

# FLUIDS

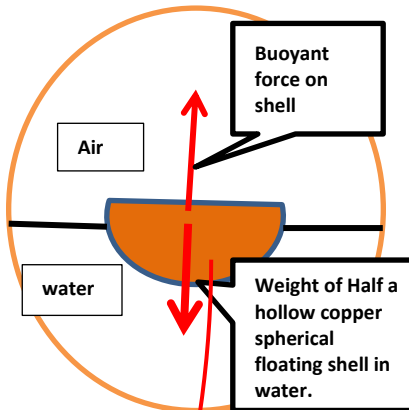
Unit 18 Dr. John P. Cise, Professor of Physics, Austin Community College, 1212 Rio Grande St., Austin Tx

78701 [jpcise@austincc.edu](mailto:jpcise@austincc.edu) & NYTimes Oct 16, 2011 by Edward Rothstein. Send Dr Cise an email on you used this application.

## Finding Archimedes in the Shadows

BALTIMORE — “The Archimedes Palimpsest” could well be the title of a Robert Ludlum thriller, though its plot’s esoteric arcana might also be useful for Dan Brown in his next variation on “The Da Vinci Code.” It features a third-century B.C. Greek mathematician (Archimedes) known for his playful brilliance; his lost writings, discovered more than a hundred years ago in an Istanbul convent; and various episodes involving plunder, pilferage and puzzling forgeries. The saga includes a monastery in the Judaeen desert, a Jewish book dealer trying to flee Paris as the Nazis closed in, a French freedom fighter and an anonymous billionaire collector.

**Archimedes' writings had been removed and replaced by prayers**, and later with painted illustrations of Evangelists. An international team using advanced imaging technologies worked for 12 years to reveal the original words.



**Introduction:** Copper has a density of  $8.94 \text{ g/cm}^3$ . The copper shell has a outside radius of 5 cm and a inside radius of 4.5 cm. **QUESTION:** (a) Find the volume of the inside radius sphere and the outside radius sphere? (b) Find volume of one half the 4.5 cm radius and 5 cm. radius sphere? (c) Now find volume of half spherical shell? (d) Find mass of the half spherical shell? (e) Find the buoyant force (in grams) on spherical shell? (f) How many  $\text{cm}^3$  of water were needed keep copper shell a float?  
**HINTS:**  $d_{\text{copper}} = 8.94 \text{ g/cm}^3$ ,  $V_{\text{sphere}} = (4/3)\pi r^3$ , density = mass/volume,  $d_{\text{water}} = 1 \text{ g/cm}^3$   
**ANSWERS:** (a) inside  $V = 381.7 \text{ cm}^3$ , outside  $V = 523.59 \text{ cm}^3$ , (b)  $V_{\text{inside}/2} = 190.85 \text{ cm}^3$ ,  $V_{\text{outside}/2} = 261.8 \text{ cm}^3$  (c)  $70.95 \text{ cm}^3$  (d)  $634.22 \text{ g}$  (e)  $634.22 \text{ g}$ , (f)  $634.22 \text{ g}$

At the center is an ancient volume, its parchment recycled into a 13th-century prayer book. And at the climax we see those old folios, charred at the edges and scarred by dripping wax from the candles of devout monks, being meticulously studied for 12 years by an international team using the most advanced imaging technologies of the 21st century. And what is found is more revelatory than had ever been expected. The Archimedes Palimpsest has precisely this history. It really does begin with a 10th-century copy of Archimedes’ third-century B.C. writings. Three centuries later they were scraped off the parchment, which was reused — creating a “palimpsest.” And while there aren’t enough dead bodies or secret cabals to support a full-fledged thriller, there really is a sense of excitement in the account of the book’s history, restoration and meanings, at an exhibition at the Walters Art Museum here: [“Lost and Found: The Secrets of Archimedes.”](#)

That book was apparently in use for centuries at the Monastery of St. Sabbas in the Judaeen Desert. Its towers peek out of the rocks in one of David Roberts’s otherworldly Holy Land illustrations from 1842, shown here. But by then the book was gone. **In 1844 a biblical scholar happened upon it at the Metochion of the Holy Sepulcher in Istanbul and saw the curious mathematics underneath;** a leaf from the book was found in his estate and deposited at Cambridge University Library. Then, in 1906, the Danish Archimedes scholar Johan Ludvig Heiberg saw the book in Istanbul and **recognized seven treatises by Archimedes behind the prayers, making it the oldest source for his writings in existence and the sole source for two unknown works, “Method” and “Stomachion.”** [Heiberg deciphered much of the text](#) and took photographs that he worked on in Copenhagen. So we see straight lines deliberately shown as curves; points placed off kilter; and here at the show, **an unusual example in a discussion of floating bodies (the subject that led to the story of Archimedes leaping out of the bath in the ecstasy of insight and running naked outside shouting “Eureka!”).** **The diagram shows an (((inverted semicircle sitting inside an incomplete liquid sphere))).**