Rifted Margins

Early Tertiary Volcanism and the Opening of the NE Atlantic. A. C. MORTON and L. M. PARSON, Eds. Published for the Geological Society by Blackwell Scientific, Palo Alto, CA, 1988. xii, 47 pp., illus. $85. Geological Society Special Publications, vol. 39. Based on a conference, London, U.K., March 1987.

The geological expressions of continental rifting and separation prior to sea floor spreading are highly variable, ranging from extensive stretching and necking of continental lithosphere with almost no magmatism to less dramatic extension with voluminous magmatism. The opening of the northeastern Atlantic between Europe and East Greenland is one of the best documented cases of the latter type of rifting, and yet the roles of magmatism and other major geological processes remain controversial. This takes on special importance because similar geochemical and structural expressions occur in rifts and rifted margins worldwide.

This well-edited collection of short papers provides a case study of the magmatic activity that attended the rifting of the northeastern Atlantic. Thirty-three papers and four extended abstracts cover the seismic character, petrology, geochemistry, and geochronology of the rifted margins of the northeastern Atlantic and of the classic East Greenland and British Tertiary Igneous Provinces and the voluminous related offshore lithologies. Most of the offshore data are presented for the first time outside of the *Initial Reports* of the Deep Sea Drilling Project or the Ocean Drilling Program or reports from private industry. The book also includes up-to-date reviews of the major igneous terranes on shore.

Most of the papers are rather limited in scope and emphasize objective reporting of data and straightforward interpretations. Only the first three papers provide much discussion of models involving the causative agents for the rifting. This is a welcome departure from volumes on rifting in which models heavily outweigh supporting data. Regrettably, the book has no summary chapter synthesizing the new data.

One of the important themes with which nearly all of the papers in this volume are explicitly or implicitly concerned is the cause of the magmatism. It has long been suspected that heating and uplift of the lithosphere caused by a mantle hot spot or plume can make overlying continents split and separate. Such localized mantle heating is thought to produce the voluminous magmatic intrusions and volcanic eruptions that occur in some rifts. (The best modern example is Eastern Branch of the East African Rift.) In the case of the northeastern Atlantic, the evidence of such a process, presented by White, appears strong. Iceland lies like a smoking gun at the scene of the crime, and bathymetric ridges of thick crust leave trails back to the matching margins.

Hot-spot models require broad regional uplift and magmatism associated with the earliest rift faulting. Geological evidence of these relations has proven difficult to detect in the northeastern Atlantic because most of the area that would have been affected has subsided below sea level and been covered with thick basaltic lava flows that inhibit reflection seismic studies. The volcanic and plutonic rocks exposed on both shores of the northeastern Atlantic are only the outermost portions of a much larger igneous province and may not accurately reflect the initial magmatic events.

Papers in this volume show that indeed very early magmatism occurred during rifting in the northeastern Atlantic. However, the most spectacular igneous activity took

place in a very short time, only a few million years just at the onset of sea floor spreading. This conclusion has prompted another model, discussed by Mutter and Zehnder, involving accelerated mantle convection in the narrow lithosphere gap created beneath the rift. Such enhanced convection could produce an initial burst of magmatism that would decay as the gap widened and sea floor spreading separated the continents.

The distribution of volcanism does not rule out either of the two hypotheses or the possibility that both mechanisms operated in different areas, one near the hot spot and the other farther away.

The mantle processes in the two hypotheses are expected to be different and to yield distinctive geochemical signatures. The earliest magmatic rocks should contain the clearest signal of partial melting under the influence of either a hot spot or accelerated convection. However, these volcanics have not been sampled owing to the present limitations of deep drilling. Available geochemical data do not eliminate either hypothesis, but it should be noted that so far only the top 5 percent of the relevant magmatic accumulations have been sampled.

Thus many questions remain to be resolved in even this most intensely studied of all magmatic rifts. The data presented in the volume constitute an important step toward understanding this class of rifts. Geologists and geophysicists interested in all aspects of rifts and continental margins will want a copy of it.

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Some Other Books of Interest

Global Volcanism 1975–1985. The First Decade of Reports from the Smithsonian Institution's Scientific Event Alert Network (SEAN). LINDSAY MCCLELLAND, TOM SIMKIN, MARJORIE SUMMERS, ELIZABETH NIELSEN, and THOMAS C. STEIN, Eds. Prentice-Hall, Englewood Cliffs, NJ, and American Geophysical Union, Washington, DC, 1989. vi, 655 pp., illus. $44 from Prentice-Hall; $42 from American Geophysical Union (to members $29.40).

