chemically different types of oil in West Texas, the geometry of porous and nonporous rocks in several major groups of oil fields, and ground water flow through the West Texas subsurface. At the end of the volume are five excellent papers (not oriented to West Texas) discussing the origins of ground water, carbon dioxide gas accumulations, rare-gas isotopes from spontaneous fission, sulfur isotope anomalies, and the disposal of radioactive wastes.

The standard reviewer's cliche, "this symposium volume gives an up-to-date summary of the field," cannot be applied to *Fluids in Subsurface Environments.* Although the laboratory of every large oil company is actively working on the problems addressed in this volume, only the paper by Silverman is a contribution from a major petroleum laboratory. Further, the candor of Silverman's paper is marred by his illustrating and discussing an oilfield (pp. 62 to 64) without identifying the field by name, location, or age of the rocks. However, the editors are to be commended for assembling a useful volume despite the industrial restrictions on releasing information and interpretations. This symposium volume is unique in covering the wide range of fluids recoverable by drilling in sedimentary rocks. Those who would like to drop such neologisms as *criconden-bar* and *salaquifer* into future discussions would be well advised to procure a copy.

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Mineral Resources of Africa

A comprehensive compilation of mineral resources data for Africa has long been needed by both technical and nontechnical persons concerned with the development of that continent. In writing the volume reviewed here, **The Mineral Resources of Africa** (Elsevier, New York, 1965. 766 pp., $40), Nicolas de Kun has fulfilled this need by preparing part 1, Industrial Development and Mineral Economics (pp. 1 to 211), in a form that will be useful to the nontechnical audience, particularly economists and other social scientists, and part 2, Economic Geology (pp. 211 to 740), in a more technical fashion for use by geologists and mining engineers.

In part 1, a general section of Africa's share of world resources and production precedes discussion of the distribution of African output and resources in terms of the metal or mineral groups, such as iron and bauxite, base metals, gold, ultrabasic minerals, tin, carbon fuel, water, and soils. A very interesting section entitled "History and Development of Mining" clarifies the complex interrelationships of many of the African mining companies listed in appendix II; the author then describes the distribution and production of resources by regions—northern, northeastern, west, middle, and southern Africa, including "The Islands and the Sea"—and by countries within regions. The value and production of the economic materials of each country and their relationship to the totals for Africa and the world are reviewed in relationship to the existing mining companies, and notations are given on known occurrences that, in the future, may be important because of improved transportation or other economic factors. One of the unusual aspects of this compilation is that, in addition to minerals and fossil fuels, it treats both ground and surface water, with emphasis on their use for power.

Part 2, a discussion of the economic geology of the individual deposits, is arranged under the same genetic group headings used in part 1—that is, iron and bauxite, gold, and so forth. These genetic types are considered in relation to the author's "Mineralogenic Provinces"—High Africa, East Africa, the Atlantic Rim, Nigeria, the Guinean Shield, the Mauritanian Arch, the Atlas, the Sahara, and the Red Sea. The orogenic-metallogenic belts within these provinces have been delimited, on the basis of age, into seven cycles, dated as 3400 to 3000, 2800 to 2400, 2300 to 1900, 1050 to 850, 650 to 450, 400 to 200, and 150 to 0 million years. The most intense mineralization in these belts was at about 2100 million years, the next most intense at about 650 million years. Oil and coal deposits formed most abundantly at about 200 million years.

The author has a wealth of data at his disposal, and as a compilation this book has an unusually wide coverage. References to the source data in part 1, and more references in part 2, would enhance the usefulness of the book to serious students who will be interested in detailed information on specific areas.

Although all compilations must be abstracts of existing data, in this case the condensation of material in many places has been carried to the point where the data are almost useless. Perhaps this is partly because the author's native language is not English, but appropriate editing could have corrected much of it. I noted numerous typographical errors. All in all, it is difficult to read this book and to understand the author's original intent. Nevertheless, as a reference source the book will fulfill a very useful purpose in that it will acquaint interested persons with the tremendous known and potential natural resources of Africa.

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Insect Physiology

A feature of the 12th International Congress of Entomology, held in London in July 1964, was a symposium on the physiology of insect central nervous systems. This meeting marked the recognition of the insect nervous system as an important object of study in its own right, with the aid of the wide variety of research tools currently available. It also served to show that many fundamental problems of integrative physiology in nervous systems might be intensively studied with advantage in relatively simply organized insect ganglia. The speakers have elaborated on their contributions, which have been collected together in a handsome volume—**The Physiology of the Insect Central Nervous System** (Academic Press, New York, 1965. 287 pp., $10), edited by J. E. Treherne and J. W. L. Beament.

The 15 articles that make up this book range in scope from broad reviews—for example, T. Narahashi's review of the physiology of insect axons—to research data not published elsewhere (G. A. Horridge, J. H. Scholes, S. Shaw, and J. Tunstall and G. Hoyle). Excellent articles on the chemical environment (J. E. Treherne and J. H. Ray) precede a survey of the ultrastructure of synapses by D. S. Smith. Microelectrode and pharmacological studies on transmission are contributed by J. Boistel, J. J. Callec, J. Bernard, and Y. Gahery. There is a thoughtful general article on neuronal pathways by the versatile G. M. Hughes and specialized accounts of locomotion in a cater-

pillar by R. de G. Weevers; locust flight and its control are ably described by D. M. Wilson. The special subject of control of respiratory movements is covered by P. L. Miller. A detailed and highly original study of the activity of single neurons of locust optic lobe and brain is presented by G. A. Horridge and collaborators, and G. Hoyle provides an account of neurophysiological studies on "learning" in locust ganglia. F. Huber reviews his important and already classical studies on the behavior of crickets evoked by local electrical stimulation of the brain, and some interesting general thoughts are contributed by C. H. F. Powell and by K. D. Roeder in his epilogue.

