and a rich supply of dissertation topics for the beginner. It is not in the nature of symposium proceedings to be profound and long-lasting, but this one is at least important and stimulating. I am happy to have it in my library, and I can recommend it without hesitation.

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Sedimentary Geology

Aspects of Diagenesis. Papers from symposiums, Mar. 1976 and Apr. 1977. PETER A. SCHOLLE and PAUL R. SCHLUGER, Eds. Society of Economic Paleontologists and Mineralogists, Tulsa, Okla., 1979. vi, 444 pp., illus. $19; to members, $15. SEPM Special Publication No. 26.

This volume, which contains the proceedings of two symposiums, offers review papers on some of the geochemical and mineralogical techniques used to estimate temperatures reached at particular points in sediment piles and papers concerned with how porosity and permeability are created and destroyed in these materials. Although the conceptual range of the volume is broad, it is a fair representation of the subfields about which a sedimentary geologist interested in diagenesis would try to keep informed. Because coal, natural gas, and petroleum are diagenetic products, the subject has important practical applications, particularly in locating stratigraphic traps.

The methods of estimating temperature that are discussed in the book make use of parameters that range from stable oxygen isotopic ratios (Eslinger *et al.*), whose interpretation is solidly grounded in physical theory, to the color alteration of the organic matter in conodonts, microfossils of carbonate apatite from organisms of unknown taxonomic affinity (Harris). The reflectance and the extent of graphitization of organic matter fragments (Bostick, Harrison), fission-track density (Naeser), fluid-inclusion properties (Roedder), and the nature of clay and zeolite mineral assemblages (Hoffman and Hower, Ghent) complete the list. Not surprisingly, many of these parameters are sensitive to solution composition as well as to temperature, and metastable phases and compositions form and persist at low temperatures (up to 200° or 250°C). Calibration of the organic parameters draws upon the body of knowledge about coals, which are made up of the same constituents in different proportions. The consistency of fluid-inclusion compositions observed by Roedder in geode minerals, Mississippi-Valley-type orebodies, the sphalerite of bituminous coal seams, and carbonate and quartz cements of detrital limestones and sandstones strongly suggests that hot, strongly saline solutions moved pervasively through sediment piles at some time in their history and thereby contributed to diagenetic alteration.

Papers concerned with the general principles governing generation and destruction of porosity are followed by others that consider particular sediment types and particular localities. The volumetrically dominant arkosic and lithic sandstones of the continental margins have clays and zeolites as their principal cements, requiring modification of the former assumption that quartz- and feldspar-cemented cratonic sandstones are typical (Hayes). The important role played by water from shale dewatering in both petroleum migration and porosity and permeability modification has led to the utilization of increasingly complex mathematical models that seek ultimately to incorporate fluid flow, chemical reactions, sedimentation rate, and thermal regime. These models now routinely test whether present-day pore fluid is in thermodynamic equilibrium with the enclosing mineral assemblage, but the course of mineral-pore-fluid interaction back through time to the initial, frequently organic-rich, sediment must remain speculative. In this volume, Wood and Surdam test a model involving chemical reaction, chemical diffusion, and convective flow.

The book contains some sobering comments about the bounds within which the increasingly difficult search for petroleum must be made. The burial temperature of some continental shelf sediments may never have been high enough to generate hydrocarbons from included organic matter, whereas many of the sedimentary rocks of the eastern United States may have gotten too hot (Bostick). The pores of lithic, arc-derived sandstones in Northeast Pacific basins may be largely filled with mineral cements by the time they are buried deeply enough for hydrocarbon generation to take place, leaving but little volume available for petroleum accumulation (Galloway). In other areas, however, secondary porosity may form at depth by dissolution of both pore-filling cement and detrital particles (Hayes).

The pairing of papers from these two symposiums was fortunate. It would be difficult to assemble the same material from existing textbooks, so the volume should be useful in a variety of advanced courses in sedimentary geology. The papers on maturation of organic solids (Bostick), clay mineralogy (Hoffman and Hower), and sandstone porosity (Hayes) are particularly successful in conveying the subtleties of approach that have evolved for dealing with particular aspects of diagenesis.

