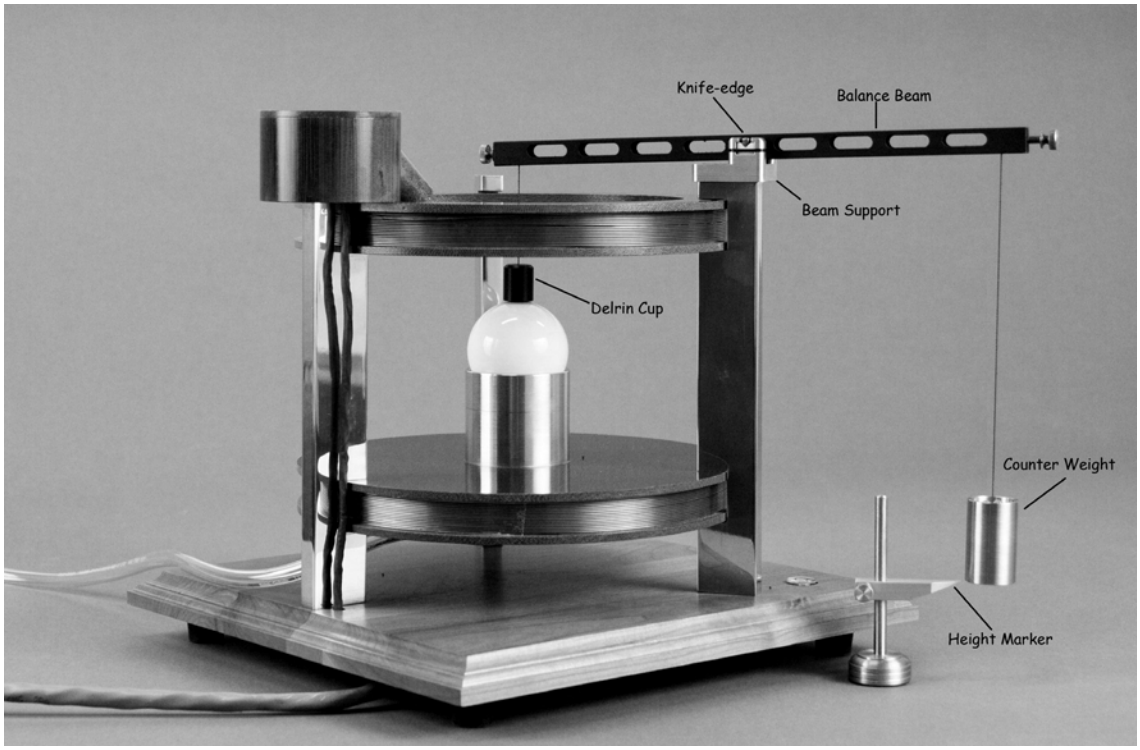
MAGNETIC FORCE BALANCE



Measure the Sphere's Magnetic Moment a Fifth Way

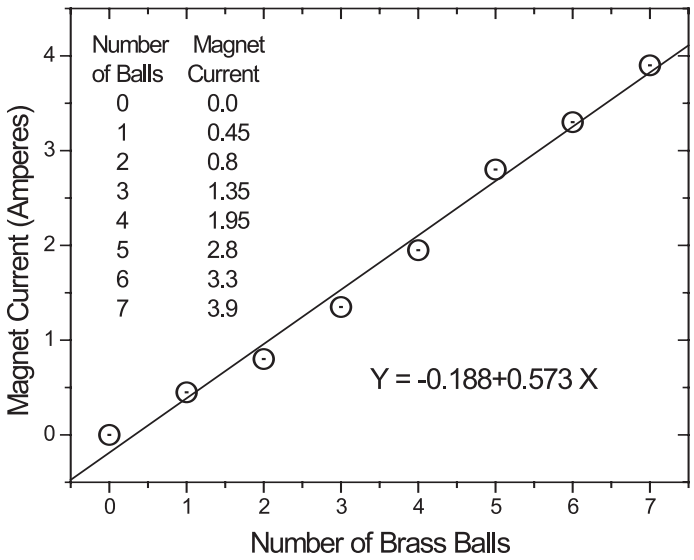
The Magnetic Force Balance mounted on the Magnetic Torque electromagnet is shown above. With this accessory, students can directly measure the magnetic moment of the NdFeB disc imbedded inside the plastic sphere using magnetic force. This force is created by the magnetic field gradient supplied by the current in the two coils. The magnetic force is balanced by a gravitational force supplied by a counter-weight and a series of small brass spheres. The physics of this experiment is mathematically expressed as:

$$F_z = \vec{\mu} \cdot \nabla B_z = \mu_z \frac{\partial B_z}{\partial z} = (m_{CW} + m_B)g$$

For this magnet, the gradient (T/m) in the center is

$$\frac{\partial B_z}{\partial z} = 1.69\text{x}10^{-2} I \text{ (with I in amps)}$$

The data shown was taken with a series of 3/16 inch balls as counterweights. From the slope of the line, the magnetic moment of this particular NdFeB disc turns out to be $\mu_z = 0.50 \text{ amp} \cdot \text{m}^2$



Parts List MFB1-A

Balance Beam with Delrin cup and counter-weight
Height Marker
Ten each: 1/4" brass balls and 3/16" brass balls
Beam Support with Agate V-Block Bearings
Extra High Strength Fishing Line
Storage Box, Instructor and Student Manuals

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