

leaving the chemosensory system a good third. The emphasis of the treatment reflects that of the research that has been done.

While the octopus is mostly known scientifically through the work of J. Z. Young and for the hope that its brain may provide us with a key to the "en-gram," this book presents the animal in a broad perspective. This will make the book useful for the neurobiologist who needs to know what kind of body the nervous system lives in and has to adapt to.

The book is well written and pleasant to read. There are many illustrations, all of good quality, and a lot of information that is difficult to find elsewhere. This book should be on the bookshelves of all zoologists, for themselves and for their students.

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Medieval Sciences

Science in the Middle Ages. DAVID C. LINDBERG, Ed. University of Chicago Press, Chicago, 1979. xvi, 550 pp., illus. \$40. The Chicago History of Science and Medicine.

Stimulated by the earlier work of men such as Pierre Duhem and Lynn Thorndike, the study of medieval science has in the last few decades blossomed forth into a well-defined and illuminating field of study, flourishing particularly in North America. At present there are a number of distinguished workers in the field, and a good number of them are represented in the present volume, which shows the collectively high level of the subject. Until recently there have been no adequate general introductions to the subject for nonspecialists. Now, within a few years of one another, we have two splendid additions to the literature: Edward Grant's *A Source Book in Medieval Science* (Harvard University Press, 1974) and the book under review, which together provide as good an orientation as any beginner is entitled to expect.

The volume edited by Lindberg consists of 15 chapters, each devoted to a different aspect of medieval science. Except for the excellent concise chapter (by Lindberg) on the transmission of Greek and Arabic learning to the West, the focus is squarely upon Western European science, and little note is taken of Islamic or Jewish science. Though the editorial preface characterizes the Middle Ages as

the period 400 to 1500, some contributors say little about the period after 1350 and others continue their narrative into the 16th and even 17th centuries. The lack of a definable "Renaissance" in science has made the boundaries between "medieval" and "modern" very flexible. The level of exposition is also somewhat variable, many contributors achieving important brief syntheses of their subjects, as valuable for the specialist as for the beginner, and others doing no more than provide adequate introductions. As might be expected, given the state of research, the balance is very much in favor of physical science. The topics covered include mathematics, the science of weights, the science of motion, cosmology, astronomy, optics, the science of matter, medicine, and natural history. In addition there are sections on early medieval science, the transmission of Greek and Arabic science, the philosophical and institutional settings, "the nature, scope, and classification of the sciences," and the relation of science to magic. There is also a useful bibliography.

Several of the contributions are particularly noteworthy. These are "Mathematics" by M. S. Mahoney, "Natural history" by J. Stannard, and "The science of motion" by J. E. Murdoch and E. D. Sylla. Each brings a vast primary and secondary literature under control. Never do I recall seeing the general trends of medieval mathematics discussed so clearly as Mahoney has done; the techniques of computation by the abacus, for example, are well explained; and the notes provide a most useful bibliographical orientation for the more advanced student. Stannard's piece is also a bibliographical tour de force, supporting a clear exposition of the strengths and weaknesses of medieval natural history, based on the latest (mostly German) research in the field. Murdoch and Sylla have presented their difficult subject with their accustomed thoroughness, pointing to the failure as well as the accomplishments of medieval ideas on motion.

There is but one paper in the volume that I find seriously deficient, B. Hansen's "Science and magic." The focus of the paper is on the 16th and 17th centuries, and there is little detailed discussion of the medieval aspects of the subject or of the Islamic background to medieval magic. Moreover, medieval and Renaissance magic are interpreted as part of the same whole, though the generation of Ficino and Pico gave the subject an intellectual respectability that it generally lacked in the Middle Ages

and paved the way for the concern of Agrippa, Reuchlin, Cardano, Postel, Dee, and Bruno, and others with it in the next century. In this regard the illuminating studies of Garin, Vasoli, and Zambelli have not been utilized. Hansen also uncritically follows certain authorities in adopting the term "Hermeticism" to portray a particular type of magic (why is nothing said of the role of the *Picatrix* and of Orphic and Zoroastrian texts in the development of magic?). One characterization of "Hermeticism" that he cites could equally well be applied to Platonism, Neopythagoreanism, or numerous other more clearly defined and more widespread bodies of ideas, and he does not take into account recent critical comments on the validity of "Hermeticism" as a historical term.

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Books Received

Advances in Chemical Engineering. Vol. 10. Thomas B. Drew, Giles R. Cokelet, John W. Hoopes, Jr., and Theodore Vermeulen, Eds. Academic Press, New York, 1978. xvi, 336 pp., illus. \$35.

Advances in Electronics and Electron Physics. Vol. 46. L. Marton and Claire Marton, Eds. Academic Press, New York, 1978. xii, 404 pp., illus. \$37.50.

Advances in Instructional Psychology. Vol. I. Robert Glaser, Ed. Erlbaum, Hillsdale, N.J., 1978 (distributor, Halsted [Wiley], New York). xiv, 304 pp., illus. \$16.50.

After Metaphysics. Toward a Grammar of Interaction and Discourse. Harvey Sarles. Peter de Ridder Press, Lisse, The Netherlands, 1977 (U.S. distributor, Humanities Press, Atlantic Highlands, N.J.). 286 pp. Paper, \$21.75. Studies in Semiotics, 13.

Aging. A Guide to Reference Sources, Journals and Government Publications. B. McIlvaine and Mohini Mundkur with Lana L. Yurchyshyn and Lucy DeLuca. University of Connecticut Library, Storrs, 1978. xii, 162 pp. Paper, \$5. University of Connecticut Library, Storrs, Bibliography Series, No. 11.

Amino Acids as Chemical Transmitters. Proceedings of a NATO Advanced Study Institute, Oslo, Aug. 1977. Frode Fonnum, Ed. Plenum, New York, 1978. xii, 748 pp., illus. \$49.50. NATO Advanced Study Institutes Series A, vol. 16.

Ausgleichsrechnung II. Aufgaben und Beispiele zur Praktischen Anwendung. Helmut Wolf. Dümmler, Bonn, Germany, 1979. xiv, 354 pp., illus. Paper, DM 48. Dümmlerbuch 7836.

Biochemistry of Wounded Plant Tissues. Günter Kahl. Walter de Gruyter, New York, 1978. xii, 680 pp., illus. \$100.

The Biogeochemistry of Lead in the Environment. Part B, Biological Effects. J. O. Nriagu, Ed. Elsevier/North-Holland, New York, 1978. xii, 398 pp., illus. \$67.50. Topics in Environmental Health, vol. 1B.

Biology of Fresh Waters. Peter S. Maitland.