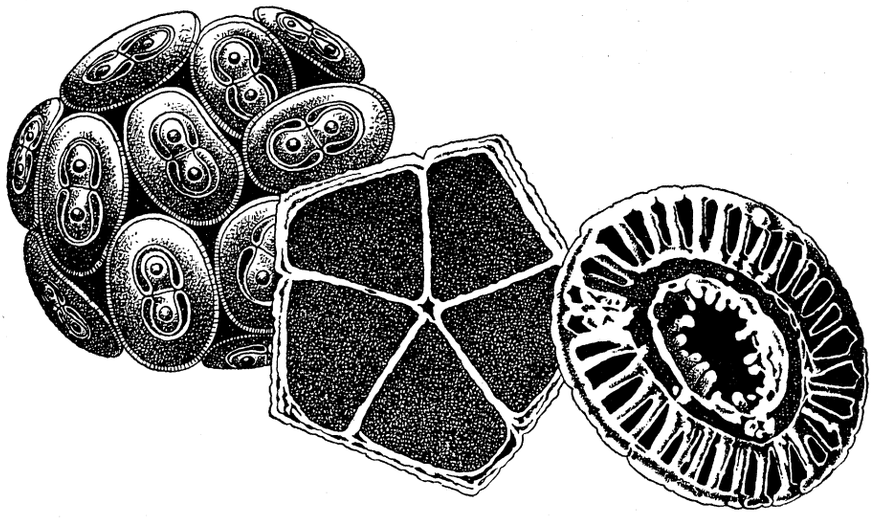

Coccoliths—remnants of unicellular algae. From a drawing in *On a Piece of Chalk.* [Copyright © 1967 by Rudolf Freund]

the age-long process by which chalk was laid down beneath the sea, the extent of the known chalk beds, up to 1000 feet thick and extending over most of Europe and into Africa and Asia, the fossil evidence found in and above these great beds of chalk, the current deposition of a new chalk bed in the Atlantic Ocean and the larger fossils embedded in it, and the conclusions one must draw from the weight of so much evidence concerning the majestic and continuing evolution of the earth and its inhabitants. It was his intent, he told his auditors, to demonstrate "that the man who should know the true history of the bit of chalk which every carpenter carries about in his breeches pocket, though ignorant of all other history, is likely, if he will think his knowledge out to its ultimate results, to have a truer, and therefore a better conception of this wonderful universe and of man's relations to it than the most learned student who is deep-read in the records of humanity and ignorant of those of nature."

That the lessons of paleontology are now so much more widely appreciated than they were when Huxley drew them from a piece of carpenter's chalk is in good measure a tribute to Huxley's genius. We have much more factual knowledge than he had, but we have no better exemplar of the art of explaining in compelling and understandable terms what science is about, nor a more vigorous example of the scientist's obligation to practice that art.

Loren Eiseley's lucid introduction and explanatory notes and Rudolf Freund's illuminating drawings embellish a profound lecture told with charm and grace.

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Inventions of Antiquity

Ancient Greek Gadgets and Machines. ROBERT S. BRUMBAUGH. Crowell, New York, 1966. 166 pp., illus. $4.95.

The author, a professor of ancient Greek philosophy, went to Athens on a fellowship and found there that "an unexpected amount of gadgetry and machinery" had been in use in ancient Athens and Alexandria. So he began to explore this new field, partly to trace the relations between this technology and ancient philosophy, but also for its own sake, since he (like myself) enjoys a clever invention as others enjoy a piece of good music. This led him, together with Paul H. Sherrick, an inventor and equipment designer, to reconstruct one of Heron's instruments (*Pneumatica* 2:7, Teubner ed.), a model of the universe, made to illustrate the Stoic cosmological model. Since the experiment depends upon a ping-pong ball, an article unknown in Heron's time, it cannot explain the apparatus; but it is an admirable idea to try out an ancient instrument in practice.

The book, then, consists of comparisons of ancient cosmological speculations with the technical instruments of the time, but it also contains descriptions of technical marvels, mostly from Heron, for their own sake. It is easy to read and written with a most contagious enthusiasm; and I regret that I cannot recommend it. The author has spoilt what might have been a charming book by neglecting to test his statements and check his references. On page 77 we read that Archimedes "singlehanded, hauled a loaded warship along the sand"; on page 78 we learn, from Plutarch's own words, that it was a ship of burden. In the legend of the figure on page 54, we read that "as the screw turns it lowers the plate"; the figure shows that it lifts the plate. Heron's date is given on page 92 as the second century A.D.; O. Neugebauer, in 1938, determined his date at 62 A.D. by an eclipse of the moon described in his *Dioptra.* On page 95 we read that the Tower of the Winds at Athens was built by Andronikos of Rhodes in the first century A.D., and that he designed the clock; but the Tower was built about 100 B.C., by Andronikos Kyrestes, and the clock is the anaphoric clock, invented by Hipparchos about 150 B.C. On page 6 the same clock is suggested for a very primitive and somewhat doubtful waterclock built on the Agora about 360 B.C.; but the klepsydra with constant flow necessary for the anaphoric clock was invented by Ktesibios, who was alive in 270 B.C. These samples must suffice. A reader who knows about these matters will find the book painful reading; to give it to a novice would be rash. The layout of the book is bad. The unnumbered figures are scattered throughout the book, and no references are given from the text to the figures or from the figures to the text. There is an annotated bibliography and an index; the latter seems to have been written before the book was finally made up.

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Seven Biographical Essays

Late Eighteenth Century European Scientists. R. C. OLBY, Ed. Pergamon, New York, 1966. 217 pp., illus. Paper, $3.50.

This volume contains seven independent biographical sketches of Europeans defined as "late eighteenth-century scientists:" Jean Lamarck, 1744–1829, by

K. M. Jack; Joseph Koelreuter, 1733–1806, and William Herschel, 1738–1823, both by R. C. Olby; Antoine Lavoisier, 1743–1794, by D. J. Knight; Henry Cavendish, 1731–1810, by D. C. Goodman; Alessandro Volta, 1745–1827, by C. G. Vosa; and James Watt, 1736–1819, by J. D. North. Although these subjects were chosen as "representative" of their age, the book is not an epitome of late-18th-century science. There is no effort to show the group to be representative, or indeed, to suggest what that might entail, and there is no indication of the reader to whom this uneven collection of essays is addressed. In short, the collection has no meaning beyond the fortuitous association of biographies which may have independent interest.

We turn, therefore, to consideration of the individual essays. Three of these must be welcomed as filling the gaps in accessible science-biography. The study of Lamarck is, however, disappointing in its failure to fit this French botanist and zoologist, notorious for his evolutionary speculations, squarely within the "romantic" metaphysical trends of the turn of the century. The Koelreuter biography is more successful, though its descriptive approach does not quite justify the selection of the German plant-hybridizer, neglected in his own day, as *representative* of 18th-century botany. The sketch of Volta is disappointing in the frame of an inadequate summary history of electricity.

The remaining essays have the advantage of continuing studies by historians. That on the French chemist Lavoisier is the most successful, for it admirably summarizes the recent work of Henry Guerlac. As recent work on Cavendish is primarily the rewriting of an unsatisfactory work nearly a century old, this essay on the English natural philosopher can only retail the current myths. The essay on Watts adds to plethora. It is marred by frequent minor errors but is graced with a concern for economics and with a detailed analysis of the inventor's favorite device, the "parallel-motion" linkage. Finally, the study of Herschel uses the recent investigations of Michael Hoskin but remains pedestrian and descriptive and fails to justify the choice of the British astronomical observer over some representative of the school of French mathematical astronomy.

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Books Received

Absentee Ownership and Business Enterprise in Recent Times: The Case of America. Thorstein Veblen. Beacon Press, Boston, 1967. 465 pp. Paper, $2.95. Reprint, 1923 edition.

Academic Freedom and the Catholic University. Based on a symposium. Edward Manier and John W. Houck, Eds. Fides, Notre Dame, Ind., 1967. 237 pp. $4.95. Eight papers.

Adhesion and Adhesives. vol. 2, *Applications.* R. Houwink and G. Salomon, Eds. Elsevier, New York, ed. 2, 1967. 604 pp. Illus. $24. Twenty-three papers.

Agricultural Insurance: Principles and Organization and Application to Developing Countries. P. K. Ray. Pergamon, New York, 1967. 343 pp. Illus. $15.50.

The Archaeology of the Palau Islands: An Intensive Survey. Douglas Osborne. Bishop Museum Press, Honolulu, 1966. 509 pp. Illus. Paper, $14.

Air and Its Function in Life. Weldon N. Lewis. Vantage Press, New York, 1967. 64 pp. Illus. $2.50.

Atlas of Human Anatomy. vol. 2, *Atlas of Visceral Anatomy: Digestive, Respiratory, and Urogenital Systems.* Johannes Sobotta. Revised by Frank H. J. Figge. Hafner, New York, ed. 8, 1965. Unpaged. $15.

Atomic Structure and Chemical Bonding. Fritz Seel. Translated from the fourth German edition by N. N. Greenwood and H. P. Stadler. Methuen, London; Barnes and Noble, New York, 1967. 120 pp. Illus. Paper, $1.50; cloth, $2.75.

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Carte pédologique de la France à l'échelle du millionième. Jacques Dupuis. Institut National de la Recherche Agronomique, Versailles, 1967. Two sheets, 60 by 115 cm. 45 F.

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The Colonizer and the Colonized. Albert Memmi. Beacon Press, Boston, 1967. 183 pp. Paper, $1.95. Reprint, 1965 edition.

Color Photography in Practice. D. A. Spencer. Revised edition by L. Andrew Mannheim and Viscount Hanworth. Focal Press, New York, ed. 4, 1966. 410 pp. Illus. $23.

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The Contemporary University: U.S.A. Robert S. Morison, Ed. Beacon Press, Boston, 1967. 382 pp. Paper, $2.45. Reprint, 1966 edition.

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A Dictionary of the Flowering Plants and Ferns. J. C. Willis. Revised by H. K. Airy Shaw. Cambridge Univ. Press, New York, ed. 7, 1966. 1289 pp. $18.50.

Directory of Selected Research Institutes in Eastern Europe. Prepared by Arthur D. Little, Inc., for the National Science Foundation. Columbia Univ. Press, New York, 1967. 457 pp. $12.

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Electricity One–Seven. *Electricity One, Producing Electricity* (110 pp., $2.25); *Electricity Two, D-C Circuits* (136 pp., $2.75); *Electricity Three, A-C Circuits* (157 pp., $2.75); *Electricity Four, LCR Circuits* (168 pp., $2.75); *Electricity Five, Test Equipment* (128 pp., $2.75); *Electricity Six, Power Sources* (152 pp., $2.75); *Electricity Seven, Electric Motors* (155 pp., $2.75). Harry Mileaf, Ed. Hayden, New York, 1966. Illus. Paper, $16.95 set; single cloth volume, $12.76.

Electronics One–Seven. Harry Mileaf, Ed. Hayden, New York, 1967. Unpaged. Illus. $14.96. Individual paper volumes, $20.95 set.

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Food Microbiology. W. C. Frazier. McGraw-Hill, New York, ed. 2, 1967. 551 pp. Illus. $12.50.