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SCHULZ, HORST D., AND MATTHIAS ZABEL [EDS.]. 2000. **Marine geochemistry.** Springer-Verlag. xx + 455 p. DM149. ISBN 3-540-66453-X.

The geochemistry group at the University of Bremen, Germany, has actively explored the early diagenesis of deep-sea marine sediments from the South Atlantic for over 10 yr. These studies provide the backbone for this multiauthored volume, which focuses on low-temperature marine sediment diagenesis.

It opens with five introductory chapters that provide a basis for understanding early diagenetic processes in marine sediments. The first two deal with marine sediment classification, global patterns of sediment distribution, geotechnical properties of marine sediments, and sediment magnetism. The third focuses on the interpretation of diagenetic processes from pore water profiles and offers a nice description of analytical methods for collecting marine sediments, extracting sediment pore waters, and analyzing chemical constituents. The fourth reviews the basic chemical properties of marine organic matter and discusses the factors regulating organic carbon accumulation in sediments, and the fifth reviews the principles of bacterial metabolism and the microbial processes governing organic matter mineralization.

Chapters 6–8 discuss the early diagenesis of oxygen, nitrogen, iron, and sulfate reduction. In general, these chapters consider both the significance of the various electron acceptors in carbon mineralization and the variety of microbial and chemical processes influencing the reduced products of mineralization. I was surprised, however, to find no discussion in any of these chapters on the coupling of sulfur and nitrogen cycles through the activities of the very interesting colorless sulfur bacteria, including *Thioploca* and *Beggiatoa*.

Chapter 9 provides a concise treatment of the formation and destruction of marine carbonates. Chapter 10 describes the principles of stable isotope geochemistry of oxygen, carbon, nitrogen, and sulfur, as applicable to marine systems, whereas Chapter 11 describes the sediment diagenesis of manganese, with a particular emphasis on the formation of manganese nodules and crusts. Chapter 12 offers an interesting description of how regional patterns of sediment metabolism can be inferred from a large database. A nice chapter on hydrothermal vents and the chemistry of vent fluids is presented in Chapter 13, and Chapter 14 reviews some of the considerations in using both thermodynamic equilibrium models and dynamic sediment diagenetic models.

The readability of the various chapters is generally good, but variable, depending on the writing styles of the individual authors. The subject matter coverage in the individual chapters ranges from adequate to excellent. I especially liked the chapters on ''Bacteria and Marine Biogeochemistry '' (Ch. 5) and ''The Reactivity of Iron'' (Ch. 7). As is often true in multiauthored edited textbooks, individual authors approach their chapters with different expectations as to the level of the reader. Thus, in most chapters a student audience is assumed; these chapters contain a good introduction to terminology and a nice discussion of methodology. Some chapters, however, appear to be targeted at colleagues, and key terminology is not defined or only casually introduced.

I am a firm believer that process rates in sediments, e.g., sulfate reduction, are best obtained from direct measurements. Rates obtained from pore water profiles may be highly inaccurate because pore water constituents are influenced by the sum of consumption, production, and precipitation reactions. Furthermore, the active exchange of pore water by marine benthos (bioirrigation) can also influence pore water profiles. Similar sentiments, and subsequent caution, are expressed in some of the chapters, but Chapter 3 emphasizes the use of pore water profiles to obtain directly process rates. I feel this emphasis is overstated, and readers—especially students—should be made more aware of the problems inherent in the interpretation of pore water concentration profiles.

In conclusion, this book provides the broadest available coverage of marine sediment biogeochemistry of which I am aware. It is intended as a textbook, and it will serve well in this role. However, some chapters will need extensive elaboration from the instructor and supplementation from the literature if coastal processes should be an important element of the course. With these caveats, I recommend it as a text.

Donald E. Canfield

Danish Center for Earth System Science (DCESS) and Institute of Biology
Odense University
Campusvej 55, Odense M, Denmark