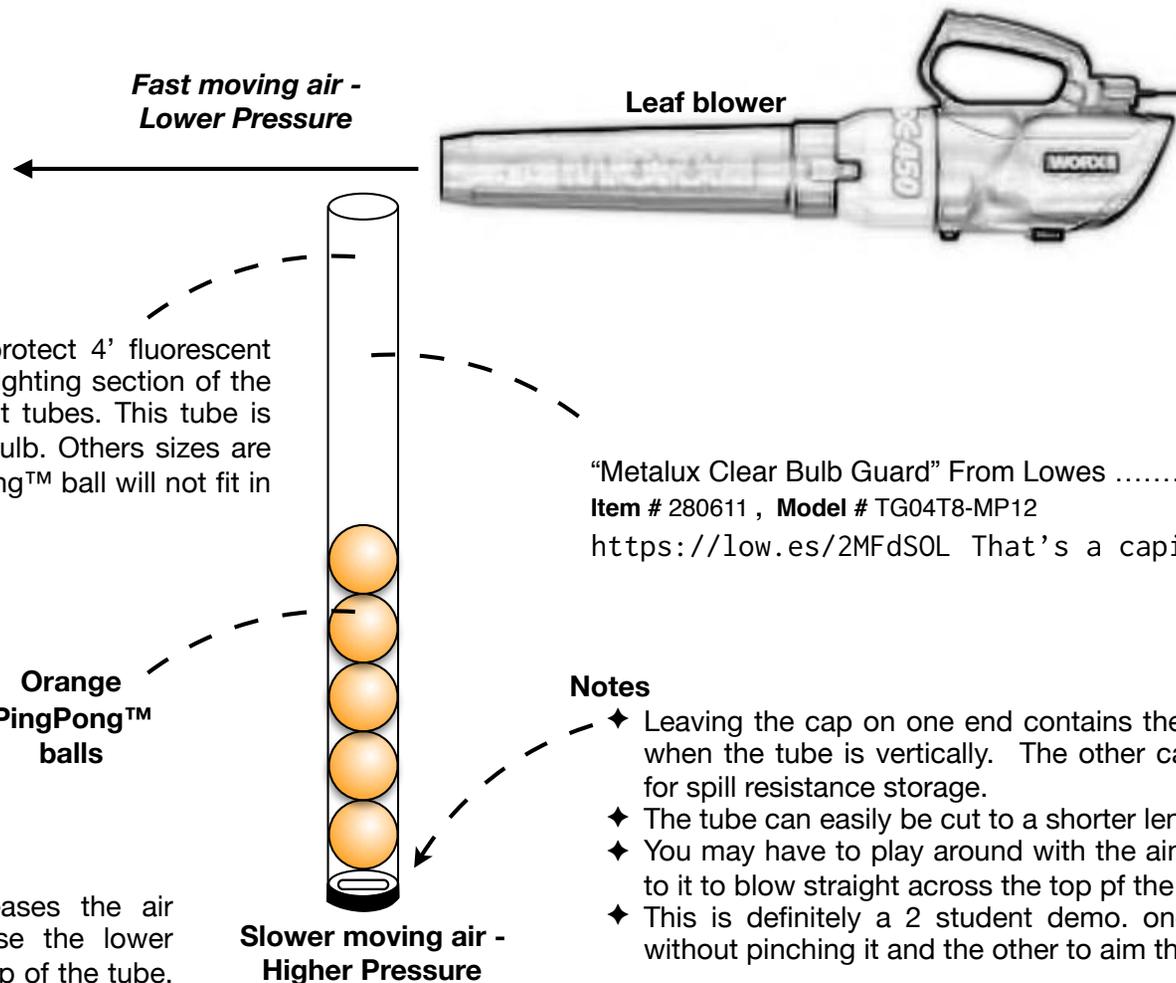


Bernoulli Demo

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Clear plastic tube

This tube is used to protect 4' fluorescent light bulbs. It is in the lighting section of the store by the fluorescent tubes. This tube is for the **T12** size lightbulb. Others sizes are available, but a PingPong™ ball will not fit in them.

