BOOK REVIEWS

Toward Modern Science. Robert M. Palter, ed. Vol. 1, Studies in Ancient and Medieval Science, 270 pp.; Vol. 2, Studies in Renaissance Science, 218 pp. Noonday Press, New York, 1961. $5.00 each, $9.00 per set. *Reviewed by R. B. Lindsay, Brown University.*

THE history of science is making great strides as a professional discipline. Scientists as a whole are becoming more and more cognizant of its importance in the education of young scientists, even though some still doubt its value to the modern researcher. Professional historians are coming to realize more keenly the enormously important role that the development of science has played in history. Hence, on all sides, the appearance of new works in this field is greeted with respect.

The volumes under review constitute an anthology devoted to ancient and medieval science and contain twenty-five essays on chosen topics in this domain. The work is not, therefore, a connected account of the history of science in the period under consideration. It displays consequently both the merits and defects of an anthology. On the positive side, each article is by a recognized scholar who speaks with authority in his field. The names of O. E. Neugebauer, Sir Thomas Heath, Pierre Duhem, Charles Singer, George Sarton, etc., amply attest to the distinction of the contributions. On the negative side, the lack of coherence in the presentation provides quite a strain on the reader who wants to obtain an over-all picture. The redeeming feature on this side probably is that the reader will become so fascinated with the essays that he will be stimulated to turn to the larger works mentioned in the bibliography.

The physicist will doubtless be most attracted by the essays on medieval and Renaissance physics by Pierre Duhem, on the Arabic achievement in physics by H. J. J. Winter, on the laws of motion in medieval physics by Ernest A. Moody, and on the physics and metaphysics of Kepler's universe by Gerald Holton. But this selection is really invidious. The whole collection calls for close attention, which will be well rewarded.

The Architecture of Matter. By Stephan Toulmin and June Goodfield. 399 pp. Harper & Row, New York, 1962. $7.50. *Reviewed by D. J. Montgomery, Michigan State University.*

"BUT man . . . who cannot give a true reason for the Grasse under his feet, why it should be greene rather than red, or of any other colour . . . will (notwithstanding) examine the Art of GOD in creating the World . . . ," Sir Walter Raleigh chided the natural philosophers in his *History of the World* (1614). But husband-and-wife authors Toulmin and Goodfield in their *Architecture of Matter* (1962) tell us that man's persistence and curiosity have today extended his intellectual grasp everywhere, including certain fundamental life processes. Thus, to lift a felicitous example from Bernal, the biochemist tells us not merely why grass is green but also why blood is red, using quantum-mechanical notions to show how magnesium in chlorophyll and iron in hemoglobin (in the center of otherwise virtually identical porphyrins) give lifetimes of an excited triplet-state just long enough to let oxygen play the roles appropriate to each compound.

In their captivating book, Professor Toulmin and Doctor Goodfield attempt to give a coherent account of the whole field of theories of the structure of matter, both inanimate and animate, as these theories have evolved from the beginnings of science. The intended audience is clearly to be drawn from those who respect learning: scientists interested in the world pattern, humanists concerned with modern society and thought, or simply the educated layman. The work traces a meaningful continuity in the modes of thought about the structure of matter from Ionian times up to the present. Part I follows the threads of questions recurring from 600 B.C. to about 1700 A.D., during which period the behavior of matter, life, and mind were studied together, by the same concepts and as often as not by the same people. Then the ascendancy of dualism—the absolute division between mind and matter—growing out of the dilemmas posed by the success of deterministic mechanics, led to a splitting of the sciences. The principles of physical science developed almost completely independently of those of life science during the 18th and 19th centuries; Part II treats the development of physics and chemistry during this time, Part III the development of biology. In each case the examination is carried up to the most recent work, such as the thermonuclear furnaces of the stars and the protein factories of the cytoplasm.

To conclude the book, a brief and powerful epilog sets forth the burden of the work: A reunified view of matter and life is now forming. Matter is intrinsically neither developing nor inert; it is potentially one or the other. The chemical elements are neither organic nor inorganic; they can form gases and minerals, or viruses and cells. The distinction between living and nonliving materials is not in terms of the stuff of which they are made; the contrast is rather in terms of organization and activity. The existence of viruses, for example, shows how the absolute distinctions between the organic and the inorganic fade into differences of