

## Higgs Analogy

Helen Heath, University of Bristol

This analogy was used for one of the PPEP exhibits, but most Physics departments or secondary schools have the equipment. As with any analogy there is plenty of room to pick holes in it, but it is visual.

You need a length of plastic tubing and the same length of copper tubing, one magnet, which will fit down the tubes, and one non-magnetic metal slug of the same size. Rare earth magnets are best (you normally have to buy several at once and I have a limited supply I could pass on at cost).

This is, of course, a nice demonstration of electromagnetic induction in its own right.

The basic principle is that the plastic tube is a Universe with no Higgs field through which all particles pass at the speed of light. The copper tube is a universe with the Higgs field where massless particles still pass through at the speed of light but massive particles are slowed by their interactions with the field.

To make this more interesting try it as a race. Invite two teams, perhaps boys v girls or children v adults, and set up some sort of relay. Simplest version is two people where one drops the "particles" and the other picks them up. Ask them to make the "particles" go through ten times and ensure that you give those with the plastic tube the magnet. Whoever wins you can then suggest a rematch and swap the "particles" to make sure there is no bias. The plastic tube team will probably finish before the magnet has reached the end of the tube for the first time.