“Metalux Clear Bulb Guard” From Lowes\$3.68

Item # 280611 , Model # TG04T8-MP12

<https://low.es/2MFdSOL> That’s a capital “O”

Orange
PingPong™
balls

Notes

- ◆ Leaving the cap on one end contains the Ping Pong™ balls when the tube is vertically. The other cap can be replaced for spill resistance storage.
- ◆ The tube can easily be cut to a shorter length.
- ◆ You may have to play around with the aim of the leaf blower to it to blow straight across the top of the tube.
- ◆ This is definitely a 2 student demo. one to hold the tube without pinching it and the other to aim the leaf blower.

The Physics

Fast moving air decreases the air pressure. In this case the lower pressure exists at the top of the tube. Air rushes in from the relatively higher pressure side through the tube to the lower pressure above. The higher pressure pushes the balls into the air stream at the top.

These demos can be found at <http://bit.ly/CSAAPTwayne101219>

Lenz Law Demo 1

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The Physics:

- ❖ As the magnet moves across the copper, it locally changes the flux in the copper. Lenz Law says these changes are opposed by the production of a temporary counter magnetic field. The counter magnetic fields generate a resistance to the magnet's movement across the copper. The resistance is felt by the user's movements.
- ❖ When the magnet is dropped, the flux is also changed and resisted.

Materials:

- ❖ 1 Pound Copper Bar Bullion Paperweight - 999 Pure Chemistry Element Design by Metallum Gifts Short link - <https://amzn.to/2p841Ya>
- ❖ Neodymium cube 0.75 inches or larger on each side. <https://supermagnetman.com/collections/neo-cubes> \$7.00 for the 0.75 cube, \$21.00 for the 1 inch cube. (Short link - <http://bit.ly/2VsXftz>)

What to do

Hold the copper in one hand and place the magnet on top.

- ❖ Move the magnet around. Notice its resistance to movement. Note that the faster you try to move it, the more it resists.
- ❖ Hold the magnet about 1 cm above the largest face of the copper bar. Try to hold the magnet such that its face is parallel to the copper. Drop it. If done right, the magnet will settle on the copper and hardly make a sound.

Magnet storage tip

Take "dead" tennis ball and using a new utility knife or razor blade cut a slit in the tennis ball large enough to slide the magnet through. The magnet is now easy to handle.

Safety Considerations

This magnet is extraordinarily strong. If a finger should come between it and a piece of metal, the magnet will split the finger as it is quickly sticks to the metal. Then it will be bloody and painful to remove. But you must remove it quickly before the pain builds.

If the magnet SLAMS to another piece of metal or magnet, it will likely break or shatter. Physically, it is very fragile.

These demos can be found at <http://bit.ly/CSAAPTwayne101219>

Lenz Law Demo 2

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This is a twist on the classic magnet drop through pipe. Three different bars are placed in wood frame. On each bar is a set of neodymium magnets. The magnets on the wood accelerate down at nearly 9.80 m/s^2 . The other magnets on the copper and aluminum bars reach terminal velocity and travel down much more slowly. The beauty of this set up is how visual it is.



The Physics:

- ❖ As the magnet moves across the bar, near the magnets the flux changes in the bars. The change in flux creates a whirlpool of electrons that generate a local current that in turn generates a temporary counter magnetic field. The wood does not have free electrons to exhibit a change in flux. The aluminum has about 36% more resistance than the copper. This means the aluminum generates less current for a given motion and therefore less magnetic field to counter the change in magnetic flux as the magnet moves. Less counter magnetic field means the magnets move faster down the bar than the magnets on the copper bar.

Materials

- ❖ 15 - Neodymium ring magnets. 5 for each bar. source: is SuperMagnetMan, <https://supermagnetman.com/products/r1018b45h?variant=11410339011> Short link. <http://bit.ly/35oSpBZ> Item number R1018B45H They are \$1.65 each. (\$24.75 for 15.) I order 20 so I will have some spares, They are fragile.
- ❖ 1 - 1 x 2 x 48 stick of wood I used oak from Lowes because it will give me less wrapping over time. ~\$ 5.00
- ❖ 2 - rubber faucet washers that will fit over the $\frac{3}{8}$ " diameter bars.
- ❖ 1 - "2 Pieces $\frac{3}{8}$ " C110 COPPER ROUND ROD 12" long H04 .375" OD CU New Lathe Bar Stock" from Amazon \$17.49 per pair (you only need 1) <https://amzn.to/328e5QG>
- ❖ 1 - "Remington Industries 0.375RD6061T6511-12 $\frac{3}{8}$ " Diameter, 6061 Aluminum Round Rod, 12" Length, T6511, Extruded, 0.375" Diameter" from Amazon \$10.67 per pair (you will only need 1) <https://amzn.to/2Vwd2YB>
- ❖ 1 - 36" x $\frac{3}{8}$ " oak dowel rod from Lowes or Home Depot. ~\$1.50
- ❖ 8 - $1\frac{1}{4}$ " Screws to hold everything together.

