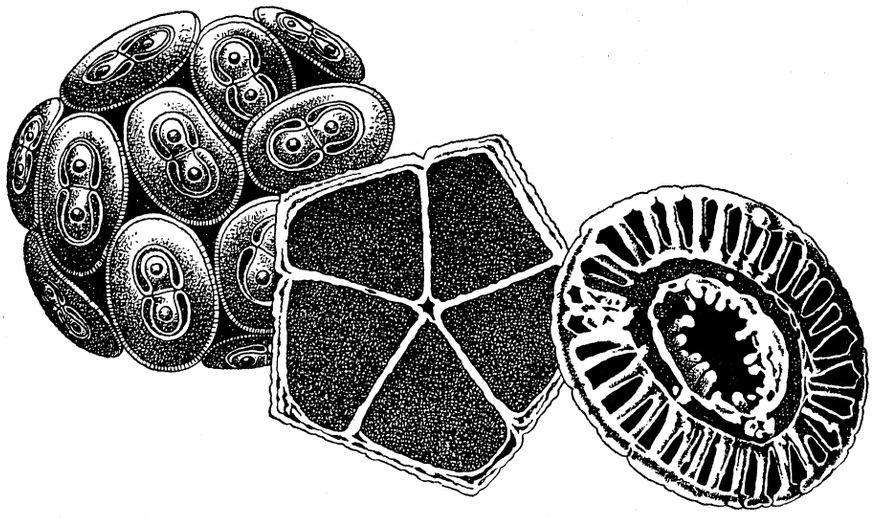

Coccoliths—remnants of unicellular algae. From a drawing in *On a Piece of Chalk.* [Copyright © 1967 by Rudolf Freund]

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.

DAEL WOLFLE
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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