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The Deposition of Organic-Carbon-Rich Sediments: Models, Mechanisms, and Consequences, edited by Nicholas B. Harris, 2005, SEPM Special Publication 82. Society for Sedimentary Petrology (SEPM), Tulsa, Oklahoma, USA, hardcover, 282 p., USD 138, ISBN 1-56576-110-3.

"Omnes viae Romam ducunt" is a well-known Latin proverb, stating (in translation) that "all roads lead to Rome." Likewise, after reading the collection of papers that comprise SEPM Special Publication No. 82, one has to conclude that there are many ways to make source rocks for hydrocarbons and that the organic productivity versus preservation debates are definitely a thing of the past. To those that are not experts in this area of research, this collection of twelve research and review papers provides a comprehensive, compact, and very portable entry point to a tangle of geological questions that can be simultaneously intellectually stimulating and maddeningly inconclusive.

Organic-carbon-rich sediments are of interest to a broad range of earth scientists. Concerned disciplines include geochemistry (organic and inorganic), petrography (traditional and organic), sedimentology, stratigraphy, paleontology, paleoceanography, paleoclimatology, earth history, earth systems science, petroleum geology, and even the study of metallic ore deposits (e.g., Kupferschiefer). These sediments are poised where the world of physicochemical sedimentation processes meets the biosphere and record the state of the atmosphere-ocean system as modulated by the dynamics of the global carbon cycle.

The prolific primary literature on organic-rich sediments is scattered across the many specialist journals of earth science disciplines and, thus, requires considerable time and effort with which to become familiar. This collection provides a shortcut to the essential literature in the field, and that alone is a most valuable help to those who wish to familiarize themselves with this area of research. In addition, there is a good mix of more general reviews of broader principles (e.g. Katz, Tyson, and Arthur and Sageman) with in-depth case studies of specific examples from Devonian to Miocene in age, and in location from North America, to Europe, Africa, and Asia. These case studies highlight on one hand the multiple paths that can be taken in order to arrive at answers and also make it abundantly clear that there are no simple answers for understanding the outcome of the multiple simultaneous processes that are involved in the formation of organic-rich sediments and source rocks.

Whereas some authors prefer a high level of integration of multiple data sets (Bohacs et al.), others place particular emphasis on paleoecological and microfacies data (Röhl and Schmid-Röhl), on information derived from organic geochemistry (Harris et al.), and on trace-metal geochemistry (Tribovillard et al.). Bohacs et al. provide a comparison of three well-documented case studies, the Cretaceous Mowry Shale (Wyoming), the Permian Brushy Canyon–Cherry Canyon succession (West Texas), and the Miocene Monterey Formation (California), to make their point that there are many ways to optimize organic matter accumulation and consequently that a range of depositional settings are plausible for the accumulation of source rocks. They combine sequence stratigraphic analysis, assessment of facies and depositional environments, and organic geochemical data (TOC, hydrogen index, biomarkers), in order to evaluate the various factors that affect dilution, production, and destruction. That sea level variations play an important role in the distribution and quality of source rocks is also emphasized by Arthur and Sageman (Black Sea, Cretaceous Interior Seaway, Appalachian Basin), by Röhl and Schmid-Röhl (Posidonia Shale, lower Toarcian, Germany), van Buchem et al. (Upper Devonian Duvernay Formation, western Canada; Upper Carboniferous Paradox Formation, Utah and Colorado; Natih Formation, Upper Cretaceous of Oman), and Huc et al. Van Buchem et al. explore differences in source rock formation in relation to greenhouse versus icehouse conditions and propose that stratigraphic architecture is controlled by different orders of stratigraphic sequences depending on the global climate state. Huc et al. explore the influence that first- and second-order cycles have on the global distribution of organic-rich rocks in the Phanerozoic. Kerogen accumulation is related to periodic tectonically driven increases in atmospheric CO_2, and based on empirical evaluation they propose that at the first and second stratigraphic order scale. They also propose that CO_2-enhanced land productivity and chemical weathering results in higher nutrient fluxes to the oceans and that this then promotes global increases in marine productivity.

Overall this is a well rounded, state-of-the-art collection of papers that address the majority of issues one is likely to encounter when working with organic-matter–rich rocks. It will definitely be a welcome and valuable addition to the reference collection of most libraries and can be recommended as a worthwhile addition to the libraries of practicing petroleum geologists and academic geologists who work on issues that relate to source rocks.

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