EARLY GREEK MATHEMATICIANS

11

Give me a place to stand and I shall move the earth.
—Archimedes

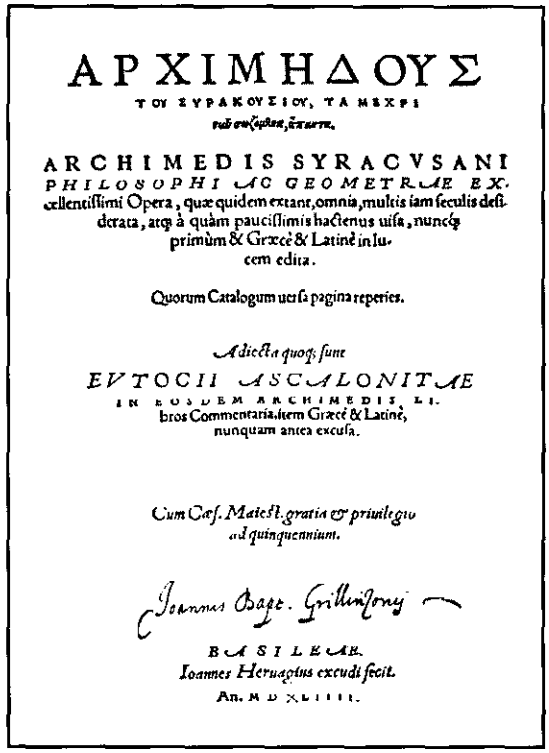
I have hardly ever known a mathematician who was capable of reasoning.
—Plato

From about 600 B.C. to 200 B.C., the Greeks rigorously developed systems of mathematical thought in an effort to explain the world around them. Scholars and thinkers traveled far and wide, amassing knowledge and exchanging ideas, and eventually discarded much of the Greek mythology generated by the belief that gods manipulated the physical world according to their whims. The stories of each of the mathematicians listed below could fill a book—and they do!—but they're for you to discover. To get you started, here's a sampling of their contributions.

Anaximander (610-546 B.C.): Anaximander was fascinated by the world he lived in, by the worlds he couldn't reach, and by the origins of all. In addition to creating one of the earliest maps of the world, he was an astronomer who attempted to estimate the size of the sun and who envisioned the planets to be globes of fire and air. Additionally, he fixed the earth at the place where it remained for over 2,000 years, until sixteenth-century astronomer Nicholas Copernicus displaced it from the center of the universe. Not content to simply explore the *existing* world, he also considered its *beginnings*, giving science its first comprehensive—though not very plausible—theory of evolution. In doing so, he helped to shift explanations about nature away from the supernatural. As a mathematician, he produced a formal, if limited, exposition of geometry with theorems arranged in a logical sequence.

Plato (429-347 B.C.): In 385 B.C., Plato founded his Academy in Athens, Greece. A center of learning for hundreds of years, this famous school attracted learned men and women from all over the Mediterranean world. Plato's belief that the study of mathematics was best used for "drawing the soul towards the truth" heavily influenced the Academy's curriculum. In fact, he stated in his *Republic* that "the knowledge at which geometry aims is knowledge of the eternal." This emphasis on mathematics used for training the mind (pure mathematics) rather than for practical purposes (applied mathematics) prepared students for an education in philosophy, Plato's primary interest. Plato's belief system, called Platonism, influenced generations of philosophers after his death. Additionally, Plato espoused the doctrine of nature's mathematical design. Greatly influenced by the Pythagoreans and their theory of numbers, he used triangles to represent spiritual forms of the four material elements: An equilateral triangle represented the spirit of earth; a right triangle, the spirit of water; an isosceles triangle, the spirit of fire; and a scalene triangle, the spirit of air.

Archimedes (ca 287-212 B.C.): The first mathematician we know of to simplify a complicated mathematical problem by creating a physical model of it, Archimedes developed important mathematical principles that are used in the fields of physics and engineering. In one story, he demonstrated a principle of levers by single-handedly pulling a ship out of dock to sea. According to Greek biographer Plutarch (A.D. ca 46-ca 120), "he fixed accordingly upon a ship of burden . . . , which could not be drawn out of the dock without great labor and many men; and . . . , sitting himself the while far off, with no great endeavor, but only holding the head of the pulley in his hand and drawing the cords by degrees, he drew the ship in a straight line, as smoothly and evenly as if [it] had been


ΑΡΧΙΜΗΔΟΥΣ

ΤΟΥ ΣΥΡΑΚΟΥΣΙΟΥ, ΤΑ ΜΕΧΡΙ

ARCHIMEDIS SYRACVSANI
PHILOSOPHI AC GEOMETRAE EX-
cellentissimi Opera, quæ quidem extant, omnia, multis iam seculis desiderata, atq; à quàm paucissimis hactenus uisa, nunc& primùm & Græcè & Latinè in lucem edita.

Quorum Catalogum uersa pagina reperies.

Adiecta quoq; sunt
EVTOCII ASCALONITAE
IN EOSDEM ARCHIMEDIS, LI-
bros Commentaria, item Græcè & Latinè, nunquam antea excusa.

Cum Cæs. Maiest. gratia & priuilegio ad quinquennium.

Ioannes Hagæ. Grillingensis

BASILEAE.
Ioannes Heruagius excudi fecit.
An. M D XLIIII.

Title page of Archimedes'* Archimedis Syracusani philosophi ac geometrae *(Basel, 1544).

in the sea." Archimedes is the mathematician of legend who ran naked through the streets of Syracuse shouting "Eureka, eureka!" ("I have found it!") after having discovered the first law of hydrostatics while taking a bath. (For more on Archimedes, see vignettes 2, 60, and 80.)

For more on the mathematics of ancient Greek and Alexandria, see vignettes 9, 10, 12, 13, 15–20, 23, 64, and 73. ★

ACTIVITIES

1. What is the science of hydrostatics? What is the first law of hydrostatics that Archimedes discovered?

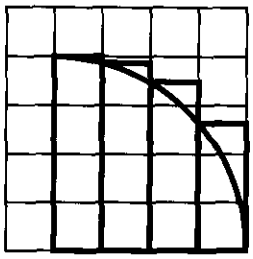


Figure 1

2. Use a compass to draw a quarter-circle in the first quadrant of a coordinate grid. Divide the horizontal radius into four equal segments. Using the left endpoint of each segment, draw rectangles as shown in Figure 1. Then, using the right endpoint of each segment, draw rectangles as shown in Figure 2. Measure to find the sum of the areas of the rectangles in Figure 1; do the same for Figure 2. How do these areas compare with the area of the quarter-circle? How could you use your calculated areas to estimate the circular area? (Archimedes used this approach to calculate areas bounded by complicated curves.) What could you do to produce a more accurate approximation?

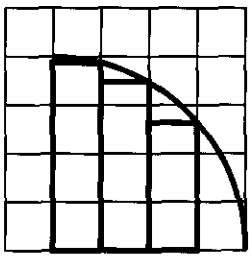


Figure 2

3. In Ionia, a Greek settlement in Asia Minor, philosophers attempted to apply reason to human affairs. Why were the Ionians freer to disregard the religious beliefs that dominated the European Greek culture?

RELATED READING

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