This is a delightful and an important book for anyone interested in insect function, and its publication will be welcomed by all comparative and insect physiologists. It provides an excellent summary of the state of our knowledge and of current progress in a rapidly expanding field.

All investigators of nervous systems, whether of insects, rats, cats, or men, should find food for thought in this volume. The authors and Academic Press are to be congratulated on its excellent format and the speed with which it was produced.

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AIME Metallurgical Society Conference

The Sorby Centennial Symposium on the History of Metallurgy (Gordon and Breach, New York, 1965. 580 pp.), edited by Cyril Stanley Smith, is quite different from the 26 volumes compiled from previous AIME Metallurgical Society Conferences. It is based on the Sorby Centennial Meeting arranged by the Society for the History of Technology in collaboration with the Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers and the American Society for Metals. It covers a wider field, and with a different purpose, than the other conference volumes.

The result is an anthology of metallurgy, with as broad a range of writing styles and topics as one expects in an anthology of literature. In this field, the authors are as well known as those selected from the general field of literature, and some of the results are as disappointing as those encountered in that field.

As an anthology, it should be read one piece (or perhaps two) at a time, with plenty of time in between for digestion, so that the lack of continuity and the irregularity in style are least noticeable. Besides, the ideas and ways of arriving at ideas, as presented by Orowan, Bain, Taylor, Mehl, and Jeffries, deserve careful consideration, as do the unanswered questions posed by Multhauf, Weill, and Müller.

The editor commended this volume "both to metallurgists who want to understand the past of their profession and to general historians who can gain from it added light on the nature of an activity which has sometimes helped man's thinking and has always influenced what he could achieve." I concur in its general value to metallurgists, but must qualify the recommendation to historians. The biographical and autobiographical papers will benefit both groups of readers, despite the difficult styles of Humphries, Moore, and Thompson. In addition to the biographical papers, both groups can gain pleasure and benefit from Multhauf, Bastien, Sadovsky, Cohen and Harris, Mehl, Taylor, Orowan, Müller, Coolidge, and Gale, because these authors clearly transmit the ideas and define the problems which they review.

Unfortunately the other 14 articles fall into technical discussions which require more than passing acquaintance with metallurgy and which are historical only in the sense that literature reviews for dissertations are historical. For the metallurgist who is attacking a new problem, most of the 14 provide a convenient starting place in the subject fields. Even from this point of view, the paper by Rhines seems out of place.

The book itself suffers in two areas: the lack of discussion and an inadequate index. The lack of discussion may accurately reflect the conference, but the index does not accurately reflect the book. Too few technical categories were indexed (not even all the subheadings of the papers), and too many of the names listed occurred only because authors conscientiously completed the literature reviews. The historian of technology or science will find this an unhandy reference.

I salute Cyril Smith for providing many pleasant hours with great men who touched on metallurgy among their many contributions, and for inspiring so many "amateur" historians to make the enthusiastic contributions they have provided here.

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Conference and Symposium Reports

Accuracy in X-ray Intensity Measurement. Proceedings of a symposium (Suffern, New York), February 1965. S. C. Abrahams, Ed. American Crystallographic Assoc., Pittsburgh, Pa., 1965 (order from Polycrystal Book Service, Pittsburgh). 122 pp. Illus. Paper, $3.50. Six papers: "On determining absolute x-ray intensities with powders" by B. W. Batterman; "Accuracy in x-ray intensity data, how to recognize it, what to do with it" by W. H. Zachariasen; "Background factors and technique design" by R. A. Young; "The comparison of single crystal diffractometric techniques" by T. C. Furnas, Jr.; and "Systematic errors in the determination of structure factors" by Joshua Ladell.

Adipose Tissue Metabolism and Obesity (*Ann. N.Y. Acad. Sci.* **131**). Harold E. Whipple, Ed. New York Acad. of Sciences, New York, 1965. 683 pp. Illus. Paper, $12. Fifty-seven papers presented at a conference held in December 1964. The topics considered were Adipose tissue metabolism (25 papers); and Metabolic factors in obesity (32 papers).

The Biological Significance of Climatic Changes in Britain. Proceedings of a symposium (London), October 1964. C. G. Johnson and L. P. Smith, Eds. Published for the Institute of Biology by Academic Press, New York, 1965. 232 pp. Illus. $7. Symposia of the Institute of Biology, No. 14; 13 papers: Dimensions of change (1 paper); Effects of climatic change and their implications (7 papers); The manipulation of material and the selection of sites (3 papers); and Perspectives of the future (2 papers).

The Fisheries: Problems in Resource Management. James A. Crutchfield, Ed. Univ. of Washington Press, Seattle, 1965. 152 pp. Illus. $5. Seven papers, and commentary, on public policy issues involved in the management of fisheries resources; the papers were prepared by members of the faculty of the University of Washington for oral presentation at the inaugural series of Natural Resources Public Policy Seminar sponsored by the Graduate School of Public Affairs.

Photographic and Spectroscopic Optics. Proceedings of a conference (Tokyo and Kyoto, Japan), September 1964. Japanese Journal of Applied Physics, Tokyo, 1965. 694 pp. Illus. One hundred and eleven papers given at a symposium held under the auspices of the International Commission for Optics and arranged by the Science Council of Japan and the Japan Society of Applied Physics.