

BOOK REVIEWS

tical seismology. Over two hundred of them authored by Soviet investigators, and a list of important symbols is given. In speaking, the notation and nomenclature. Then follows the nucleus of the book which deal with the ray-series method which together encompass 177 pages. The method for high frequencies, leads to the principle and other more or less familiar. The geometrical behavior of ray paths in is discussed in considerable detail. Vector ray compact expressions for the coefficients of reflection and transmission at a sharp interface is also discussed, reflection—transmission coefficients. The authors commendably point out, in the book are not very useful since it requires less equations directly.) Results for a chapter on the ray-series method. The method to describe propagation in the book is reduced as higher-order terms in the ray treatment is again encyclopedic. A very comparison of wavefront diagrams and ray paths with wavefront diagrams. The head-wave coefficients (again probably of limited value) for the head-wave coefficients for a range of frequencies. Concluding this chapter are elementary ray paths for a head wave and its associated reflected wave, reflection at a curvature or velocity gradients. The results above are generalized to multilayer media and very little new information in these chapters is given in book-book fashion. However, this is not surprising in view of the techniques to specific models. The models with velocity gradients below the surface and multiply reflected head waves that are common in the earth. The effects are minimal. Results for the propagation of head waves. Some numerical results are also given. The ray-series method by wave methods (i.e., all methods other than ray-series method), head-wave studies using wavefront diagrams and ray paths. The investigations of propagation in the earth when the ray-series solutions are known. The discussions

BOOK REVIEWS

55

in this chapter are mainly descriptive, although the single-plane interface problem is treated in detail by approximate contour integration methods. Of particular interest are the improved approximations given for the interfering reflected and head waves in the neighborhood of the critical point. Unfortunately, the entire discussion of Cagniard's method and normal (and leaking) mode theory are crowded into the last five pages of the book. The most elegant and physically intuitive treatments of head waves in plane-layered media to date have been obtained by use of Cagniard's method. In addition the Cagniard treatment has recently been used as the basis for elegant approximate methods in models with curved boundaries and spatially varying elastic parameters. Mode theory is also essential to the understanding of interfering head waves. Primarily because of this disparity between chapters 2 and 3 on the one hand and chapter 7 on the other, this reviewer cannot wholeheartedly recommend this book as the definitive work on head waves. Nevertheless, it should serve a useful purpose in disseminating an understanding of head waves in the ray theory approximation.

STAN LASTER (Dallas)

139
Geothermal Problems. S. Uyeda and A.M. Jessop (Editors). Elsevier, Amsterdam, 1970, 390 pp., Dfl. 54.00. *Tectonophysics*, 10(1-3).

This special issue of *Tectonophysics* contains a collection of papers presented at the Symposium on Geothermal Problems which was held at the Escuela Técnica Superior de Ingenieros de Caminos, Ciudad Universitaria, Madrid, Spain, on September 3rd, 1969. The symposium was a part of the meeting of the General Scientific Assemblies of the International Association of Seismology and Physics of the Earth's Interior (I.A.S.P.E.I.) and the International Association of Geomagnetism and Aeronomy (I.A.G.A.) held in Madrid from September 1st to 12th, 1969.

A total of 24 papers were presented at the symposium and are divided into four topical categories with the following headings: (1) Geothermal Areas; (2) Methods and Techniques of Thermal Conductivity Measurements; (3) Regional Heat Flow Measurements; and (4) Geophysical Interpretations of Heat Flow and Basic Studies of Thermal Processes in the Mantle. Most of the papers are highly current and many of the authors are well known for their excellent work in these fields.

Part I commences with a paper by Rinehart on geysers, their behavior and dissipation of heat. A paper by Yuhara follows on the methods and equipment to derive the rate of heat dissipation from geothermal areas. Noguchi presents an evaluation of the available energy content of magma chambers. This section is relatively brief and does not contain much information on geothermal areas of practical interest.

