast in the old heroic mold. Albritton is best on the history of estimates of geological time in the past hundred years, where the arguments are closest to the practice of modern geologists. Each of the earlier chapters, by contrast, deals almost exclusively with a single Great Man. The author's biographical sketches of these heroes are evocative and generally accurate on a factual level, and his summaries of their published writings are clear and concise. But the heroes are linked in a triumphal line of succession by little more than coincidences of dates and attributed conceptual influences. The line of succession leads almost inexorably from the first groping intuitions of Steno and Hooke to the pioneers of modern radiometric dating, disturbed and retarded only by the repeated intrusion of misplaced and misguided religious convictions. The reader is given scarcely a hint of what was generally "taken-for-granted" knowledge in a given period, against which an individual's conclusions might be judged innovative. There is little to indicate how conclusions that seem to us bizarre might have been highly plausible in earlier cultures. Above all, the theme of continuous conflict between a self-evident "science" and an undifferentiated "religion" is presented in terms that could have come straight from Draper or White a century ago.

The reason for this slant to the book is not hard to find, however: in Albritton's view the conclusions of modern geologists need to be defended here and now against the criticisms of fundamentalist creationists. They are the ones who are now suffering from "chronophobia" and who would like to squeeze geological time—at least in U.S. public schools—back into the straitjacket of a few thousand years, as it was in the days of Steno and Hooke. In other words, this is not just an absorbing historical narrative but also—just beneath the surface—a tract for the times. Albritton's notion of chronophobia is an interesting one that would have been worth pursuing. There is indeed some evidence in the historical record that people in Western societies have often found it difficult for imaginative reasons to accept the notion of a time scale that dwarfs human lives and even human history. This is not unlike their difficulty in comprehending the vast scale of the universe in space. But it is far too simple to equate this difficulty in imagining a vast time scale with religious reasons for adopting a literal interpretation of certain parts of the Bible. It is also too simple to equate the cultures of the 17th century, in which the precritical sense of a unitary biblical narrative was part of the ordinary knowledge of society, with the modern fundamentalists' deliberate rejection of the corresponding mainstream knowledge of present-day society (including modern theologians' critical methods of biblical hermeneutics).

Albritton quotes against the creationists the memorable graffito, "If daunted by the noxious stench / Exhaled from Time's Abyss, / Retreat into some lesser trench / Where ignorance is bliss." But his own story hardly begins to tackle the fascinating question why some people in the past have thought the stench noxious, or why some still do; or, in other words, why the vast quantitative estimates that have emerged in the past three hundred years should have been experienced humanly as an alarming abyss in the first place. His book, readable though it is as an introduction to the story, only highlights our lack of unified cultural interpretation of changing conceptions of the age and development of the earth and of mankind's place in it. What is still needed is a historical sociology of the perception of time in the natural world in relation to time in human lives; in that story the work of the great men of the past would find its true meaning.

MARTIN RUDWICK
Program in History and Philosophy of Science, Princeton University, Princeton, New Jersey 08540

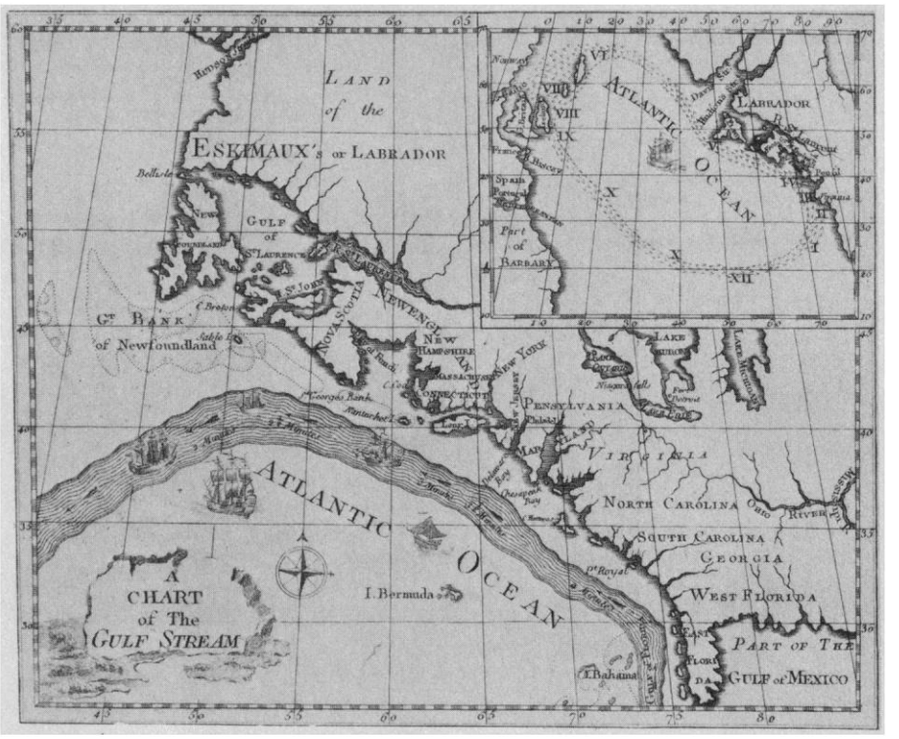
Matters Relating to the Sea

Oceanography: The Past. Proceedings of a congress, Woods Hole, Mass., Sept. 1980. M. SEARS and D. MERRIMAN, Eds. Springer-Verlag, New York, 1980. xx, 812 pp., illus. $37.50.