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Health Hazards of Asbestos

Asbestos and Disease. IRVING J. SELIKOFF and DOUGLAS H. K. LEE. Academic Press, New York, 1978. xviii, 552 pp., illus. $39.50. Environmental Sciences.

The authors of this welcome book have attempted to put together in one volume a comprehensive review of all aspects of asbestos and its relationship to human health. They have addressed the book to the nonspecialist but have included a bibliography of over 800 references to enable an interested reader to explore the literature further.

The book is well organized for the intended audience. Five major sections cover the distribution of the mineral, nonmalignant effects, malignant effects, pathogenic mechanisms, and prevention and control of asbestos-related disease. The chapters within sections are planned to stand alone to the extent possible, so there is some repetition for those who will read the book from cover to cover.

The discussion of methods of measuring asbestos and their relative merits and limitations is particularly useful in light of the continuing debate about the most desirable field measurement techniques. In addition, the discussion serves as a background to the authors' consideration of the hazardous nature of nonfibrous or small-fibril forms of asbestos. There is also a well-documented chapter summarizing existing knowledge of the environmental distribution of asbestos in air, water, food, drugs, and consumer products.

Particularly welcome is an extension and restatement of Koch's postulates, a set of rules designed to establish the relationship between a particular agent and a particular disease. The original postulates were formulated for infectious disease, largely acute in onset. Selikoff and Lee have extended and modified them for use with chemical agents associated with chronic disease. The proposed postulates are applied in a review of evidence concerning the role of asbestos in causing pleural and parenchymal nonmalignant disease and mesothelial, bron-

chial, and other cancers. Although this approach will benefit from others' attempts to refine the postulates, it is a pleasure to be presented with criteria designed for nonmicrobial disease.

The major controversy regarding asbestos exposure today centers on the risk at low exposures. It is agreed that high levels of asbestos exposure (a daily average of greater than two fibers per milliliter of air) can cause lung disease and cancer, and attention is currently focused on exposures to very low levels of asbestos such as are experienced by those who come in contact with water supplies containing asbestos, by family members of asbestos workers, or by residents near asbestos mining, manufacturing, or construction operations. The authors have gathered available information on the risks at such low exposure, drawing extensively on data from their investigations at Mount Sinai School of Medicine. Mesothelioma in particular is thoroughly discussed, and the lack of an association between mesothelioma and cigarette smoking is emphasized.

Bronchogenic carcinoma in asbestos workers who smoke has been characterized as an epidemic, and much attention is now focused on the control of cigarette smoking among asbestos workers. Some have hypothesized that without cigarettes asbestos is an unimportant carcinogen. Although there is a large difference in risk between smoking and nonsmoking asbestos workers, recent Mount Sinai occupational cohort studies of lung cancer risk in nonsmokers indicate that asbestos exposure alone is not an insignificant risk. Data from these extensive studies were unfortunately not ready in time to be included in the book.

The section on pathogenic mechanisms is valuable. In contrast with the case of silica, no generally accepted theory of pathogenesis exists for asbestos as a fibrogenic or carcinogenic agent. The authors have made an important start, however, in presenting a review of the existing data and the outlines of a coherent theory. They recognize that the theory can be elaborated and refined through subsequent experimental work.

The section on the prevention and control of asbestos-related disease is unusual in a monograph designed for a medical audience. It presents a systematic overview of principles and objectives of regulation, efforts at regulation in the United States and in other countries, and procedures for prevention and control. It would be beneficial if medical professionals read this section with a view to its application to many other hazardous work exposures. A somewhat expanded section on medical screening would make the section all the more valuable.

The illustrations in the book are generally excellent. Of particular note are the x-rays of pleural disease and the electron micrographs of phagocytosis and asbestos bodies. With such excellent illustrations, it is disappointing that the schematic diagrams of asbestos mining and of asbestos manufacturing processes are not better. It would also have been nice to have a map of asbestos distribution. The geology of asbestos is at best a complex and confusing topic, and the chapter on it is the least successful part of the book in summarizing and organizing material for the nonspecialist.

The public health orientation of the authors is displayed throughout the book, placing in its appropriate context the information about the health effects of exposure to asbestos. The book will prove valuable reading for anyone, from scientist to regulator, interested in any aspect of asbestos-related disease.

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