

A Multi-Purpose Instrument

by

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(Editor's note: This article is reproduced, with permission, from a delightful little book, "The Sun on the Floor -- Physics experiments that can be performed at home." This 68-page book describes 58 experiments that can be accomplished with simple apparatus. There are many drawings and photographs to illustrate the experiments. A single copy of the book can be ordered for only \$10 U.S. from the authors at the address above, and 20 copies can be obtained for \$100 U.S.)

A table tennis ball bearing is an interesting and easy-to-make physical instrument that can be used for demonstrations as well as for measurements. Take a bicycle spoke or a similar straight steel wire and sharpen it at one end. Take a table tennis ball and pass the spoke through its centre. Bring the spoke into contact with a magnet for a while in order to magnetise it. Find a container (like an egg-cup) that has only a slightly larger diameter than the ball. Fill it up with water and place the ball in it. Balance the wire by sliding it delicately through the ball one way or the other. Enjoy playing with it to check how sensitive a magnetic needle it is. It points toward North and reacts to distant magnets.

(A special note: Have you noticed that hydrometers tend to stick to the side of a dish? This disturbs the measurement a lot. If you fill a container up to the very top, a convex meniscus will assure a central position of the hydrometer. This "discovery" helped in inventing the "bearing" described above.)

Experiment with the magnetic field of a current-carrying wire

You will need a 4.5-V or 9-V battery and a lead of about 1 m to demonstrate and study the effects of interaction between the compass needle and the electric current. Check the "right hand rule," and see that the best effect is achieved when the wire is above the needle and initially parallel to it.

Polarisation of a solenoid

The same wire, but this time coiled, can be used to show the similarity between a current-carrying solenoid and a bar magnet. The role of a magnetic material inside a coil can be easily checked by placing different materials inside the solenoid.

Reaction to static electricity

Would you expect steel wire to interact with a rubbed plexiglass ruler or a comb? It certainly does. A piece of styrofoam fastened at the end of the pin (with correction for balance) was found to be an interesting tool for the investigation of electrostatic effects.

This instrument can be made out of materials other than steel wire: a drinking straw or a wooden stick, aluminum or copper wire. If, instead of steel wire, a wooden stick or a drinking straw is used, samples of various materials can be stuck at the end, and having a strong magnet, one can find out whether the material is diamagnetic or paramagnetic.

PHYSICS WEB SITE FOCUS

BERKLEY PHYSICS DEMONSTRATIONS

<http://www.mip.berkeley.edu/physics/physics.html>

This physics WWW site is an effort to make available an on-line source of information and pictures used for preparing and performing undergraduate lecture demonstrations at the University of California Physics Department at Berkeley. This site deals with demonstrations for the subjects of:

- Mechanics
- Waves
- The Properties of Heat and Matter
- Electricity and Magnetism
- Optics
- Modern and Contemporary Physics
- Astronomy and Perception

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Submissions describing demonstrations will be gladly received by the column editor.