the subject is appalling. It touches on every branch of geophysics." Hence the authors discuss not only the astronomical data but also wind and air masses; atmospheric, oceanic, and bodily tides; sea level; rigidity of the earth's mantle; and motion in the Earth's fluid core. For good measure, one piece of Jules Verne's science fiction is discussed.

The dynamics of the variations in speed of rotation and the motions of the axis of rotation, such as the 14-month Chandlerian motion, are treated together. Observational data are analyzed in terms of the "power spectrum." Variations in speed—for example, monthly, annual, irregular, and secular variations — are considered as strong lines in the spectrum.

Secular retardation is given extensive treatment. The authors find that, as yet, there is no satisfactory explanation of how the energy lost by tidal friction is dissipated.

Polar wandering during vast ages of the past is treated in the chapter on geological variations. (Precise astronomical observation goes back only 60 years.) Paleomagnetic evidence, much of it speculative, is discussed, and the authors conclude, "The story of polar wandering is varied and complex. Our principal conclusion is that the problem is unsolved."

The book evidently stems from researches published since 1950 by M + V, where M denotes W. Munk and V is a variable author—G. Groves, E. M. Hassan, R. Haubrich, G. J. F. MacDonald, R. Miller, Y. Mintz, or R. Revelle. The subjects, however, are treated anew, critically and systematically, and the authors do not attempt to force theories to fit the facts.

The volume has been well prepared; it contains four pages of symbols, a reference bibliography, and an index. The faults are few. The photograph in the frontispiece is not described; the linear scale shown has no dimensions. (I have the same feeling toward unexplained photographs in a technical book as I have toward the absence of an index.) According to the authors, "The geophysical discussion is intended for a reader without special training in various branches of this science." Can they really mean this? The description of power spectra (in appendix 2) is far too condensed to be useful. Two methods for representing changes in speed of rotation are ascribed to D. Brouwer (1952), but Brouwer says he presented only one.

This book was awarded the Monograph prize of the American Academy of Arts and Sciences for the year 1959 in the field of physical and biological sciences. As far as I know, it is the only comprehensive treatment of the rotation of the earth, and I recommend it for use in any library concerned with astronomy, geodesy, and geophysics.

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"Mechanistic" Reinterpreted

The Mechanization of the World Picture. E. J. Dijksterhuis. Translated by C. Dikshoorn. Oxford University Press, New York, 1961 viii + 539 pp. Illus. $18.60.

All students of the history of science concerned with the so-called Scientific Revolution of the 17th century will welcome this English translation of Dijksterhuis' *De Mechanisering van het Wereldbeeld* (Amsterdam, 1950). This work, both in its original form and in the German translation (1955), has already become a classic, for its author is one of the most profound interpreters of the history of mathematics and mechanics. The author modestly claims that his interpretation of the mechanization of physical science is not "intended as a handbook for historians of science; [that] it has been written for the general reader with a broad interest in the subject." But let me assure the readers of this review that many historians of science have already learned much from it and many more will learn from it.

To the subjects that he touches in this substantial volume, Dijksterhuis brings accurate, careful, and up-to-date (at least to 1950) scholarship. For example, many of the results of Anneliese Maier's superb investigations into medieval natural philosophy are incorporated. The only points of vexation with this translation are that it costs the American reader $18.60 and that the translation took so long to appear.

Starting with the Pythagoreans, the author steps his way surely through the major phases of Greek natural philosophy, the scientific legacy of antiquity, and the science of the Middle Ages and the Renaissance; he concludes with an examination of the evolution of classical science through Newton. I think no other single volume makes so clear the relationships of ancient and medieval science and philosophy to the development of early modern physical science—in connection with the growth of the substantive ideas of classical (Newtonian) physics and with the underlying philosophical concerns.

In the epilogue Dijksterhuis discusses the nature and meaning of the "mechanistic" viewpoint of classical science which developed in the 17th century. He examines and rejects a number of possible ways of interpreting the "mechanistic" character of Newtonian science: (i) It is "mechanistic" because it conceives of the universe as a "machine," created by God; or (ii) it is "mechanistic" because the hidden mechanisms of nature are considered to be essentially the same kind of mechanisms as simple instruments or machines; or (iii) its theories are "mechanistic" because they describe processes as possessing the same inanimation as machines. Rejecting all of these as the most fundamental way of interpreting the mechanism of this early modern physical science, Dijksterhuis suggests another possible interpretation—that it is "mechanistic" in the sense that it is fashioned "with the aid of mechanics." While this definition of *mechanistic* may seem to be circular and to lead back to the original picture of the machine, he points out (page 498) that in fact this is not so "if one bears in mind that the science called mechanics had emancipated itself in the 17th century from its origins in the study of machines, and had developed into an independent branch of mathematical physics dealing with the motion of material objects and finding in the theory of machines only one of its numerous practical applications." In line with this suggested interpretation of classical physics as "mechanistic," Dijksterhuis is thus able to highlight the difference between medieval and early modern mechanics, namely, that, while the former on occasion uses mathematics and mathematical methods, the latter is essentially mathematical, that is, its basic concepts are mathematical. Many other wise things about the relation of Newtonian to modern science are briefly discussed, as the author brings his fine treatment to a close.

An excellent bibliography completes the book; unlike the main body of the text, it includes titles published as late as 1959. Thanks are due to the Oxford University Press for the handsome makeup of the volume.

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