

Magnetic Spinning Pencil^λ

(Balanced repulsive forces can keep a pencil standing at attention!)



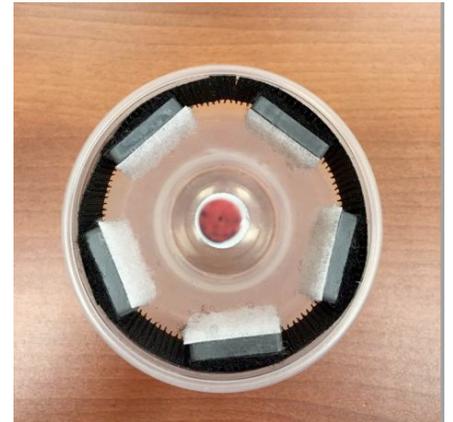
Previous version



Updated 5 below*



Updated 5 above*



Viewed from above
(Centered between 5 cup magnets)

Materials:

1 Plastic cup
1 Ring magnet* (CR10)
5 Block magnets* (CB41ST)
Knitting Needle (long)
Hammer or medium rock
Masking tape (optional)

1 Sharpened pencil
Adhesive-backed Velcro:
~ 24 cm hook Velcro (9 ½ inches)
~ 12 cm white loop Velcro (4 ¾ inches)
~ 12 cm black loop Velcro (4 ¾ inches)

* All Magnetics, Inc./The Magnet Source 1-800-262-4638

Procedure:

Follow the steps provided in my *Visual Instructions PowerPoint*.
For a PDF of the PP, email: tien@ligo-la.caltech.edu

What's Going On?

The pencil is able to remain centered inside the cup because the 5 (4 or 3!) block magnets on the cup repel the ring magnet on the pencil EQUALLY and the 'dead' spots between the block magnets are fairly small. The direction the pole of the ring magnet faces (towards the tip of the pencil or towards the eraser) will determine how high (or low) to place the ring magnet on the pencil.

Getting the pencil to balance in the middle of the cup can be quite challenging, as well as very rewarding.

* Big **'THANK YOU'** to Curt Gabrielson (Watsonville Environmental Science Workshop in CA) for showing me this wonderful magnetic activity many years ago at the Exploratorium.

LIGO Connection:

"There are over 1000 magnets used in LIGO, these are located in close proximity of the OSEMs (Optical Shadow Sensors and Electro-Magnetic Actuators) to enable alignment (i.e. steering of the laser beam) and damping of suspended test mass optics." Dr. Stuart Mark Aston, Detector Opto-Mech Engineer LLO