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Archimedes

by Sylvia Frank

Archimedes, the Greek mathematician and philosopher who lived in the years 287-212 B.C., is remembered for his important mathematical works and inventions—and for several utterances.

One discovery, which we know as Archimedes's Principle, is said to have come to him while he was bathing. He was so excited when he made the discovery that he leaped from his bath and, shouting "Eureka" (Greek for "I've found it"), ran through the streets naked.

The problem he was trying to solve as he lay soaking in the tub had been put to him by his employer, the tyrant Hiero of Syracuse. Was the crown that had been made for Hiero pure gold? Hiero suspected that the gold in the crown had been mixed with silver, a less-precious metal. He asked Archimedes if there was any way that his suspicions could be proved.

Archimedes noticed that the deeper his body sank into the water, the more water overflowed, and his body seemed to weigh less the more it was submerged. He realized that the apparent loss of weight of a body is equal to the weight of water it displaces—Archimedes's Principle. He already knew that the volume of a body determines its displacement. He realized that by immersing first the crown, then the same weights of silver and gold, different volumes of water would be displaced, because each metal had a different ratio of weight to volume, or *density*. The crown displaced more water than the same weight of pure gold. It had indeed been adulterated with silver. Eureka!

Another of Archimedes's discoveries was the principle of the lever and pulley. The apparently unlimited lifting power of these devices inspired another famous utterance: "Give me a lever long enough and a fulcrum upon which to rest it, and I will move the earth." Hiero, challenging him to put his words into action, told Archimedes to help

the sailors beach a large ship in the Syracusan fleet. Archimedes arranged a series of pulleys and cogs so that, with his own strength, he was able to pull the great vessel out of the water onto the beach.

This was long before the slide rule or calculator, and Archimedes used to do calculations on his skin. After taking a bath, it was the custom of the time to anoint oneself with olive oil. After dousing himself thoroughly, Archimedes used his fingernail to trace diagrams and equations on his oily skin.

At other times Archimedes made drawings in the sand. When the Roman general Marcellus eventually captured Syracuse, he gave special orders that the genius should be protected. A Roman soldier, sent to fetch the philosopher, found him drawing mathematical symbols in the sand. So engrossed was Archimedes in his work that, when the soldier appeared, he gestured impatiently, saying, "Don't disturb my circles." Enraged, the soldier drew his sword and killed Archimedes.

BIOGRAPHY

Sylvia Frank is a biologist and free-lance science writer in New York, N.Y.