

BOOK REVIEWS

GLOBAL GEOLOGY M. Aftab Khan, Wykeham Publications (London) Ltd., pp. i-ix-165, 1976, (£3/-).

'This is not a geology book in the traditional sense. It is not an account of the geological history of the earth' says the author of this book in his preface, adding that 'the content is largely geophysical'. The difference between geological and geophysical work is that in the former, the data collection is principally by direct (visual) observations, while in the latter it is wholly dependant on instrumental means. However, the final interpretation of geophysical data actually adds to geological knowledge. It is by synthesis of both geological and geophysical data that we can understand the various phenomena and processes which have taken place or are taking place in the Earth. As the book under review presents a comprehensive account of some important aspects of the geology of our globe, the title 'Global Geology' seems quite appropriate. In this small handy book of only 165 pages, in eight chapters, the author has presented a remarkably large volume of information relating to several topics beginning with the origin and age of the Earth, and taking us through Geodesy, Seismology, Volcanology, Geomagnetism and to the consideration of Internal Structure of the Earth and the origin of the major features of the Earth's surface, and finally to Plate and Plume Tectonics. In each of the chapters the results of not only the earlier views but also of the modern researches on the respective topics are presented in logical sequence. In addition, brief accounts of geophysical prospecting methods and instruments are also included.

Regarding the origin of the earth, both the nebular and planetismal hypotheses are reviewed in the light of densities and distribution of the planets, and the hot molten metallic interior of the earth.

The earth's shape, topography and gravitational field are outlined, giving the results obtained from satellite studies. Amongst the topographic features of the earth, it is pointed out that the most remarkable feature is the mid-ocean ridge system, the extent and magnitude of which has been known only within the last two decades! The mid-ocean ridge system occupies nearly a quarter of the Earth's surface area, being continuous for over 60,000 km, with several hundreds of km width. The maximum relief of this spectacular feature is nearly 10,000 m above the ocean floor!

Regarding Isostasy, it has been noted that neither Airy's nor Pratt's hypothesis is entirely true everywhere, and that it is now apparent that compensation is achieved by lateral density changes both in the crust and its substratum, by changes in crustal thickness or by a combination of both.

Seismology and the Internal Structure of the Earth (Chapters 3 & 7) together account for nearly one-third of the total number of pages in the book. In most text books the two topics are considered together as the knowledge of the internal structure of the earth is derived mostly from the study of the earthquakes. However, in this book, the consideration of the internal structure has been rightly postponed to a later chapter allowing for review of data from volcanology, geothermal and earth's radioactivity, and geomagnetism, all of which have thrown considerable light in recent years on the internal structure of the earth. In Seismology, the topics covered include the incidence and distribution of earthquakes, instruments for recording the earth vibrations, and the methods of determining the intensity, magnitude and the epicentre of the earthquakes. Some account is furnished of the special devices for

detection of the shocks produced in atomic blasts, and the criteria for distinguishing these disturbances from the vibrations due to natural earthquakes are discussed. Recent work on Earthquake prediction and control is also very briefly reviewed.

Volcanic phenomena reminding us of the fact that the 'earth is very much alive' has been described, noting the distribution of volcanoes on the surface and the ocean floor. The composition of igneous rocks is considered in relation to the speculation that the mantle, the source of igneous rocks, consists of pyrolite, a hypothetical material, predominantly magnesian silicate. The prediction of volcanic eruption is also discussed.

Geothermal energy and the global heat flow and radioactivity are dealt with in some detail. Geochronological methods are reviewed and a geological time scale is presented denoting the ages of the various epochs from Cambrian to the Quaternary periods.

The Earth's magnetic field and magnetic properties of rocks are explained. The different views on the origin of the earth's magnetic field are reviewed and it is concluded that the theory of dynamo action within the conducting liquid core of the earth satisfactorily explains the earth's magnetism. The studies on Global palaeomagnetism indicate many reversals of polarity and polar wandering. The absence of rocks with intermediate direction between normal and reversed sequences is said to indicate that the reversals took place in a much shorter time than the length of a polarity epoch. The implication of polar wandering on continental drift is also considered.

The Internal structure of the Earth as revealed from data from density of earth, the study of earthquakes and the Deep Seismic Soundings and other evidences is considered in some detail, and an account is given of the properties of the different internal zones viz., the crust, the upper mantle, lower mantle, outer core, transition zone and the inner core and centre of the earth. The idea of contracting vs expanding earth is discussed briefly.

The nature and origin of the earth's features such as continents, continental shelves and mountain ranges and the ocean basins and mid-ocean ridges are considered at some length, in relation to continental drift, sea floor spreading, and Plate Tectonics. The mechanism which could satisfactorily account for drift is said to be convection currents in the interior of the earth. An elegant exposition is presented of Plate Tectonics, which is referred to as 'the revolution in Earth Sciences since the sixties, the decade of geophysics'. The prognostic depiction of the relative positions of the continents in 50 million years from now (in what has been termed as the Psycho-Zoic era by Deitz and Holden) is an interesting speculation based on extrapolations of known rates and directions of drift and plate tectonics. However, we do not know what man will do in this era by atomic holocaust and space exploration, may be upsetting the natural state and sequence of events in this globe!

Finally, a brief outline is presented of 'Plume' tectonics which explains the formation of aseismic volcanic islands. These hot spots are regarded as manifestations of Plumes which bring heat and primordial matter from the lower mantle by convection.

The book on the whole is a very welcome contribution to both geology and geophysics, and the author is to be congratulated on presenting the foregoing aspects of Global Geology in a comprehensive, but succinct manner. The style of writing is charming and makes reading pleasant. Every geologist can profit a great deal by reading it. The get up of the book is good.

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