

# Archimedes : Modern Mind of Ancient times

## Abstract

Archimedes, aristocrats, greatest scientist of antiquity. Legends of his life and personality. His discoveries and claim to modernity. A sturdy Roman. Defeat of Archimedes and triumph of Rome.

**Keywords:** Discoveries, Modernity, Archimedes

### Introduction

It was during the second punic war when Archimedes surfaced as a personage in history . His machines were used with great effect against the Romans in the siege of Syrcuse . The Ingeniously constructed long or short machines for discharging showers of missiles through holes made in the walls , and other consisting of long movable poles projecting beyond the walls which either dropped heavy weights on the enemy's ships , or grappled their prows by means of an iron hand or a beak like that of a crane, then lifted into the year and let them fall again . Marcellus is said to have told to his engineers with the words "Shall we not make an end of fighting against this geometrical Briareus (three hundred armed and fifty headed greek diety) who uses our ships like cups to ladle water from the sea" The romans were in such a terror that if they see a piece of rope or wood projecting above the wall , they would cry " There it is " declaring that Archimedes was setting some engine in motion against them . In spite of this Archimedes himself attached no importance to these inventions and when we see Archimedes in totality his contribution in other field is so great and long lasting

Any list of the three 'greatest' mathematicians of all history would include the name of Archimedes . The other two usually associated with him are Newton (1642-1727) and Guass(1777-1855). In the respective ages in which these giants lived, and estimating their achievements against the background of their times, would put Archimedes first. Had the Greek mathematicians and scientists followed Archimedes rather than Euclid , Plato, and Aristotle , they might easily have anticipated the age of modern mathematics, which began with Descartes (1596-1650) and Newton in the seventeenth century ,and the age of modern physical sciences inaugurated by Galileo(1564-1642) in the same century , by 2,000 years.

In body and mind Archimedes was an aristocrat. The son of an Astronomer Phreidias, he was born at Syracuse, Sicily, and . His essentially aristocratic temperament expressed itself in his attitude to what would today be called applied science. Although he was one of the greatest mechanical geniuses of all time ,if not the greatest when we consider how little he made to go on, the aristocratic Archimedes had a sincere contempt for his own practical inventions . From one point of view he was justified. Books could be written on what Archimedes did for applied mechanics ; but great as this work was from our own mechanically biased point of view, it is completely overshadowed by his contributions to pure mathematics .

According to tradition Archimedes is a perfect museum speicimen of the popular conceptions of what a great mathematician should be.Like Newton and Hamilton he left his meals untouched when he was deep in his mathematics . In the matter of inattention to to dress he even surpasses Newton , for on making his famous discovery that a floating body loses in weight an amount equal to that of the liquid displaced, he leaped from the bath in which he had made the discovery by observing his own floating body , and dashed through the streets of Syracuse stark naked , shouting 'Eureka eureka' (I have found it, I have found it) what he had found was the law first law of hydrostatics. According to the story a dishonest goldsmith had adulterated the gold of a crown for Hieron with silver and the tyrant , suspecting fraud , had asked Archimedes to put his mind on the problem . Any high school boy knows how it is solved by a simple experiment and some easy arithmetic on specific gravity ; ' the principle of Archimedes' and its numerous practical applications are meant for youngsters and naval engineers today, but the man who saw through them had more than common insight . It is not definitely known whether the goldsmith was

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guilty. Another exclamation of Archimedes which has come down through the centuries is 'Give me a place to stand on and I will move the earth'.

He himself was strongly moved by his discovery of laws of levers. The phrase would make a perfect motto for a modern scientific institute. In one of his eccentricities Archimedes resembled another great mathematician, Weiestrass. According to the sister of Weiestrass he could not be trusted with a pencil when he was a young school teacher if there was a square foot of clear wall-paper or a clean cuff anywhere in sight. Archimedes beat this record. A sand floor or dusted smooth earth was a common sort of 'blackboard' in his day. Archimedes made his own occasions. Sitting before the fire he would rake out the ashes and draw in them. After stepping from the bath he would anoint himself with olive oil, according to the custom of the time, and then, instead of putting his clothes, proceed to lose himself in the diagrams which he traced with a finger-nail on his oily skin. Archimedes as a young man studied for a short time at Alexandria, Egypt, where he made two life-long friends, Conon, a gifted mathematician for whom Archimedes had a high regard both personal and intellectual, and Eratosthenes, also a good mathematician. These two, particularly Conon, seem to have been the only men of his contemporaries with whom Archimedes felt he could share his thoughts and be assured of understanding. Some of his finest work was communicated by letters to Conon. Later, when Conon died Archimedes corresponded with Dositheus, a pupil of Conon.

Contribution which Archimedes made to pure and applied mathematics can be listed only as by preferences which may vary from person to person. He invented general methods for finding the areas of curvilinear plane figures and volumes bounded by curved surfaces, and applied these methods to many special instances, including the circle, sphere, any segment of parabola, the area enclosed between two radii and two successive whorls of a spiral, segments of spheres, and segment of surfaces generated by the revolution of rectangles (cylinders), triangles (cones), parabolas (paraboloids), hyperbolas (hyperboloids), and ellipses (spheroids) about their principal axes. He gave a method for calculating  $\pi$  and fixed  $\pi$  between  $3\frac{1}{7}$  and  $3\frac{10}{71}$ . He also gave methods for approximating to square roots which shows that he anticipated the invention of Hindus of what amount to periodic continued fractions. In arithmetic, far surpassing the incapacity of the unscientific Greek method of symbolizing numbers to write, or even to describe, large numbers, he invented a system of numeration capable of handling numbers as large as desired. In mechanics he laid down some of the fundamental postulates, discovered the laws of levers, and used his mechanical principles to calculate the area and centre of gravity of several flat surfaces and solids of various shapes. He created the whole science of hydrostatics and applied it to find the positions of rest of equilibrium of floating bodies of several kinds.

Archimedes composed not only one master piece but many. How he did it all, no hint of the methods used were known by the help of which he arrived to his wonderful results. Until 1906 nothing much could

be said, it was J.L. Heiberg, the historian and scholar of Greek mathematics, made the dramatic discovery in Constantinople of a hitherto 'lost' treatise of Archimedes addressed to his friend Eratosthenes On Mechanical Theorems. In it Archimedes explains how by weighing, in imagination, a figure or solid whose area or volume was unknown against a known one. In short he used his mechanics to advance his mathematics. He used anything and everything that itself as a weapon to attack his problems.

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