Part II begins with a paper by Jessop on the divided bar method, which presents a valuable discussion of the technique of conductivity measurements. There follows an analytic treatment by De Marco and Sestini of the heat-conduction problems in and

around cylindrical borehole probes for in situ measurements of the heat conductivity. Hurtig and Brugger present a paper on the influence of a uniaxial pressure on the heat conductivity of rocks, and finally there is a paper by Doroginitskaja and Moiseenko on the use of correlation techniques in the estimation of heat conductivity. The authors show that there is a correlation between the heat conductivity and various other measureable rock properties.

In Part III, Moiseenko et al. present a paper on the use of boreholes of only 100 meters depth in the determination of the terrestrial heat flow. This is an important topic and the authors show that shallow boreholes can be used for this purpose. There follow nine papers on the results of heat-flow measurements in various regions such as western Siberia, southern Italy, France, Cambay Basin in India, Godavari Valley in India, Korea, Philippine Sea, Ryukyu Islands, and in the South American continent. All these papers contain valuable data based on a critical evaluation of a substantial amount of field work.

Part IV is devoted to more theoretical aspects. Lubimova and Feldman present an interesting, lengthy discussion of the correlation between temperature, heat flow, and electrical conductivity in the crust and upper mantle in the U.S.S.R. Sclater et al. present a thorough paper on the relation of heat flow, bottom topography, and basement relief in the northeast Atlantic. The paper contains numerical results on the influence of various types of irregularities on the ocean-floor heat flow. Verma et al. discuss the correlation between the age of igneous activity and regional heat-flow based on data from North America and Australia. There follow three papers of considerable interest on the thermal problems associated with sinking lithospheric slabs. Hasabe et al. present a theoretical discussion of thermal and other processes under island arcs. McKenzie introduces the concept of potential temperature within convecting fluids in a discussion of the temperature field beneath island arcs. Moreover, Mınear and Toksöz present a thorough discussion of the thermal regime of a downgoing slab. Finally, Knopoff et al. present a paper on phase velocities of Rayleigh waves across the East Pacific Rise.

This brief summary shows that a substantial number of topics of great current interest are discussed at length in this volume. A wealth of important observational data is also given. Physically, the book is attractive and the quality of illustrations is quite good. The reviewer finds most parts of this volume very informative. It will no doubt be of great value to all solid-earth scientists and other persons who are interested in geothermal problems.

GUNNAR BODVARSSON (Corvallis)

Bauxites. I. Valetton. Elsevier, Amsterdam, 1972, 244 pp., Dfl. 75.00.

This reviewer recommends Valetton's book to those scientists interested in the various phases of bauxite research. The aim of this volume is to present a survey of the mineralogy, geochemistry, geology, world distribution and economic significance of bauxite deposits.

BOOK REVIEWS

The book contains concise mineral decomposition and discussion of the problem of environmental factors governing the chemical and physical properties of bauxite.

The second part of this book deals with bauxite ore deposits according to their origin. The various types of bauxite, their chemical, and mineralogical characteristics, and their source rocks, diagenetic processes, and tectonic settings are discussed.

Valetton considers that the most important ore type proposes in addition high-temperature bauxite (10-10% combined Al_2O_3 and Fe_2O_3). The book includes reviews of the available published literature on bauxite.

Glossary of Mining Geology
Elsevier, Amsterdam, 1972
(ca. U.S.\$15.00).

Mr. Amstutz, as always, has contributed to the *Glossary of Mining Geology* with his "Splendor of Translation". He has provided a list of the "Misery" especially a catalogue of definitions, each with its own disposition is based on the English index at the end of the book. The book is in two languages and with numbers.

The *Glossary of Mining Geology* includes definitions of terms, and includes diagrams, charts, geological time scale, bauxite deposits, crystallization and important ore minerals.

Any author of a glossary of definitions, otherwise the book in this book will enable a geologist to understand problems of economic geology. It will also help him to understand the work of engineers and the ore dressing process. The problems have been treated too soon.