range are the relatively unstable dusts at one end of the scale and suspensions of ions and nuclei at the other.

The book has not been changed radically from the first edition (1957). Some 80 pages have been added to deal with recent advances. The theoretical treatment of suspensions of particulate matter is given in the first two-thirds of the book, which is devoted to the production of particulate clouds, their optical behavior, and their coagulation, deposition, and filtration. Considerable attention is given to the movement of particles away from the sources and the physical laws that govern diffusion and turbulence.

In part 2 the reader is acquainted with some of the practical consequences of the presence of aerosols. As a rule these are rather undesirable, and our present standards of living demand that smokes, dusts, and fumes be held to a minimum. The principles of various corrective engineering methods are discussed. Brief mention of health hazards, illustrated with some well-chosen examples, completes a balanced review of the practical side of the study of particulate matter.

The authors have had theoretical and practical experience in this field, and they have imparted an enjoyable personal touch to the book.

A. J. HAAGEN-SMIT
Division of Biology,
California Institute of Technology

History of Science

Archimedes in the Middle Ages. vol. 1, *The Arabo-Latin Tradition.* Marshall Clagett. University of Wisconsin Press, Madison, 1964. xxxii + 720 pp. Illus. $12.

It is mostly senseless and futile, although it is quite a common practice, to attempt to decide who was the greatest representative of some science in a given period. However, whether one considers content, technique, style, or subsequent influence, one must describe Archimedes' contribution to mathematics and mechanics in superlatives. Fortunately, the modern reader has easy access to Archimedes' extant works. The English version by Sir Thomas Heath, who not only translated the Greek text but who also rendered the cumbersome Greek technical terminology into modern mathematical symbols, is readily available at a modest price in the laudable series of Dover reprints, and a word-true translation into French by Paul Ver Eecke is once again in print. Both are based on the definitive edition of the Greek text by J. L. Heiberg. He who wishes to consult the original Greek should use the second edition, published between 1910 and 1915, for it takes advantage of Heiberg's spectacular discovery of a Byzantine manuscript, a palimpsest that contained, among much else that was valuable for establishing a good Archimedes text, most of a hitherto unknown and highly important work by Archimedes called *The Method* (it was the only Byzantine manuscript of Archimedean works to survive into modern times; unfortunately its recent fate is unknown).

From any of these editions one may grow acquainted with Archimedes' results and techniques, and even from Heath's condensed rendition one cannot help receiving a strong impression of his elegant and dramatic style. For a penetrating analysis of all aspects of the Archimedean corpus one can further turn to E. J. Dijksterhuis' *Archimedes.*

But to get an impression of Archimedes' influence on later times one must go elsewhere. His impact on the 16th and 17th centuries is reasonably well known, but not until the appearance of Marshall Clagett's book could one really begin an evaluation of the Archimedes tradition in the Middle Ages, without recourse to manuscript material. (I might mention, though, that Clagett's *The Science of Mechanics in the Middle Ages* gave a foretaste of what was to come as far as the mechanical works were concerned.) The present volume, *The Arabo-Latin Tradition,* the first of two, is a critical edition and translation of Latin texts, dating from the 12th to the 15th century, which are derived from Arabic versions of certain of Archimedes' works, principally his *On the Measurement of the Circle* and *On the Sphere and Cylinder.* The second volume will mainly be devoted to William of Moerbecke's Latin translation, of 1269, from the Greek, of the greater part of Archimedes' extant works and related texts.

Clagett gives here the result of a Herculean labor. It involved first an exhaustive search through European libraries for Archimedean manuscripts, followed by a careful classification of them into families (there are, for example, 12 distinct types of treatises on *The Measurement of the Circle* printed in the present volume). He then constructed a critical edition representative of each family, collating the Latin text with its Arabic prototype, wherever possible; and finally he translated each version into English. The Latin and English texts are printed on facing pages, with introductory passages and accompanied by a critical apparatus and full indexes.

I cannot begin to do justice in a short review to the wealth of information contained, explicitly as well as implicitly, in this volume, but I wish it to be clear that its magnitude makes my few objections and corrections dwindle in comparison.

First, there are, of necessity, some errors like the one where the title of Al-Bīrūni's treatise is given as *On Finding Sines in Circles* where one should read *Chords* for *Sines* (p. 7), as Bīrūni's Arabic and Suter's German has it; here *Chords* does not even refer to the trigonometrical chord function.

Second, on occasion the English translations look a bit awkward to a mathematical eye; thus *multiplicatio* is translated by *multiplication* where *product* would be the proper term.

Finally, I cannot quite agree with Clagett when he writes that the Arabs had "mastered the techniques that mark Archimedes' work, and in such a way as to show that they had made them their own," or when he makes similar statements about the Arabs' Western successors. I find, after an admittedly cursory investigation, that the Arab and Latin additions to Archimedes' text, far from showing a mastery of his deeply original and powerful techniques, rather fall in the tradition of the commentators such as Theon and Pappus, who, with Euclidean tools, endlessly belabored rather trivial points while nicely avoiding the real difficulties. But such a judgment may well be premature, and much good work, in the nature of a mathematical rather than a text-critical analysis, can be expected to grow out of this volume; anyone seriously interested in the history of science owes Clagett a debt of gratitude for making such work possible.

ASGER AABOE
Department of History of Science and Medicine, Yale University