

from situations encountered in the course of research, but only from ambitions for a total explanation of organic nature.

It is a measure of Erasmus Darwin's success as an exponent of the scientific vision of nature that King-Hele should register so generous an estimate of his place in history. He is compared to Leonardo and to Goethe and is credited with an influence on the Romantic poets, as well as on Charles Darwin, which it is doubtful that he exerted. For the most part, however, the author lets his versatile and imaginative subject speak for himself, for his speculations, and for his belief in the importance of science in the advancement of knowledge and the progress of man.

PHILIP C. RITTERBUSH

*Office of Senator McIntyre,
Washington, D.C.*

Earthquake Seismology

An Introduction to the Theory of Seismology. K. E. Bullen. Cambridge University Press, New York, ed. 3, 1963. viii + 381 pp. Illus. \$9.50.

The appearance of this updated edition of Bullen's valuable textbook on earthquake seismology is most welcome. The book remains primarily an exposition of basic theory, a concise and lucid presentation of fundamentals, but much material of current interest has been added. This includes three new chapters on long-period oscillations of the earth, seismic effects from nuclear explosions, and planetary seismology.

The plan of the earlier editions is retained. The first six chapters, nearly one-third of the book, lead from the general theory of elasticity into a discussion of waves and vibrations, and to a consideration of the body and surface waves important in seismology. The presentation is in the nomenclature of Cartesian tensors, although no prior familiarity is assumed; vectors, where needed, are also indicated by subscript notation rather than by conventional symbolism. Most of the discussion refers to infinitesimal motion in uniform media, but effects of imperfect elasticity and finite strain are considered.

Chapter 7, on seismic ray theory in a spherically symmetrical body, is the

only chapter on basic theory which has been substantially rewritten for this edition. It is a condensation of material published elsewhere by the author.

Brief chapters on seismic energy and instrumentation principles precede a long chapter in which Bullen describes the construction and use of travel-time tables. Chapters 12 and 13 offer detailed discussions of the physical constitution, particularly density, of the earth's upper layers and deep interior. In the remaining quarter of the book, Bullen considers briefly a variety of topics: long period oscillations; earthquake mechanism, distribution, and periodicity; nuclear explosions.

Bullen is chairman of the Department of Applied Mathematics at the University of Sydney as well as a distinguished seismologist. Not unexpectedly, thorough treatment is given those topics to which he, sometimes in collaboration with Sir Harold Jeffreys, has made important original contributions: seismic ray theory, construction of travel-time tables, and determination of the earth's density distribution.

The omission of references from the first edition was remedied in the second. In this third edition, there is a bibliography of nearly 700 items, grouped in 33 categories and arranged chronologically through 1963. Russian authors appear under-represented with only 31 entries, if we consider their contributions to seismology. A comprehensive 19-page index adds to the value of the text.

This third edition maintains and improves on the high standards of the previous editions.

HAROLD M. MOONEY

*Department of Geology and
Geophysics, University of
Minnesota, Minneapolis*

Political Geography

Politics and Geographic Relationships.

Readings on the nature of political geography. W. A. Douglas Jackson. Prentice-Hall, Englewood Cliffs, N.J., 1964. xiv + 411 pp. Illus. \$6.95.

It is important for the nonsocial scientist to appreciate what Jackson set out to do in assembling the readings in *Politics and Geographic Relationships*. Otherwise he may conclude what

some have long suspected—that geography in the United States, once on at least speaking terms with the earth sciences and biology, has finally flown off to find a more congenial home shared by politics, theoretical economics, and metaphysics. Even some rather traditionalist geographers may wonder if the book is really their concern when the authors are able to reach page 223 without needing to explain themselves in maps or charts and when it is noted that rather less than half of the chapters are by geographers. In truth, the title warns us what to expect, for the book is primarily about *politics* and geographical relationships. It may find its widest audience in endeavoring to persuade political scientists or specialists in "government" that there are geographical relationships which should be taken into account when the affairs of nation states are being considered.

The editor has selected 34 papers for inclusion, all previously published. About half of them fall into the orthodox field of political geography, including those by well-known geographers such as Richard Hartshorne, Stephen B. Jones, O. H. K. Spate, Mark Jefferson, Roy Wolfe, N. J. G. Pounds, Norton Ginsburg, and Jean Gottmann. The essays in which they discuss traditional topics include "A free and secure access to the sea" (Pounds), "The nature of frontiers and boundaries" (Kristof), and "National resources and economic development" (Ginsburg), as well as several of a soul-searching character—for example, "What is political geography?" (Hartshorne).

It is this last question, Jackson confesses, which originally led him to assemble these papers for the use of college students, and he enlarges on the problem in an all too brief introductory chapter. In searching for a line of demarcation between political geography and political science, Jackson concludes that the essential distinction lies in the point of view, for, while the latter is concerned mainly with institutional structure, the geographer keeps his eye on the resulting geographical patterns and relationships. Nevertheless, he believes that the geographer should be more fully aware of the emphasis placed on institutional structure by the student of politics, hence the strong representation among the authors of such political theorists as George Santayana, Karl W. Deutsch, Gunnar Myrdal, and Ernest B. Haas.

Taken as a whole the book provides