

Buoyancy, Principle Of Encyclopedia Article

Buoyancy, Principle Of

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Contents

Buoyancy, Principle Of Encyclopedia Article.....	1
Contents.....	2
Buoyancy, Principle Of.....	3

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The king of ancient Syracuse, Hieron II, was vexed. He had received a crown from a goldsmith but suspected it was not really all gold. According to legend, he asked Archimedes, a brilliant relation of his, to divine the truth without causing any damage to the crown.

One day, perhaps while pondering the problem, Archimedes stepped into his bath and noticed the overflow of water. He suddenly realized that the volume of water that overflowed had to be equal to the portion of his body that was immersed. His problem was solved; he had discovered the principle of buoyancy and was considerably excited. "Eureka!" ("I've found it!") he was reported to have exclaimed as he ran naked through the streets of Syracuse (thereby immortalizing the word as an expression for the arrival of a sudden insight).

He began performing experiments with objects in liquids. He immersed the crown and measured the amount of water it displaced. Then he immersed an equal weight of gold in the water. If the crown was pure gold, it would displace the same amount of water. But the crown displaced more water than the gold, indicating it was made of a mixture of gold and silver, which is a bulkier substance. The crown had a bigger volume than a pure gold crown of equal weight. The results of the test were reported to the king, who promptly had the deceitful goldsmith executed.

Archimedes concluded that the buoyant force on an object is equivalent to the weight of the water displaced by the object. This concept, "Archimedes' principle," explains flotation. A pound of cork will float in water while a pound of lead will sink. Since weight of the cork is less than the weight of the water it would displace when immersed, it is pushed to the surface. Of course the lead weighs much more than an equal volume of water, so it drops to the bottom.