

physical science techniques and before ethnoarchaeology emerged as a formal discipline. Rice's work is a worthy continuation of the Shepard tradition.

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African Rifts

Sedimentation in the African Rifts. L. E. FROSTICK, R. W. RENAUT, J. REID, and J. J. TIERCELIN, Eds. Blackwell Scientific, Palo Alto, CA, 1986. xiv, 382 pp., illus. \$88. Geological Society Special Publication no. 25. From a meeting, London, U.K., Sept. 1984.

The importance of continental extension and faulting is now fully recognized by earth scientists. The formation of depositional basins in the initial stages of crustal thinning within rift systems provides analogues for the early development of rift basins that are now producing oil and gas in such areas as the northern Red Sea and West and Central Africa. This book, from a meeting attended by both oil-company and academic earth scientists, contains 32 papers by more than 65 authors.

The papers are grouped under five headings that are somewhat arbitrary, as they overlap considerably in subject matter and geographic coverage. The initial section provides a good introduction to the tectonics, sedimentary development, and geomorphology of continental rift basins. It is clear from this overview that current sedimentary and tectonic models incorporate data from geologic mapping, volcanologic studies, detailed stratigraphy, regional geophysics, and isotopic geochronology. The second section gives geophysical evidence that yields estimates of crustal thickness and configuration within the rifted zones. Seismic profiling, so successful in oceanic areas, has revealed asymmetric fault patterns in the rift lakes. These fault patterns exert strong control on the depositional patterns, as do the sudden volcanic events that punctuate the rift development. The third section presents considerable detail on siliciclastic, chemical, pedogenic, and organic sedimentation in the evolving rift basins. The variety of sedimentary processes, from clastic deposition to chemical precipitation combined with diagenesis, yields abundant markers that allow for detailed paleoenvironmental reconstructions for the Neogene to Quaternary deposits. Most of these studies were carried out in Kenya; one hopes that the record will be extended by work along the whole length of

the East and West African rifts. The fourth section gives detailed sedimentary histories for basins formed from the late Mesozoic to the Holocene. In this section, comprehensive relationships among climate, volcanic eruptions, and tectonic disturbances are utilized to develop models of sedimentation.

The final section demonstrates that the unique conditions of the East African rift valleys have provided a spectacular environment for the preservation of vertebrate fossils including those of early man. The frequent volcanic eruptions of carbonatite ash led to rapid chemical fossilization and protection of the fossils by the surrounding pyroclastic blanket. These finds have stimulated many of the detailed stratigraphic and paleoenvironmental studies of this area.

The papers in this volume will be of interest to a wide spectrum of earth scientists. The fascinating interplay of tectonics and volcanic eruptions of variable composition, together with the range in sedimentary source rocks and depositional environments, has permitted a wide range of sedimentary processes to be studied in microcosm. The careful stratigraphic studies, which include isotopic dating of interlayered pyroclastic rocks and flows, have provided an invaluable record of the evolution of hominids and other vertebrates in the Late Tertiary and Pleistocene.

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Terrains Under Water

Geology and Geochemistry of Abyssal Plains. P. P. E. WEAVER and J. THOMSON, Eds. Blackwell Scientific, Palo Alto, CA, 1987. xii, 246 pp., illus. \$76. Geological Society Special Publication no. 31. From a meeting, London, U.K., Jan. 1986.

International scientific initiative to study the sea floor has often been stimulated by the prospect of new resource development or the excitement of the latest frontier of discovery. Recent interest in abyssal plains has been stimulated by a quite different motive: the need to assess the feasibility of disposal of radioactive waste in deep-sea sediments. This has required the application of the latest technology to survey the morphology and sediment infill in these basin plains acoustically, to sample the sediment stratigraphy, and to characterize the sediments physically and chemically.

About 80 abyssal plains have been identified, of which more than half are located in

the Atlantic Ocean and adjacent seas. Only five or six of them have been studied in any detail, and they are all in the Atlantic. The 14 research papers presented in this book do little to redress this geographic imbalance. However, they document significant advances in understanding the genesis, evolution, and nature of abyssal plains and the sediments they contain. This knowledge provides a firm foundation for further studies of abyssal plains and of other depositional basins in other oceans.

The book begins with a general survey of geomorphic and sedimentary characteristics of basin plains and progresses through specific studies of sedimentation processes on three North Atlantic abyssal plains and one South Atlantic plain. Eight papers present results of specific geophysical, sedimentological, and geochemical studies on the Madeira Abyssal Plain in the eastern North Atlantic. These studies provide a coherent picture of sedimentation over the past 300,000 years, in which very large debris flows and turbidity currents, originating on the Northwest African continental margin, provide the main source of sediment supply to the basin. Detailed stratigraphic and geochemical studies of piston core samples demonstrate that individual turbidites can be traced over an area of up to 80,000 square kilometers. Specific geochemical studies on diagenetic processes that take place in turbiditic sediments clearly demonstrate how oxidation zones (fronts) are developed and how this process can lead to remobilization and precipitation of important metals such as iron and manganese, as well as trace elements such as uranium, copper, cobalt, vanadium, and nickel. Because of the excellent preservation of the oxidation zones at the top of many buried turbidites in the Madeira Abyssal Plain, these processes can be defined in some detail, and this may become a "type locality" for other abyssal plains.

Other important contributions appear in papers dealing with possible mechanisms of faulting in plastic sediments as a result of differential compaction, definition of the processes of organic matter oxidation and preservation in basin-plain sediments, and interpretation of geotechnical properties of turbidite sequences in terms of consolidation processes. The book is well edited and contains comprehensive, up-to-date references. It should be a valuable addition to the libraries of specialists and an excellent reference book for students.

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