

METAMORPHISM AND METAMORPHIC ROCKS OF INDIA. By S. Ray, Basu Publishing Company, Calcutta, 1976; 156 pages, 45 text figures, 12 tables; Metamorphic Map of India. Price: Rs. 12.25.

This book is based on twelve lectures delivered by the author to the senior post-graduate students of the Calcutta University. Professor Ray wrote this book with the object of providing a thorough basis to University students for understanding the main principles of metamorphism.

The book is divided into three chapters dealing broadly with principles of metamorphism, microscopic petrography, and metamorphic belts of India.

Chapter 1 deals with the pressure-temperature conditions of metamorphism. Kinds of facies series are described and exemplified; also, mineral reactions and parageneses in different kinds and grades of metamorphism. A section of this chapter which will be of great use to the student is that wherein details for mapping metamorphic belts are given, and the procedure to be followed for structural analysis and processing of data.

Chapter 2 deals with structures and textures met with in various types of metamorphic rocks—cataclastic, contact, and regional. The brief section on the petrofabric analysis of metamorphic rocks dealing with fabric diagrams is a good introduction to the beginner.

Chapter 3 gives an account of the metamorphic belts in India, the regions selected being from the Himalayas, Singhbhum and neighbouring areas, Gangpur, Bastar (Madhya Pradesh), Rajasthan, and Eastern Ghats. This chapter concludes with metamorphic map of India on the scale 1:4,500,000; in the inset, isograd maps are given of a few areas like Darjeeling and Sikkim hills, Singhbhum-Manbhum-West Bengal, Gangpur, Bastar and Simla.

A serious omission is the almost complete absence of any reference to work done in Karnataka.

Among the Tables, special mention may be made of Nos. 7 and 9. The former gives the changes in composition of metamorphic minerals as the grade of metamorphism increases; and the latter provides a broad classification of the facies, grade, zone, and minerals met with in regional metamorphism.

Two new terms have been proposed by the author—*isophase* instead of *isograd* (p. 15), and *Khondalite Type* (p. 53) to signify the kind of metamorphism in the granulite grade where only pressure shows marked variation at an almost constant temperature.

In a short compass of 140 pages, Professor Ray has been able to compress a vast amount of material relating to almost every aspect of metamorphism. The price is reasonable and I expect the book will be popular among post-graduate students of Geology in Universities.

C. S. PICHAMUTHU.

LATERITE AND LANDSCAPE. M. J. McFarlane, Academic Press, London, 1976, pp. 1-151. Price: £ 5.80, 21.75 dollars.

Ever since Laterite was first recognised by Buchanan in parts of the West Coast of India nearly 170 years ago, interest on this rock type has steadily grown. The contribution of Indian geologists to this problem, however, is unfortunately negligible compared to the extensive work carried out in other parts of the world. Most of the research carried out on laterite has centred round the possible processes leading

to the formation of laterite starting from different source rocks. So far, laterite as an index for landscape analysis has not separately been discussed. The present work 'Laterite and Landscape' therefore, is a welcome addition to the growing literature on laterite.

Chapter 1 presents a historical review of laterite genesis. Research points to many kinds of laterite and many different environments in which they form. In order to use laterite as geomorphic criterion it becomes necessary to know which laterite belongs to which environment. The confusing array of conflicting opinions are ably summarised in Chapter 2 entitled 'What is Laterite'. Chapter 3 deals with the environment of laterite. Laterite development is not confined to certain rocks only, but covers a great variety and it is argued, that environmental features other than geology have had a more significant influence on the nature of the end product.

What the environment of laterite is and its relation to topography is considered in Chapter 4. The surmise that laterite is commonly associated with low relief is disputed and several instances where it is found to occur in regions of considerable relief are quoted. Chapter 5 considers relation of climate to laterite formation. High temperatures are indicated to favour desilicification. Alternating conditions of moisture are required for sesqui-oxide precipitation. The relation of laterite to vegetation is considered in Chapter 6. It is shown that the entrenched belief that laterite genesis is exclusive to a grassland vegetation is not warranted. The author emphasizes the need for recognising the profile in which laterite occurs as being the most essential part of its environment. This is discussed in Chapter 7, identifying the laterite horizon, the horizon overlying it and the horizon below it.

Several structural varieties of laterites like oolitic, pisolitic, nodular, concretionary, vesicular, vermicular, are described in Chapter 8 and it is concluded that the various structures reflect the local environment of formation. A genetic classification of laterite based on structure can provide an useful tool for the recognition of the nature of the imperfectly preserved landsurfaces in which these laterites occur.

The chemical constituents of laterite, their mobility and relevance to the study of laterite genesis are considered in Chapter 9.

These introductory accounts of various aspects of laterite lead logically to a consideration of laterite genesis in Chapter 10. The several theories of laterite formation are described in detail which reveal the bewildering divergence of opinion that exists on laterite genesis. The study emphasizes further research.

The way in which laterite can be used or misused in the study of the geomorphology of an area forms the subject matter of the concluding chapter, in the belief, that such studies will establish a more satisfactory relationship of laterite genesis to landscape development.

This brief review will serve to give a sufficient introduction to the variety of subjects considered in this short but extremely informative book. The review of literature is exhaustive. Illustrations are excellent. Printing and get up are of a high order. This is a welcome addition to our knowledge on laterites and it is hoped it will stimulate the interest of geologists and geomorphologists in India on this interesting and enigmatic rock type, first recognised in this country.

B. P. R.