The Smithsonian Institution's Scientific Event Alert Network consists of over 1000 correspondents (scientists and others) who have since 1975 provided the Smithsonian with reports of volcanic events observed in various parts of the world. The reports are then compiled into the monthly *SEAN Bulletin* and redistributed "in the hope that timely information will both increase volcanological understanding and facilitate study while events are still new." For this volume the reports from the network's first decade have been brought together with further editing and revision. The information is arranged geographically according to the sequence used in the *Catalogue of Active Volcanoes of the World* initiated in 1950. There are 20 divisions, beginning with Italy and Africa, including a number of island groups, and concluding with Earth 's atmosphere and Io. Within the divisions information is presented chronologically, volcano by volcano, with sources of reports, literature references where available, and "information contacts." Preceding this 576-page main section is an introductory section providing guidance for the use of the work (including the caveat that the reports remain preliminary) and a summary of volcanic events occurring in the decade covered (a discussion of "highlights" and a complete chronology, with page references). A concluding section defines abbreviations, gives addresses of 696 information contacts, and provides a detailed index to the text. Many of the reports include maps, photographs, or other illustrations, and the endpapers of the volume provide convenient summaries of basic information and a world map showing the locations of volcanoes active in the last 10,000 years.—**K.L.**

Radioactivity and Health. A History. J. NEWELL STANNARD. Raymond W. Baalman, Jr., Ed. U.S. Department of Energy Office of Scientific and Technical Information, Washington, DC, 1988 (available from Battelle Memorial Institute Pacific Northwest Laboratory, Richland, WA). xlviii, 1963 pp., illus. $67.50.

This very thick book, prepared under contract between the Department of Energy and the Battelle Pacific Northwest Laboratories by a radiologist whose own work in the field spans much of its history, is an account of knowledge of the biological effects of ionizing radiation from the discovery of radium to about 1980. The author characterizes the book as "a history of research facts, measurements, and ideas and the people who developed them," presenting research findings and conclusions "largely as the investigators saw and reported them" except where the work under discussion was "markedly iconoclastic or obviously wrong." The work is based on over 100 personal interviews and literature searches including unpublished or little-known materials. The emphasis is on work done in the United States. The arrangement of material is thematic and chronological. The opening four chapters are devoted to naturally occurring radioactive elements. Chapter 1 deals with radium, whose "biomedical effects . . . were center stage for much of the earlier twentieth-century work with radionuclides" and whose isotopes "continue to supply important bench-mark information." It includes accounts of the much-written-about case of the luminous dial painters and of work on radium-226 at Chicago, Rochester, MIT, and Harvard during and after World War II. Chapters on uranium, radon and its decay products, and polonium and thorium follow similar patterns, the radon chapter being concerned mainly with effects on uranium miners. Man-made radioisotopes are the subject of the next section of the book, with some account of the earliest work by Rutherford and Lawrence and chapters devoted to fission products (1939–1950), plutonium and the transplutonic elements (1940–1950), and post–World War II research on these isotopes, project by project. Section 3 deals with inhalation toxicology (radioactive dusts and particles, respirable gases), an early specialty of the author's. Environmental matters—radioecology, fallout from nuclear weapons tests, transport of radionuclides, testing and standard setting—are taken up in section 4. Section 5 consists of chapters on laboratory and field instrumentation by H. L. Andrews and R. L. Kathren. Finally, the development of therapy for exposure and of nuclear medicine is traced, and the text concludes with considerations of "unfinished business" in the field and what we have learned from Chernobyl. Each chapter begins with an outline, capsule chronology, and overview and has its own reference list, and each group of chapters has a preface. Appendixes and three indexes provide access to information about particular persons, places, and institutions, and the text itself contains some 500 tables and figures, listed at the beginning of the book.—**K.L.**

Books Received

Applied Bioactive Polymeric Materials. Charles G. Gebelein, Charles E. Carraher, Jr., and Van R. Foster, Eds. Plenum, New York, 1988. x, 334 pp., illus. $69.50. Polymer Science and Technology, vol. 38. From a symposium, New Orleans, LA, Aug.-Sept. 1987.

Applied Biosensors. Donald L. Wise, Ed. Butterworths, Stoneham, MA, 1989. xiv, 354 pp., illus. $59.95. Biotechnology, vol. 11.

Biochemistry of the Algae and Cyanobacteria. L. J. Rogers and J. R. Gallon, Eds. Clarendon (Oxford University Press), New York, 1989. xiv, 374 pp., illus. $90. Proceedings of the Phytochemical Society of Europe, vol. 28. From a meeting, Aberystwyth, U.K., April 1987.

Charles Conley Memorial Volume. M. R. Herman *et al.*, Eds. Cambridge University Press, New York, 1989. iv, 409 pp., illus. $69.50. *Ergodic Theory and Dynamical Systems*, vol. 8* (1988).

Dust in the Universe. M. E. Bailey and D. A. Williams, Eds. Cambridge University Press, New York, 1989. xliv, 570 pp., illus. $69.50. From a conference, Manchester, U.K., Dec. 1987.

Electronics for Physics Experiments Using the Apple© II Computer. John W. Snider and Joseph Priest. Addison-Wesley, Reading, MA, 1989. xiv, 289 pp., illus., + floppy disk in pocket. Paper, $27.75.