

Demo 12-12 **Archimedes' Principle**

Archimedes' principle states that the buoyant force is equal to the weight of the water displaced. As a large weight, hanging from a spring scale, is lowered into a water bath, the displaced water is collected in a glass beaker. When the displaced water is poured into a pail, also hanging from the spring scale, as shown in *Figure 1*, the original reading of the spring scale is restored.[†]



Figure 1

[†] Sutton, *Demonstration Experiments in Physics*, Demonstration M-284.

Freier and Anderson, *A Demonstration Handbook for Physics*, Demonstration Fg-1, Archimedes' Principle.

This demonstration will show how the buoyant force on a submerged object is related to the amount of water displaced by the object.

This aluminum cylinder and pail hang from a scale, which shows the total weight to be 29 newtons. We'll lower the cylinder into this water container, which has an overflow spout.

When the cylinder is submerged, the reading on the scale decreases to 20 newtons. All water displaced by the cylinder will flow into a beaker.

If we pour the water that was displaced by the cylinder into the small bucket hanging from the scale, how will the reading change?

The scale now reads the same as before the cylinder was lowered into the water. The buoyant force on the cylinder is equal to the weight of the water displaced.

Equipment

1. Tall ring stand.
2. Clamp, short bar, and hook.
3. Spring scale.
4. Small bucket with string running below the bucket from handle to handle.
5. Weight with hook (can be irregularly shaped).
6. Large clear container of water with spillover spout and an appropriate sized rubber stopper.
7. Catch basin.