The third international congress on the history of oceanography was held in Woods Hole in late 1980 on the occasion of the 50th anniversary of the founding of the Woods Hole Oceanographic Institution. This book is a product of the congress, but because it was in print at the time of the congress it represents not the actual proceedings of that meeting but those intended.

What is, or was, oceanography? Historically, the difficulty and expense of making observations at sea have thrown together into single institutions scientists of otherwise divergent interests who had to club together to afford a ship, or at least a view of the beach. If we lived in the sea, instead of in the air, perhaps there would be "meteorographic" institutions, which would include, willy nilly, meteorologists as we know them, but also aeronautical engineers, ornithologists, lawyers involved in air pollution litigation, entomologists, continental geologists, and farmers. One can imagine the stresses and strains of such a place and the difficulty of writing a connected history of such a "discipline" of the "air." Such is oceanography, where many of the proclamations of interdisciplinary intellectual content reflect more pious wishful thinking than reality.

In this book we see a reflection of the kaleidoscope that is oceanography. Beyond the broad requirement that there be some connection, however remote, with



A version of Benjamin Franklin's 1786 chart of the Gulf Stream. "While . . . Franklin was in London as Deputy Postmaster General for the American colonies (1764–1775) he was consulted as to why mail packets sailing from Falmouth, England to New York were taking weeks longer than merchant ships traveling from London to Rhode Island. In October 1768 Franklin discussed this problem with his cousin Timothy Folger, a Nantucket sea captain. . . . Folger sketched the Stream on a chart and added written directions on how to avoid it." The Franklin-Folger chart was first printed in London around 1769–70, and a version of it was included in Franklin's "Maritime Observations," published in 1786. This paper and the chart were reprinted a number of times. "Usually the chart was carefully and accurately copied, but there are some exceptions." The version shown here is one of them. [From P. L. Richardson's paper in *Oceanography: The Past*]

the sea, the collection of papers here is most notable for its diversity. In one thick volume we can find contributions, some of considerable interest if only for their curiosity value, that include a discussion of the social implications of Victorian aquaria, a listing of Chilean naval hydrographers, a paper insisting that Prince Henry the Navigator was really an oceanographer, a Marxist tract on oceanographic expeditions, an account of the medicinal use of sea creatures, histories of international oceanographic conferences, personal apologias, passionate defenses of unpopular scientists of previous centuries, nationalistic claims to serious contributions to marine research, and a few thorough technical discussions of the origin of some particular "marine" idea. Even this list does not encompass the sweep of what has been drawn together here in the name of oceanography.

The book contains a number of contributions (a small fraction of the total) written in honor of the anniversary under celebration. To a great extent, these papers share with many of the others in the book a style and substance one can call "annual report boilerplate." It is the kind of thing that most institutions put into their annual reports—a listing of money raised, names of staff, projects and programs undertaken, all proclaimed as important and lasting. Such accounts are ultimately of some use to historians both as a source of facts and figures and as an indication of what the institution's administrators thought was important at the time. But annual reports do not ordinarily make particularly stimulating or enlightening reading.

The difficulty both individuals and organizations have in attempting open and honest evaluations of their roots and history is well known. What usually results from institutionally sponsored accounts is bowdlerized puffery lacking both the flesh and blood of real human organizations and any substantive intellectual context. A much keener sense of the origins and atmosphere of the early days of the Woods Hole Oceanographic Institution, a fascinating place, can be found in the journalistic account, *On Almost Any Wind*, by Schlee (Cornell University Press, 1978). Otherwise the accounts of the role of Bigelow, Iselin, Lillie, and others in "reviving" American oceanography with the financial help primarily of the Rockefeller Foundation have little to add to previously published material.

In the purely scientific context of oceanography, an opportunity was missed here. The Oceanographic Institution shared in the great transformation of American science that took place during and after World War II. The scientific aspects of the field have been dominated for 30 years by leaders who emerged during that period. Many of them were and are powerful, fascinating personalities, superb scientists by any standards. Many are gone already (Bullard, Ewing) and the rest are nearing retirement; an era soon will have passed. If those who remain had been asked to contribute their personal views of oceanography of the 1930's, '40's, and '50's, with no pretense to "history," corporate or otherwise, we could have had something of lasting value to future historians of the science. With a few notable exceptions, what we have in the present book is "amateur" history, neither unapologetic firsthand memoirs nor careful, documented tracing of ideas.

This is a book to be browsed in; anyone tempted to read it through risks mental indigestion. There are fascinating anecdotes, vignettes, insights, and arguments strewn throughout. But it does not define "the past" of anything recognizable as a coherent subject.

CARL WUNSCH
Department of Earth and Planetary Sciences, Massachusetts Institute of Technology, Cambridge 02139

Physical Aspects

Evolution of Physical Oceanography. Scientific Surveys in Honor of Henry Stommel. BRUCE A. WARREN and CARL WUNSCH, Eds. MIT Press, Cambridge, Mass., 1981. xxxiv, 624 pp., illus. $37.50.

This volume of scientific surveys honoring Henry Stommel on the occasion of his 60th birthday is unusual in several ways. Often such books excite only passing interest. Although they may reflect the scope of the scientific contributions of the person they honor, they may fail to give much feeling for his or her personality and individual style. This book, however, mirrors well the personality and style of Henry Stommel, who has been one of the dominant intellectual