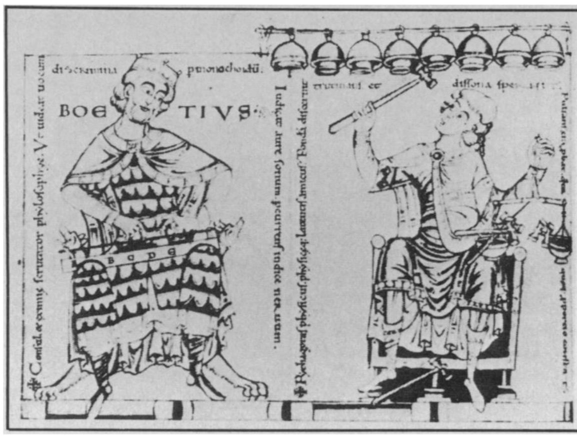
'First lab' attributed to ancient Greeks



Drawing accompanying a manuscript by the Roman scholar Boethius (5th century A.D.). Right frame shows ancient Greek mathematician Pythagoras conducting hammer experiments with bells in what may have been the first scientific laboratory. Left frame shows Boethius plucking a monochord, an instrument allegedly designed specifically for acoustics experiments.

Classicists and historians tend to portray the ancient Greeks as high-minded theoreticians who eschewed practical, hands-on investigation. But a mechanical engineer now argues that "the first known research laboratory" existed in ancient Greece some 25 centuries ago – long before modern-day controlled research sprouted in Renaissance Europe.

Andrew D. Dimarogonas of Washington University in St. Louis says he has reassembled several lines of historical evidence indicating that Pythagoras – a Greek mathematician, mystic and cult leader who lived around 560 to 480 B.C. – set up an acoustics lab in his home.

The conventional depiction of the ancients as anti-technology chauvinists springs largely from the assumption that the views of Plato and other Greek philosophers represented those of the society as a whole, notes Vernard Foley of Purdue University in West Lafayette, Ind. Foley praises Dimarogonas for highlighting the "forgotten" practical side of ancient Greece. The new proposal, he says, should help to "get Greek culture out from the grips of Plato."

Yet Foley and other historians hesitate to conclude that Pythagoras and his followers established a *bona fide* research lab. "Whether they [the Pythagoreans] did research systematically and continuously enough to say they had a laboratory is debatable," he contends.

Pythagoreans took secrecy vows, and any loose talk allegedly could lead to their execution by fellow cultists. This secrecy, combined with scant historical records, hampers researchers' attempts to characterize the cult, says science historian Edward Grant of Indiana University in Bloomington.

Dimarogonas' claim pivots largely on the writings of the Roman scholar Boethius, who lived 1,000 years after Pythagoras died and who probably had access to documents long since lost.

Boethius recounts a story of unknown origin in which Pythagoras, after going into a metalworking shop, conducted impromptu experiments to learn how different hammers produced specific tones. As Boethius tells it, Pythagoras discovered that a hammer weighing half as much as another produced a note an octave higher no matter how much force was used to swing the hammer. Pythagoras also found that other sets of hammers with specific weight ratios produced other tonal consonances such as fourths.

According to the story, Pythagoras returned home from the shop and conducted experiments into the relationship between objects' physical proportions and the tones they produce. His experiments included plucking strings of different lengths and widths and hitting vessels filled with varying amounts of liquid. Other ancient authors, such as Theon of Smyrna (2nd century A.D.), offer similar anecdotes indicating that Pythagoreans and other ancient Greeks were not merely head-in-the-sky theoreticians, Dimarogonas asserts in the May JOURNAL OF SOUND AND VIBRATION.

Dimarogonas summons further evidence from a drawing accompanying Boethius' manuscript. Pythagoras is shown using a hammer to hit a series of hanging bells, while other hammers rest in the pans of a balance suspended from his other hand. To the left, Boethius himself appears with a so-called monochord, an instrument consisting of a single taut string whose length can be varied. The monochord "was deliberately designed and built to conduct experiments regarding the relation of the length of the string to the pitch of the sound," Dimarogonas suggests.

He contends that most historians may not be equipped to interpret subtle scientific messages in historical documents and objects. "Hopefully, this work will trigger pure historians to seek cooperation of scientists and engineers in interpreting things that they cannot interpret themselves," he says. *– I. Amato*

South Pole's 'hot' snow: Chernobyl source?

Scientists studying Antarctic snow have discovered radioactive isotopes they think may have come from the April 1986 accident at the Chernobyl nuclear power plant in the Soviet Union. But others question whether significant amounts of Chernobyl's fallout could cross the equator and reach the South Pole.

Geochemist Jack E. Dibb and his colleagues from the University of New Hampshire in Durham analyzed samples collected from a snow pit about 38 kilometers from the South Pole. As expected, the deeper portion of the pit held radioactive layers corresponding to the years 1955 through 1974 – the peak period of above-ground nuclear bomb testing. Yet the researchers also measured a radiation "spike" – about 20 to 30 times above the background level – in snow near the top of the pit, deposited during late 1987 and early 1988. They traced the radioactivity to cesium-137, an isotope that does not form in nature but does form during nuclear explosions and in reactors.

The radioactive snow fell on Antarctica about 20 months after the Chernobyl accident – a lag consistent with the time it took isotopes to reach the South Pole from bomb tests in the Northern Hemisphere. In a letter in the May 3 NATURE, Dibb's group proposes that some of Chernobyl's radioactive isotopes penetrated the stratosphere, crossed the equator and then fell in snowflakes on central Antarctica. They speculate that special wind patterns above the Antarctic might explain why the South Pole is the only spot in the Southern Hemisphere where scientists have detected excess cesium-137 following the Chernobyl event.

Some atmospheric scientists remain skeptical about this route of transport. Unlike a nuclear or volcanic explosion, the Chernobyl accident did not spew debris directly up through the atmospheric barrier at the base of the stratosphere, 10 to 15 km above the ground, they say. Thus, if isotopes did travel through the stratosphere, only weather patterns could have lofted them high enough. But in that case, water condensation in the rising air should have washed the cesium out, contends Jerry D. Mahlman of the Geophysical Fluid Dynamics Laboratory in Princeton, N.J.

Mahlman raises another possibility: Small amounts of isotopes might have crossed the equator via the troposphere, the atmosphere's lowest layer. However, he doubts significant levels of this radiation would have reached the pole, because tropospheric weather patterns tend to block movement across the equator. *– R. Monastersky*