Tools

- ❖ Saw and mitre box or table saw.
- ❖ Drill press
- ❖ Forstner drill bit

What to do

Hold the copper in one hand and place the magnet on top.

- ❖ Move the magnet around. Notice its resistance to movement. Note that the faster you try to move it, the more it resists.
- ❖ Hold the magnet about 1 cm above the largest face of the copper bar. Try to hold the magnet such that its face is parallel to the copper. Drop it. If done right the magnet will settle on the copper and hardly make a sound.

Magnet storage tip

Take "dead" tennis ball and using a new facto knife or razor blade cut a slit in the tennis ball large enough to slide the magnet through. The magnet is now easy to handle.

Safety Considerations

This magnet is extraordinarily strong, magnetically. If the magnet SLAMS to another piece of metal or magnet, it will likely break or shatter. Because physically, it is very fragile.

These demos can be found at <http://bit.ly/CSAAPTwayne101219>

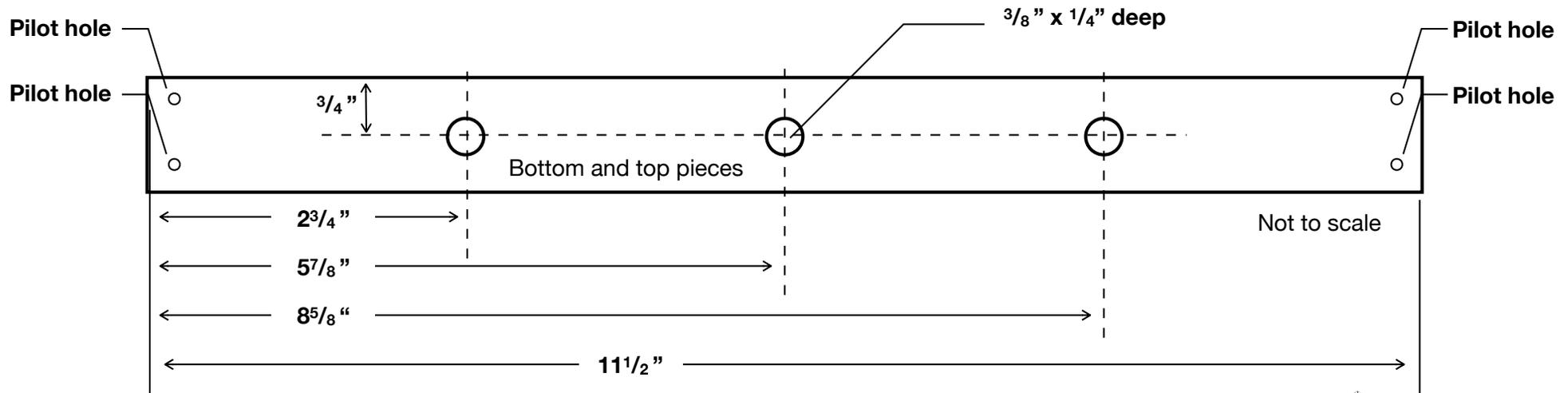
Lenz Law Demo 2

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Construction

1. Cut the wood into 4 pieces $11\frac{1}{2}$ inches long.
2. Use the drill press and Forstner bit to drill $3\frac{3}{8}$ " holes in 2 of the pieces of wood. One piece will be the top and the other will be the bottom piece. The Forstner bit will make a nearly flat hole bottom. The holes need to be the same diameter as the bar. Drill down $\frac{1}{4}$ inch into the wood.
3. Drill pilot holes in the topped bottom at the ends. These holes will help to prevent the wood from splitting.



4. Screw the 2 vertical pieces into the bottom piece.
5. Put the bars into the holes. I put them in the order of wood, aluminum followed by copper.
6. Place 1 rubber faucet washer on the wooden bar.
7. The magnets are 1mm thick. Stick 5 of them together. Place the 3 magnet groups on each bar.
8. Place the top wood piece in place and screw it down.

These demos can be found at <http://bit.ly/CSAAPTwayne101219>

