BOOK REVIEWS

OUTLINES OF GEOPHYSICAL PROSPECTING—A MANUAL FOR GEOLOGISTS. by M. B. Ramachandra Rao, Prasaranga, University of Mysore. p. 403, Price Rs. 50/-, 15 dollars.

This book belongs to the field of Geophysics. The purpose of the book is to provide a 'handy compendium on geophysical prospecting methods covering the applications in the field of petroleum, mining, groundwater and engineering investigations' with the hope that 'it will be very useful to the students of geology in India'. The author is eminently suited to the task he has undertaken.

The art of geophysical prospecting has become immensely sophisticated during the last decade. It has tremendously benefited from the advances made in the fields of electronics and computer sciences. Many characteristics of geophysical fields which were not measurable in part are now observed routinely and many techniques of data analysis which one could use only at headquarters and with a lot of time involved, have become amenable even under field conditions. Progress achieved in any area of geophysics immediately permeates through related areas. For example, the Backus and Gilbert inversion technique was developed in late sixtees in connection with Earth's free oscillations. Within about five years time this technique has been applied in gravity, magnetic, electrical-resistivity, electromagnetic and seismic prospecting problems.

Another recent development concerns geophysical activities in the field of energy. We need to discover not only more hydro-carbons, but also look for alternate sources of energy, viz., solar, geothermal, tidal and wind energies. In many developing countries, demand for more food has taxed all the known surface water resources and their emphasis is shifting to groundwater. The opportunities to geophysicists are tremendous. Shri Rao's book will certainly encourage a large section of geologists to participate fruitfully in these ventures.

There are eleven Chapters in this book. Chapter I contains an introduction to geophysical prospecting, an over-view of the subject and elaboration of its historical development abroad in India. This chapter provides a glimpse of the approach which the author adopts in the later chapters.

Chapter II is entirely devoted to electrical methods. Fundamental concepts involved in this method are initially reviewed. Self-potential method, resistivity methods, equi-potential line method, Mise-a-la-masse method, potential drop ratio method, electromagnetic methods, telluric and magnetotelluric methods, AFMAG and induced polarisation methods are then presented giving in detail the principle, instruments, field procedures, interpretation and applications.

Magnetic methods are dealt with in Chapter III, which includes a description of the Earth's main magnetic field and the magnetic properties of various rocks and minerals. The instruments in vogue are described along with the methods of data acquisition and data reduction. Both qualitative and quantitative methods of interpretation of these data are discussed. Applications of this method are shown in mineral exploration and engineering purposes. Costs involved in these surveys are also presented.

Chapter IV is concerned with the gravity method which is of immense value for reconnaissance surveys in oil exploration. The gravitation field of the earth and the densities of rocks and minerals are summarised at the start of the chapter. Various instruments like pendulum, torsion balance and gravimeters are then discussed. The procedures to be adopted for acquring gravity data and corrections to be applied to these data are presented, Discussion on interpretation techniques includes such topics as gravity ambiguity and estimation of the mass of the ore body. Applications of this method in various parts of India and to various kinds of problems are illustrated.

Seismic methods are discussed in the next three Chapters 5, 6 and 7. Chapter 5 contains a general discussion on the seismic method. Earth's internal structure and elastic properties of commonly occurring rocks are briefly discussed. This Chapter ends with a comprehensive discussion on the general scheme of seismic operations. The Chapter on refraction methods treats general principles, equipment, operation methods, data reduction, interpretation and applications. Examples of applications are drawn mainly from the work done by Oil and Natural Gas Commission. The discussion on reflection methods includes a discussion of principles involved and descriptions of various strategies for conducting surveys. Methods used to enhance signal to noise ratio are also presented. Various corrections to be applied to reflection data and the form of reflection data to be prepared for interpretation purposes are then described. This Chapter also includes section on interpretation techniques and applications to various geological structures.

Chapter 8 is concerned with only 'salient points regarding radioactivity method of prospecting'. The principle behind this method is first described which is then followed by field procedure, data analysis, interpretation and applications. Towards the end of this chapter, a brief discussion on isotope X-Ray fluorescence method is presented.

Airborne surveys have proved very successful in solving many geological problems. This is dealt with in Chapter 9. Various advantages and disadvantages of these surveys are discussed. Survey procedures and methodology of presentation of data are then described. The chapter ends with a summary of results obtained in India by these surveys.

Chapter 10 treats the well-logging methods. These are the methods which allow the geophysicists to observe the targets within a close distance. Electrical logging methods are discussed in some detail. Other methods which are discussed are radioactive logging, sonic logging, temperature logging, caliper logging, and dipmeter logging. Some aspects of interpretation of these data are then described. A summary of the results obtained by well-logging methods in India are also presented. The chapter ends with a discussion on how cosmic radiations can be used in mining and engineering problems.

In the last chapter, the author attempts 'to point out certain salient features of the geophysical prospecting methods as a whole and to highlight the importance of integrated surveys'. This chapter also deals with various discoveries made by the applications of geophysical methods in India—in some of these the author himself has made significant contributions.

The list of references is quite exhaustive. It presents at one place some of the publications of Indian geophysicists in the applications of geophysical methods.

This book is recommended not only to every student of geology, but also to the practising geophysicists in India for their general guidance and reference. The book highlights Indian field examples and the important results obtained therein with the help of geophysical methods over a span of thirty years. Shri M. B. Ramachanra Rao has rendered a great service to the community of Indian Earth Scientists by providing an introductory volume in an area which is comparatively new in our country and where books by Indian authors giving Indian examples are non-existent.

HARI NARAIN

THE MINERAL AND NUCLEAR FUELS OF THE INDIAN SUB-CONTINENT AND BURMA. By J. Coggin Brown and A. K. Dey, Oxford University Press, Delhi. pp. (i-xix) 517, 1975, Rs. 240/-

There has been stupendous progress in the Development of Mineral resources in India which has now gained a more respectable position amongst the many countries of the world as regards resources of petroleum and nuclear fuels, quite apart from those of several other important minerals for which India has long been famous. A large volume of literature on the scientific and economic aspects of these developments lies scattered in numerous reports, official records and some papers published in journals or periodicals of scientific societies. One has to wade through a multitude of such reports in order to obtain authentic information on the geological occurrence, reserves, production, processing and utilisation of these minerals. In the currently available text books on Indian Geology, the information given on the economically important minerals is very brief and elementary. 'India's Mineral Wealth' by Coggin Brown and Dey, published in 1955, has been long out of print. The book under review is the first one to deal exclusively with the mineral and nuclear fuels, and it may be hailed as a boon to students of Geology and Geologists and others interested in coal, petroleum and atomic energy minerals. The foregoing minerals are dealt with in three sections and each section in two parts: an introductory portion giving succintly the general aspects such as origin, chemical constitution, utilization etc., and a descriptive portion giving in detail the geological conditions of individual fields or deposits in India, Pakistan, Bangladesh and Burma.

The first section on Coal, (including lignite and peat) comprises 15 chapters, of which 10 form the introductory part. The chapters on the origin, petrography, chemical constituion, and classification of coal are written lucidly and include the gist of a large volume of literature on these aspects. The processes of gasification and synthesis of petoleum are explained, pointing out the results of researches carried out in India and abroad. The figures of reserves of coal given, viz. 118,004 million tonnes, (of which 23,612 million tonnes are of coaking grade suitable for metallurigical plants) in India are as on 1-7-64 i.e., more than a decade prior to the publication of the book. The annual production of coal in India in 1951 was 35 million tonnes; it increased to 70 million tonnes in 1965. After nationalisation