FIGURE 8—In situ cluster of posterior ends of several *Teredina* tubes in transition zone, about natural size.

specimens identifiable to species are found in the Fruitland, they might aid in solving the long-standing problem (Russell, 1975) of the exact age of the formation.

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Review

EARTH RESOURCES, ENERGY, AND THE ENVIRONMENT, by *Douglas G. Brookins*, C. E. Merrill Publishing Company, Columbus, Ohio, 1981 (this book can be purchased at the University Bookstore, University of New Mexico, Albuquerque, NM), $7.95

This text provides a broad yet concise description of our diminishing earth resources and considers the effect on selection of energy alternatives. *Earth resources, energy, and the environment* is not a detailed all-encompassing technical reference, but is an elementary text that will provide a scientist, student, or layman with the facts and figures necessary to evaluate energy alternatives.

Brookins, a geology professor at the University of New Mexico, draws heavily on his geochemical background and work experience in New Mexico. Almost half of the plates (pictures) are taken in New Mexico and cursory descriptions of New Mexico mineral production, the Albuquerque water system, and Grants mineral belt are included.

Earth resources, energy, and the environment is a particularly useful reference for those of us engaged in any aspect of natural resources, impacts on the environment as a result of mining or urban development, or energy development. The book is also useful to those who do not have the time to read the voluminous literature (since 1972), or to learn all the technical details for these related, yet diverse, subjects. Brookins provides enough geochemical background to enhance his discussions, yet avoids most of the political and emotional discussions on these sensitive issues.

The book is divided into eight chapters. The introductory chapter defines many of the terms used throughout, for example, possible, probable, proven reserves, MACD, and others. Chapter 2, Ores, production, and mining, contains a brief geochemical discussion on why some rocks contain ores that can be economically mined and why others do not. Short sections on open-pit and solution-pit mining also are included. The chapter on water (Water: The most valuable resource) emphasizes water as our most valuable world resource and shows the need of careful planning for effective future use. Subsections include the hydrologic cycle, water reservoirs, desalination, and uses of water in the United States. Chapter 4, entitled Metals, includes descriptions of the properties, uses, major minerals, geologic associations, locations of major districts, and import-export facts for the elements Fe, Al, Mg, Ti, Mn, Cu, Ni, Co, Pb, Zn, Nb, Mo, Hg, Cr, Sn, W, Be, Ta, V, Au, Pt, and Ag.

Chapter 5, Nonmetals for agriculture and the chemical industry, is a relatively short chapter that includes discussions on nonmetals "used for reasons other than their metallic properties." Evaporites, potassium, nitrogen, phosphorus, and sulfur (with sections on sulfur from salt domes, petroleum, and metal-sulfide mining) are major topics; halite, chlorine, bromine, fluorine, and barite are discussed briefly. Building materials, which include building stones, sand and gravel, and light-weight aggregates (for example, pumice, scoria) are major subjects in Chapter 6; minor sections on clays, cement, calcium sulfates, asbestos, and abrasives are included.

Chapter 7 (Energy), the longest and one of the most interesting chapters in Brookins' book, is filled with pertinent facts and figures, geochemical discussions, and the pros and cons for many of the energy alternatives available today. Major subsections include discussions about coal, nuclear energy, petroleum, and uranium (mostly on uranium deposition in a sedimentary environment, for example, Grants mineral belt). Brief sections on other energy sources, including hydrothermal, geothermal (including the Hot Dry Rock program at Los Alamos), ocean and solar energy are included. Most of the latter topics are not discussed at great length because Brookins states they will not be feasible until at least the 21st century.

Brookins finishes his book with a chapter on "Geochemistry and human impact on the environment." In this chapter, subsections cover environmental geochemistry, land use, coal-based versus nuclear-based technology, and chemical wastes. A table of 18 trace elements, with their toxicity effects, is included. Brookins does stress that medical expertise needs to be collated with the voluminous trace-element data on soils and waters, and that the future type of health and trace-element studies needed are those that monitor a mining or urban activity before, as well as during and after, initialization.

Covering the breadth of material Brookins has covered, and yet being coherent without overwhelming the reader, is very difficult. Still, I have few complaints with this book; most of these are of a personal nature. For example, the section on coal-based versus nuclear-based technology (in Chapter 8) would fit better in Chapter 7 (Energy); the small section on milling (in Chapter 4) would fit better in Chapter 2 (Ores, production, and mining); a brief definition of light water reactor and fast breeder reactor would be useful. A few figures (for example, p. 4) may be difficult for the layman to interpret; however, the majority of figures are legible and easy to understand. My major complaint is that many of the plates are poorly reproduced.

To summarize, the book is well organized and inexpensive; the type is easy to read, and there are few typographical errors (I found only one). I would recommend it for those scientists and students engaged directly or indirectly in the fields of earth resources, energy, environmental concerns, or nuclear development. The book is not a "stand-alone" comprehensive text on all of the above subjects, but it does provide the facts and figures as well as the pros and cons associated with future energy development. The book is written for an audience with a broad nonscientific background, and most New Mexicans will find it enjoyable reading.

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