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-

motor mechanisms, middle ear function, and general biology (including physiology, sense organs, brain, and ecology). These chapters provide a comprehensive review of the synapsid literature into 1981.

I was pleased that Kemp's phylogenetic analyses are based on cladistic methods but was disappointed that he chose not to wrestle with the difficulties of representing his cladistically based phylogeny in a formal classification. Rather, he reverts to a traditional classification (presented in an appendix) in which many of the subjective grade groups of more "classical" schemes are retained.

In the last two chapters, Kemp develops a macroevolutionary model of synapsid history that he hopes will yield generalizations about "the way in which a major new taxon arises from its ancestors" (p. 4). He views "the evolution of mammalness" as synonymous with the evolution of increased homeostasis and sees it occurring as a somewhat loose "correlated progression" in which each feature of the organism evolves gradually and in necessary functional association with all other features. Because the synapsids, irrespective of ecological niche, benefited from increased independence from the environment, there was an orthogenetic trend toward increased homeostatic control. Though earlier literature is not cited in this regard, these ideas are by no means new; over 20 years ago they were used to explain the pervasive parallelism then perceived to be the dominant theme in synapsid evolution.

The broad pattern of synapsid history is seen by Kemp to consist of three sequential adaptive radiations—pelycosaurs, non-cynodont therapsids, and cynodonts—with the last giving rise to mammals. He perceives each radiation as following a similar course: after the mass extinction of an earlier radiation, a single surviving lineage of more progressive small carnivorous forms rapidly radiated into all of the main niches formerly occupied by the less progressive forms; some turnover at low taxonomic levels occurred, but the higher taxon persisted until it, in its turn, was removed by a mass extinction. Major evolutionary change was restricted to the short interval between the mass extinction and completion of the subsequent radiation.

Turning to the interpretation of the processes underlying this pattern, Kemp suggests that the mass extinctions "were caused by relatively small environmental changes that altered the ratio of extinction rate to speciation rate of the various lineages" (p. 326). The rapid rates of morphologic change accompanying the subsequent radiations are attributed to mutations of "regulator genes"—in effect, the production of "hopeful monsters"—with natural selection playing only a minor role in the process. The large role of chance in this punctuational view of synapsid evolution leads Kemp to conclude that parallel evolution, considered a dominant phenomenon by most earlier workers, was an improbable occurrence.

It seems to me that Kemp's interpretation of synapsid history has been as much influenced by the model of macroevolution he has adopted (a model that appears to owe a great deal to Steven Stanley's book *Macroevolution*) as the model has been influenced by the synapsid record. Assessment of the amount of parallelism that occurred in the mammal-like reptiles hinges upon one's theory of relationships within the group; without a detailed phylogenetic analysis, which Kemp has not really attempted, one can make statements about parallelism only on the basis of a priori assumptions about how evolution ought to have occurred. Likewise, although the fossil record of synapsids is sufficiently continuous to permit the main outlines of their history to be discerned, it is also sufficiently discontinuous to be compatible with a variety of macroevolutionary interpretations. For example, whether the mass extinctions overlapped or entirely preceded the subsequent radiations cannot be established with certainty; this surely affects one's interpretation of causes and effects.

Despite these reservations, I believe Kemp has provided a much-needed survey of a fossil group that, with further resolution of its systematics and faunal relationships, has the potential to contribute significantly to our understanding of large-scale patterns of evolution.

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Books Received

Annual Review of Materials Science. Vol. 12. Robert A. Huggins, Richard H. Bube, and David A. Vermilyea, Eds. Annual Reviews, Palo Alto, Calif., 1982. viii, 444 pp., illus. $22.

Archaebacteria. Proceedings of a workshop, Munich, June 1982. Otto Kandler, Ed. Fischer, Stuttgart, 1982. xii, 366 pp., illus. Paper, DM 98. Enlarged reprint from *Zentralblatt für Bakteriologie, Mikrobiologie und Hygiene*, vol. 3, no. 12.

Astronomy Handbook. James Muirden. Arco, New York, 1982. 190 pp., illus. $8.95.

Bacterial Resistance and Susceptibility to Chemotherapeutic Agents. L. E. Bryan. Cambridge University Press, New York, 1982. viii, 234 pp., illus. Cloth, $34.50; paper, $14.95.

Batteries and Energy Systems. C. L. Mantell. McGraw-Hill, New York, ed. 2, 1982. xvi, 320 pp., illus. $29.95.

Current Problems in Sociobiology. Papers from a conference, Cambridge, England, July 1980. King's College Sociobiology Group, Eds. Cambridge University Press, New York, 1982. xiv, 394 pp., illus. Cloth, $49.50; paper, $16.95.

Cytomegalovirus and Immunity. John D. Hamilton. Karger, Basel, 1982. viii, 108 pp. $45. Monographs in Virology, vol. 12.

