REVIEWS
Edited by Joseph B. Dence

Reviews should be sent to Joseph B. Dence, Department of Chemistry, University of Missouri, 8001 Natural Bridge Rd., St. Louis, MO, 63121. Books on any area of undergraduate mathematics, mathematics education, or computer science are appropriate for consideration in this column. Reviews may be typed or neatly printed, and should be about two pages in length. The editor may undertake minor editing of a review, but only in connection with matters unrelated to the essential content or opinion of the review.

Sherman Stein. *Archimedes: What Did He Do Besides Cry Eureka?* The Mathematical Association of America, Washington, D.C., 1999.

While Archimedes is commonly hailed as one of the greatest mathematicians of all time, most of us would be at a loss to explain why. It is easy to be unimpressed by the area of a circle, volume and surface area of a sphere, or π estimated to two decimal place accuracy. His (dubious) "burning mirrors", catapults, and other mechanical inventions seem more likely catalysts for future fame. This slim volume captures the brilliance and innovation of Archimedes' arguments in the context of the mathematics known to his contemporaries and the reader is left full of wonder at the beauty of his achievements.

The language of mathematics in the third century B.C. was geometry (length, area, volume, lines, curves), and proofs, while accompanied by useful drawings, were narrative because algebraic notation had not been developed yet. Euclid's *Elements* and works of Aristaeus and Apollonius were Archimedes' sources for plane geometry, properties of conic sections, and of conoids. The Greek standard of proof was rigorous, and Archimedes' manuscripts typically presented a large number of (at times seemingly unrelated) lemmas, followed by major results whose proofs depend on the lemmas and results from other sources. Numbers were not abstract; each number had a context (e.g., length, area, weight, number of units), and, for example, length and area could not be compared. However, ratios could be compared. Archimedes developed his "law of levers" as $\frac{w}{w'} = \frac{d'}{d}$ (we would write $wd = w'd'$) which allowed him to apply it to lengths, areas, or volumes, as well as weights. The Greeks did not have algebraic formulas, but through very ingenious methods could determine things like the sum of a geometric series, or the sums of the squares of integers.

To get a glimpse of how Archimedes did mathematics, it is valuable to look at a method of exploration which he developed, which led him to many of his results. In a letter to Eratosthenes, Archimedes writes: