Book Reviews

Earth's Satellite

The Measure of the Moon. Ralph B. Baldwin. University of Chicago Press, Chicago, Ill., 1963. xx + 488 pp. Illus. Maps. $13.50.

Physics and Astronomy of the Moon. Zdeněk Kopal, Ed. Academic Press, New York, 1962. xv + 538 pp. Illus. $16.50.

The appearance of two large books about the moon, in such close sequence, with so much to praise and so little to criticize, yet with such widely different choices of subject matter, testifies to the almost explosive increase in the study of our satellite that has been carried on by physical scientists since World War II. Although each book contains material of interest to the intelligent layman, both are directed primarily toward physical scientists, and especially toward the men who are attempting lunar research. Such men, if they lack technical library facilities, either because they are connected with small universities or because they are retired, will perhaps find that these books are the most used ones in their professional libraries. The space that any journal can allot to a review must be inadequate.

Baldwin's book is a new one, not a revised and enlarged version of his *The Face of the Moon*, published 14 years ago. The first 105 pages scarcely mention the moon! They bring together short, authoritative descriptions of some terrestrial craters, which are either definitely of meteoritic origin, or which at least bear evidence that favors such an origin. Those of us who are not geologists specializing in vulcanology have missed much of the material, and we welcome this digest with its voluminous list of references. The next hundred pages continue this introductory material on craters. There are theoretical discussions of diameters, depths, rims, the distribution of material, the effects of shock waves, and especially of the relationships of parameters of craters produced by varying explosive actions that occur at different heights or depths from the original surface. Baldwin provides equations based on data from nuclear explosions, from terrestrial meteoritic craters, and, less certainly, from lunar craters which are assumed to be meteoritic. Here again his list of references is ample, and the brief characterizations of the research of selenologists are useful. The third major portion of the book concerns the shape of the moon, a matter that has worried students for a long time. He summarizes previous work and goes into some detail in presenting his own careful study and his new contour map.

The latter half of the book is devoted to the lunar data as we observe them visually, photographically, photometrically, and spectrographically. Baldwin considers craters, the different forms of maria, lava flows, the lunar rays, the atmosphere, the magnetic field of the moon, tektites, the testimony of varying albedoes concerning the nature of the moon's surface, the heat balance of the moon, the question of color, domes, rilles, possible changes of the surface, and all of the other subjects that must occupy the selenologist's time. In all of this he appears to have performed a masterful feat of summarizing. I must, however, plead guilty to a stubbornness which forces me to remain one of the minority who believe that, despite the great importance of meteoritic impacts on the moon, its internal conditions have been even more important in producing the surface we observe today.

In contrast to Baldwin's presentation, Kopal has gathered more than a dozen of the world's greatest authorities, each to write a chapter on the part of the subject for which he is best known. One could almost believe that Baldwin and Kopal had mutually apportioned the general subject. The first hundred pages of Kopal's book are devoted to a subject barely touched on in the other: "The motion of the moon in space" by Dirk Brouwer and Gen-Ichiro Hori, "Libration of the moon" by Karol Koziel, and "Dynamics of the earth-moon system" by Gordon W. Groves. The remainder is more conventional, with discussion of the polarization of moon light by Dollfus, lunar photometry by V. G. Fessenkov, eclipses by Link, topography by Kopal himself, the nature of lunar craters by Eugene Shoemaker, and outgassing by Kozyrev. There is an extremely important chapter by Sinton on temperatures of the lunar surface; Grainger and Ring consider luminescence; radio echo studies are beautifully summarized by J. V. Evans; and Urey presents his interpretation of the origin and history of the moon. Each author has carefully supplied references to original material.

In a general estimate of values, it is impossible to consider one book more important than the other.

DINSMORE ALTER
1627 Euclid Avenue,
Berkeley, California

Physics and Biology

Physicomathematical Aspects of Biology. N. Rashevsky, Ed. [International School of Physics "Enrico Fermi," *Proceedings* (Course 16)]. Academic Press, New York, 1962. 524 pp. $16.

This collection is presumably devoted to areas at the interface between biology and physics, as they are currently reflected in data and theory.

Let us examine how well the task has been accomplished. A. F. Bartholomay, in an excellent paper which may become a classic reference for students and teachers, provides a highly competent and instructive treatment of the developments of the reaction rate theory in the past hundred years; Bartholomay stresses the cooperation between experimental data and mathematical formalism.

Enzymatic reactions receive extensive discussions in this paper and in the following paper, which is by Boeri. In an attempt to relate physical theory and psychophysical data, M. A. Bouman

provides a concise but comprehensive account of certain aspects of the physics of sensory phenomena. Defares and Wise contribute lengthy papers on physicomathematical aspects of the respiratory system: the theory of pulmonary carbon dioxide diffusion is well treated, with particular emphasis on its application to the measurement of cardiac output; furthermore, there is good agreement between the theory and experimental evidence.

