easier. And the growth of suburbs made it possible for millions of Americans to live in a semirural environment.

Melosi notes with approval that in the 1960's and 1970's Americans began to think about limiting the generation of refuse rather than simply attempting to devise more efficient methods of solid waste management. But if refuse creation is a function of consumerism then it will require nothing short of a revolution in American values for this new approach to succeed.

Both books are based on exhaustive research in primary and secondary sources. They each contain numerous helpful tables and evocative photographs and are written in a lively style that keeps the reader's attention throughout.

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Ores

Ore Genesis. The State of the Art. A Volume in Honour of Professor Paul Ramdohr on the Occasion of His 90th Birthday. G. C. AMSTUTZ, A. EL GORESY, G. FRENZEL, C. KLUTH, G. MOH, A. WAUSCHKUHN, and R. A. ZIMMERMANN, Eds. Springer-Verlag, New York, 1982. xx, 804 pp., illus. $65.

This volume dedicated to Paul Ramdohr, the father of modern ore microscopy, on his 90th birthday has "special reference to his main scientific interests," ore minerals and their origins. A collection of 74 papers by 126 authors, the book illustrates the current state of thinking on the genesis of a wide variety of ore deposits and ore mineral occurrences. Also present are some phase equilibria, some crystal chemistry, and a few broad-brush thoughts on metallogenesis in general.

The book is organized on the basis of modes of ore genesis, ranging from weathering and diagenesis to subvolcanic and plutonic emplacement.

The contributions, necessarily brief because of the large number of them, are quite readable and well illustrated. Although there are accounts of deposits worldwide, the majority of papers describe lesser-known European localities. The absence of descriptions and discussions of the classical well-known deposits is at first disappointing but may actually enhance the value of the volume, for omission of such papers has permitted inclusion of papers that provide the first descriptions available in English of many of these lesser-known but mineralogically interesting localities.

The volume does contain good review papers on a few major deposits, especially the conglomeratic uranium-gold ores. Papers by Saager *et al.* and Hallbauer and Kable summarize previous findings and offer new insights into the diverse origins of the Witwatersrand gold-bearing conglomerates. The former workers report the finding of carbonaceous matter, believed to be indicative of primitive life forms, in the 3200 million-year-old pre-Witwatersrand conglomerates. The latter workers document different provenance areas for the detrital quartz pebbles and pyrite on the basis of chemical signatures and types of inclusions. These data strongly support a view of multiple sources for the uranium and the gold in the Witwatersrand.

A study of the similar quartz-pebble conglomerate uranium ores at Elliot Lake, Ontario, by Meddaugh *et al.* traces the multiple-stage loss of lead and demonstrates that the actual age of the uraninite is greater than 2100 million years and thus is consistent with a syngenetic detrital origin for the uraninite. This work overcomes the heretofore troublesome apparent young age of the uranium in very old sediments.

Klemm and co-workers have reexamined the mechanisms of formation for the massive chromite and magnetite layers in the Bushveld complex. They, like some previous workers, conclude that the precipitation of these monomineralic layers resulted from a rise in oxygen fugacity. Their belief, however, is that the rise in oxygen was due to volatile exhalations, from the underlying rocks, which were transmitted rapidly to the crystallizing magma through fractures in the previously solidified cumulates. This is an interesting concept; it overcomes some explanatory problems caused by the slowness of gas diffusion in melts but requires field testing and laboratory verification.

Frutos has prepared an excellent synthesis of the development of the Andean metallogenic belt that provides a framework for the several papers on South American deposits. He traces the Mesozoic-Cenozoic history of the orogen and relates the spatial setting of different types of ores to the evolution of the crust in western South America. Papers of this type would certainly be welcome on all of the world's major metallogenic provinces.

The title is a bit of a misnomer in that most of the papers are actually classical, but modern, geological and mineralogical descriptions of deposits. There is little in the way of "cutting edge" treatment of ore genesis, a shortcoming that is recognized by the editors. Nevertheless, the descriptions and discussions are interesting and useful and do provide information valuable to workers who are attempting to contrast and compare deposits. Notably absent are papers dealing with the solubility of ore minerals and with the transport and deposition of ores by hydrothermal solutions. The index is weak in that localities are not listed by name and only sometimes by country or metal contained; thus, pertinent data are often found only by reading through the table of contents or by thumbing through the pages.

This book is a useful source of data on many types of ores and should be examined by all workers in ore deposits and ore minerals, but it is unlikely that it will become a major reference.

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Synapsids and Evolution

Mammal-like Reptiles and the Origin of Mammals. T. S. KEMP. Academic Press, New York, 1982, xiv, 364 pp., illus. $44.50.

The mammal-like or synapsid reptiles lack the popular appeal of the dinosaurs, but they make up for it by providing us with a fossil record that is unsurpassed in documenting patterns of large-scale evolutionary change. The earliest synapsids were barely distinguishable from the most primitive reptiles, whereas those of 100 million years later differed from mammals only in small details. Here, then, in the words of T. S. Kemp, is "the one example known where the evolution of one class of vertebrates from another class is well documented by the fossil record" (p. 1). One of Kemp's main purposes in this book is to use the fossil record of the mammal-like reptiles as a model from which to derive generalizations about the patterns and processes of large-scale evolution.

Following the introduction and a chapter on methods of functional and phylogenetic analysis are ten chapters dealing with the main groups of synapsid reptiles and early mammals. Each of these chapters reviews the systematics, morphology, and stratigraphic distribution of a group, aided by numerous illustrations and, usually, a cladogram showing the relationships of the included subgroups; and each chapter ends with a section on functional anatomy that presents the author's interpretation of feeding and loco-