Eureka! The story of Archimedes

http://www.ucl.ac.uk/~ucbplrd/eureka_middle.htm

Archimedes was one of the finest mathematicians of antiquity. He derived the formula for the volume of a sphere, and found an accurate value for pi. But it is the story of King Hieron II of Syracuse and the gold crown for which he is most famous.

The king had commissioned the crafting of a crown as a tribute to the gods. He gave a carefully weighed amount of gold to a smith, who produced a beautiful crown within due course. The king became suspicious, however, that the craftsman had not used all of the gold he had been given in the crown. It was a common trick to alloy gold with cheaper silver, but the King knew no way of proving that the craftsman had been dishonest. He called upon his close friend Archimedes to solve the problem.

Archimedes knew that gold and silver have different densities, meaning that a lump of gold will weigh about twice as much as a lump of silver the same size. The trouble was that no one knew how to work out the size of an irregularly shaped object like a crown. Whilst he was pondering this conundrum, Archimedes went to the public baths to relax. As he slipped into the water he noticed some spilling over the edge, and he had a sudden flash of inspiration. The displaced water must have exactly the same volume as him. And if you know the volume of an object you can easily calculate its density. All Archimedes had to do was find out whether a lump of pure gold, with the same volume as the crown, weighed more. The crown would be lighter than it should be if the craftsman had deviously used some silver instead. Archimedes, in a fit of jubilation, leapt straight out of the bath and ran naked down the streets shouting “Eureka!” – “I’ve found it!”. The goldsmith soon confessed and was dealt with by the King.

Archimedes continued with this line of thought to arrive at the principle of buoyancy. He realized that if the weight of water displaced is greater than the weight of the object itself, then it will float.

It is unlikely that there has been another mathematician so devoted to his subject since Archimedes. He was thinking through a problem even when he died. Syracuse surrendered to Rome in 212 BC, but Archimedes was typically unaware of what was going on around him as troops entered the city. A soldier approaching Archimedes disturbed the geometrical diagrams he had been drawing in a sand pit. Archimedes angrily growled “Keep off, you!” and was slain by the soldier, not realizing who it was.