Debate on Disarmament. Michael Clark and Marjorie Mowlam, Eds. Routledge and Kegan Paul, Boston, 1982. viii, 144 pp. Paper, $7.95.

The Defence of Western Europe. Bernard Burrows and Geoffrey Edwards. Butterworths, Boston, 1982. viii, 156 pp. $34.95. Butterworths European Studies.

Diabetes Management in the '80s. The Role of Home Blood Glucose Monitoring and New Insulin Delivery Systems. Papers from a symposium, New York, Nov. 1980. C. M. Peterson, Ed. Praeger, New York, 1982. xiv, 328 pp., illus. $31.50.

The Encyclopedia of Medical Tests. Cathey Pinckney and Edward R. Pinckney. Facts On File, New York, ed. 2, 1982. xxxvi, 298 pp. $14.95.

Genetic Engineering. Principles and Methods. Vol. 4. Jane K. Setlow and Alexander Hollaender, Eds. Plenum, New York, 1982. x, 288 pp., illus. $39.50.

A Global View of Energy. Behram N. Kursunoglu, Andrew C. Millunzi, Arnold Perlmutter, and Linda Scott, Eds. Lexington (Heath), Lexington, Mass., 1982. xx, 318 pp., illus. $36.95.

The Golden Throng. A Book About Bees. Edwin Way Teale. Alphabooks, Sherborne, Eng., ed. 2, 1981 (U.S. distributor, Universe, New York). 160 pp., illus. $16.50.

Handbook of Cotton Weaving. E. Onikov, Ed. Translated from the Russian edition (Moscow, 1979) by N. Chernysheva. Mir, Moscow, 1981 (U.S. distributor, Imported Publications, Chicago). In two volumes. Vol. 1. 240 pp., illus. Vol. 2. 262 pp., illus. The set, $15.

Methods and Principles of Mycorrhizal Research. N. C. Schenck, Ed. American Phytopathological Society, St. Paul, Minn., 1982. xii, 244 pp., illus. Member, $22; nonmember, $24.

Methods in Protein Sequence Analysis. Papers from a conference, Upton, N.Y., Sept. 1981. Marshall Elzinga, Ed. Humana, Clifton, N.J., 1982. xxviii, 590 pp., illus. $64.50. Experimental Biology and Medicine.

Microbes, Man and Animals. The Natural History of Microbial Interactions. Alan H. Linton with contributions by five others. Wiley-Interscience, New York, 1982. xvi, 342 pp. $47.95.

Microbiology. With Virology and Immunology. K. D. Pyatkin and Yu. S. Krivoshein. Second English edition translated from the Russian by L. Aksenova and V. Lisovskaya. Mir, Moscow, 1980 (U.S. distributor, Imported Publications, Chicago). 560 pp., illus. $13.

Microwave Field-Effect Transistors. Theory, Design and Applications. Raymond S. Pengelly. Research Studies Press (Wiley), New York, 1982. xviii, 470 pp., illus. $34.95.

Patents for Chemists. Philip W. Grubb. Clarendon (Oxford University Press), New York, 1982. xii, 274 pp. $39.95.

Percolation Processes. Theory and Applications. Proceedings of an institute, Espinho, Portugal, July 1978. Alirio E. Rodrigues and Daniel Tondeur, Eds. Sijthoff and Noordhoff, Rockville, Md., 1981 (distributor, Kluwer Boston, Hingham, Mass.). viii, 588 pp., illus. $65. NATO Advanced Study Institutes Series E, No. 33.

Research Animals and Concepts of Applicability to Clinical Medicine. Papers from a symposium, Hannover, Germany, 1981. K. Gärtner, H. Hackbarth, and H. Stolte, Eds. Karger, Basel, 1982. x, 232 pp., illus. Paper, $88.75. Experimental Biology and Medicine, vol. 7.

Siblings. Love, Envy, and Understanding. Judy Dunn and Carol Kendrick. Harvard University Press, Cambridge, Mass., 1982. xii, 290 pp. $18.50.

Skin and Venereal Diseases. Yu. K. Skripkin. Translated from the Russian edition (Moscow, 1979) by Ludmila Aksenova. Mir, Moscow, 1981 (U.S. distributor, Imported Publications, Chicago). 556 pp., illus. $14.

Trends and Perspectives in Parasitology. Vol. 2. D. W. T. Crompton and B. A. Newton, Eds. Cambridge University Press, New York, 1982. viii, 92 pp., illus. Cloth, $19.95; paper, $7.95.

Water Quality Criteria for Freshwater Fish. J. S. Alabaster and R. Lloyd. Published for the Food and Agriculture Organization of the United Nations by Butterworths, Boston, ed. 2, 1982. xx, 362 pp., illus. $49.95.

When the Snakes Awake. Animals and Earthquake Prediction. Helmut Tributsch. Translated from the German edition (Stuttgart, 1978) by Paul Langner. MIT Press, Cambridge, Mass., 1982. xvi, 248 pp. $20.