In the course of several chapters, Landahl concerns himself with such diverse topics as the retention of airborne particles in the human respiratory tract, mathematical models for pharmacological systems, neural nets, and a variety of psychological phenomena. Although his interests seem to range over an amazingly wide spectrum, Landahl's treatment of many of these topics is highly speculative. In the light of Rashevsky's remark in the introduction to this volume—"The successful development of any science is contingent upon an harmonious co-operation between experiment and theory . . ."—I am forced to conclude that Landahl's work falls short of this goal.

Polissar and Rapaport discuss cardiac function by dealing primarily with the problem of evaluating valve insufficiency by means of indicator curves. In a very good analysis of some statistical aspects of radiation hazards, Wise points out the utility as well as the necessity of empirical laws in biomedical sciences. He concludes that "We must be prepared to use any material however untidy or unpromising." In the concluding chapter, Rashevsky discusses what he considers to be general principles of biology; for him the relational rather than the metric aspects of physics are of prime relevance to the biologist.

This last point should be borne in mind by physicists to whom this volume is primarily directed: A deeper appreciation of relational aspects is needed by the physicist who hopes to make a contribution to biology. At a moment in history when biology is moving rapidly towards a better fit between theory and data, this book gives an accurate though highly selective picture of recent developments in the physicomathematical treatment of certain biological phenomena.

ANDREA CAVAGGIONI
Center for Communication Sciences, Research Laboratory of Electronics, Massachusetts Institute of Technology

The World's Third Pole

Mount Everest. Formation, population, and exploration of the Everest region. Toni Hagen, G. O. Dyhenfurth, Ch. Von Fürer-Haimendorf, and Erwin Schneider. Translated by E. Noel Bowman. Oxford University Press, New York, 1963. xiv + 195 pp. Illus. $8.

This is not just another picture book about Mount Everest, "the world's third pole"; instead, the four authors have put together a definitive yet readable account of the geology of the Himalayas (Hagen), a history of exploration of the Everest area (Dyhenfurth), a study of the Sherpa people (Fürer-Haimendorf), and an account of surveying the area, that includes a superb Swiss-style shaded contour map with 20 meter intervals at the scale of 1:25,000 (Schneider).

The translator's preface correctly states that this ". . . is quite out of the run of the usual type of literature concerned with the area; in fact it can be considered as the best book about the Himalayas and in any case is the most comprehensive work on the scientific research of the Everest massif." Each of the authors has had a long experience in the area. Thirty-one handsome plates and two dozen geological diagrams add to the brief text. There is a picture of Chomo-Lungma (Chomo-Lungma, the Nepalese name for the Goddess Mother of the World, is sometimes attributed to Everest), whose corrected height is 8,847.6 meters, or 29,028 feet.

In structural terms, the Himalayas represent a series of great overthrusts and recumbent folds, directed from the north, not unlike the Alps, which evolved from sediments in the ancient Tethys Sea. Hagen's geological work in Nepal spread over 6 years and involved 96 profiles that range from the Ganges Plain to the Tibetan frontier. As an illustration of the local relief, his field studies covered 14,000 kilometers horizontally and 750 kilometers vertically, all on foot.

Since the uplift of the Everest chain took place after regional drainage was established, the Ganges-Tsangpo watershed lies well to the north of the crest of the Himalayas; in fact a further shift of only 15 kilometers would result in the piracy of the upper 600 kilometers of the Tsangpo. The political boundary between Nepal and China follows the main crest line through Everest rather than the watershed.

Mount Everest was "discovered" from a distance in 1852. Attempts to climb it date from 1893; that attempt was followed by scores of expeditions until Everest was conquered by Hillary and Tenzing in 1953. Reports of later Soviet and Chinese expeditions remain unsubstantiated, but in 1957 a Swiss expedition put two parties on the summit of Everest, in splendid weather, and "they took photographs, changed films, ate with a good appetite, and were able to do without oxygen."

Fürer-Haimendorf writes about the Sherpas, a Mongoloid people who live in Nepal but who originally came from Tibet. Most of their villages lie around 12,000 to 13,000 feet, with summer grazing ground up to 16,000 feet. Their traditional economy is based on grazing of yak on seasonal pastures, combined with intermediary trade between Tibet and the rest of Nepal. Cultivated crops are limited to buckwheat, potatoes, and a few vegetables.

The problem of surveying the Himalayas is well described by Schneider, one of the first Britishers to map the Everest area from the north. Of Tibet he says, "I must place on record that Tibet is a wonderful country To Have Been In, rather than To Go To." Successive survey sheets have culminated in the magnificent topographic map which accompanies this volume and which was originally published in 1957.

GEORGE B. CRESSEY
Department of Geography, Syracuse University

Industrial Processes

The Chemistry of Rhenium. K. B. Lebedev. Translated by L. Ronson. Butterworth, Washington, D.C., 1962. x + 105 pp. Illus. $7.50.

The title of this small monograph is somewhat misleading. A more descriptive title would be "The Industrial Chemistry of Rhenium." Ronson, the translator, points out that, unlike the monographs by Tribalat (1957) and Druce (1948) or the recent article by Woolf in the *Quarterly Review* (1961), little of the pure chemistry of rhenium is included in Lebedev's monograph. Only that chemistry which is pertinent to the extraction and recovery, the preparation and purification, and the