

## Electricity & Magnetism

# Lenz's Cooking Foil

(Ireland)

### Background:

The Russian physicist Heinrich Friedrich Emil Lenz 1804-1865 formulated the law that states that the direction of an induced current in a conductor opposes the change causing it.

Many teachers may be familiar with experiments that demonstrate this law. A popular one involves dropping a strong magnet into a hollow tube, made from a non-magnetic metal such as copper or aluminium. There can be difficulties sourcing suitable tubes and magnets. Kits can be bought from suppliers but can be expensive.

This low cost variation uses common kitchen cooking foil and works very well.

### You will need:

- ✓ A strong neodymium magnet
- ✓ A small non-magnetic object
- ✓ Some aluminium cooking foil tubes (ideally different heights)
- ✓ A timer such as on a smart phone

### Follow these steps:

1. Hold the aluminium tube so that it is vertical
2. Drop the non-magnetic object into the tube
3. Note the time it takes to fall through
4. Repeat with the neodymium magnet noting the time it takes to fall through
5. Compare the two times

### So what happened?

As the magnet falls it induces an electrical current in the tube. This current has a magnetic field. According to Lenz's law, the polarity is

opposite to the polarity of the falling magnet and there is a force of repulsion according to the Lorentz Force. This force is not strong enough to stop the falling magnet, but it is large enough to noticeably slow it down.

### What next?

- Investigate the effect when using different strengths and sizes of magnets and tubes.
- Challenge students to explore applications that use Lenz's law such as: metal detectors, braking systems on trains, induction motors etc .

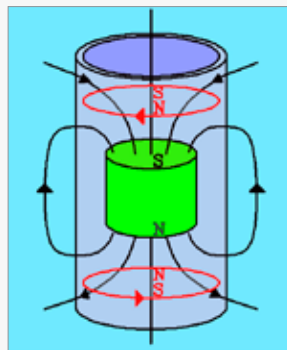


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