enough to be explored by human beings and hence called caves is a secondary, although obviously enjoyable, concern of the author.

The first four chapters describe and classify the landforms of karst terrains, including both surface and underground morphology. The complex and ethnocentric terminology of karst landforms, drawn largely from Slavic, Spanish, and German research, is conveniently tabulated and reduced to a minimum of English-language terms. Even so, the descriptive terminology of karst remains formidable, and to a nonspecialist the economy of substituting "cutter and pinnacle" for "grike and clint" is not obvious. Chapters 5 and 7, on the chemistry of carbonate dissolution and the geochemistry of karst waters, form the heart of the book. These are excellent chapters for outside reading by students in geohydrology and geomorphology courses. They specifically apply to karst evolution, but because carbon dioxide dissolved in ground water is the most important factor in chemical weathering of other rocks as well, these chapters have wide applicability. Similarly, chapter 6, on karst hydrology, is a good review of the special problems of water movement through soluble rocks: Is the concept of a water table, or the application of Darcy's law, appropriate to karst terrains? When water flows through large interconnected conduits, should we apply surface-water or ground-water flow formulas? These are provocative and interesting topics.

The book weakens a little in its chapter on the Pleistocene history of karst evolution. Climate change has been important in karst development, and cave deposits are becoming useful as clocks and thermometers for the Pleistocene. Unfortunately, this topic is developing too fast to be reviewed in a general book on karst, and the concept the author espouses of only four Pleistocene ice ages is out of date. The recent increased appreciation of microorganisms in aqueous geochemistry is also not emphasized, given the physical-chemical approach of the book.

Following tradition and his own experience, the author concentrates on the landforms and processes in well-lithified and generally ancient carbonate rocks of Paleozoic and Mesozoic age. The widespread karst development on late Cenozoic tectonically emerged coral limestone terranes of tropical island arcs is barely mentioned. The classic "phytokarst" of Grand Cayman is noted but not defined, and a few references are made to coastal weathering of limestone, but the extensive, young, nearly pure limestones of coralline tropical islands are not otherwise mentioned. In a book about the weathering of limestone, it is odd that the word "coral" is never mentioned.

We are indebted to the author for this authoritative integration of a large, complex, and scattered polyglot literature. The book is an admirable cross-disciplinary synthesis applied to one of the more romantic landscapes of our planet.

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Geothermometry

Thermal History of Sedimentary Basins. Methods and Case Histories. NANCY L. NAESER and THANE H. MCCULLOH, Eds. Springer-Verlag, New York, 1988. xiv, 319 pp., illus. $64. From a symposium, New Orleans, LA, March 1985.

Over the past decade, various thermal models have been proposed to explain the formation of sedimentary basins. At the same time, geological and geochemical studies have shown that certain sedimentary features provide an imprint of well-constrained temperature ranges.

Verification of thermal models of basin evolution by analysis of thermal imprints is one of many challenges in sedimentary basin analysis. This book has met the challenge by providing an outstanding demonstration of the type of imprints available from low-temperature geothermometry that can be used to evaluate such models. The book begins with a definitive overview chapter by the editors on various available methodologies for sedimentary geothermometry. Next follows an equally definitive paper by Blackwell and Steele on the significance of thermal conductivity measurements in sedimentary rocks. They demonstrate the importance of contrasting global heat budgets used in geophysical modeling with respect to internal thermal characteristics of basins controlled by magmatic intrusions, variation in radioactive heat production from both basement and sedimentary rocks, and lateral and vertical variation in thermal conductivity. Such local effects influence the thermal history of a sedimentary basin more than global effects. Because thermal conductivity measurements are limited, certain model assumptions lead to large-scale error in estimating thermal histories and organic maturation trends. Consequently, several published examples relying on unconstrained thermal conductivity measurements of shale have overestimated thermal budgets and hydrocarbon generation.

Next are three papers (by Creaney, Curiale *et al.*, and Barker) dealing with reactions of organic matter to geological heating, thermal organic maturity indicators, and temperature and time considerations in organic maturation. Although their approaches differ, they show that different organic parameters in sediments constrain the temperature range a sedimentary basin and its sediment fills experience. A related paper by Armagnac *et al.* utilizes vitrinite reflectance to determine postdepositional erosional history.

Seven papers follow dealing with various mineralogical and geochemical indicators of low-temperature geothermometry. Approaches reviewed include utilization of selected trace element concentrations in formation waters (Kharaka amd Mariner), fluid inclusions (Burruss), transformation of smectite to illite (Pytte and Reynolds), $^{40}Ar/^{39}Ar$ determinations of cooling histories of reheated detrital microclines (Harrison and Burke), and fission track dating (Naeser *et al.*, Green *et al.*, and Feinstein *et al.*). These techniques can be combined to calibrate temperature determinations (Feinstein *et al.*). A chapter on simulation methods (McDonald *et al.*) is included also.

The book closes with three excellent papers verifying geodynamic basin models from organic maturation data, clay mineral assemblages, and diagenetic mineral phases in extensional basins (Issler and Beaumont), a foreland basin (Hagen and Surdam), and transform margin basins (Heasler and Surdam). These chapters demonstrate clearly that well-constrained geodynamic models may be verified by a variety of geological observations and that combined approaches lead to fuller understanding of basin evolution and predicting occurrences of hydrocarbon and mineral resources.

In summary, the book is well worth reading, and any researcher interested in the evolution of sedimentary basins should possess a copy.

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Animal Liberators. Research and Morality. Susan Sperling. University of California Press, Berkeley, 1988. xvi, 247 pp., illus. $19.95.

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