

PhyzGuide: Anti-Gravity Bowling

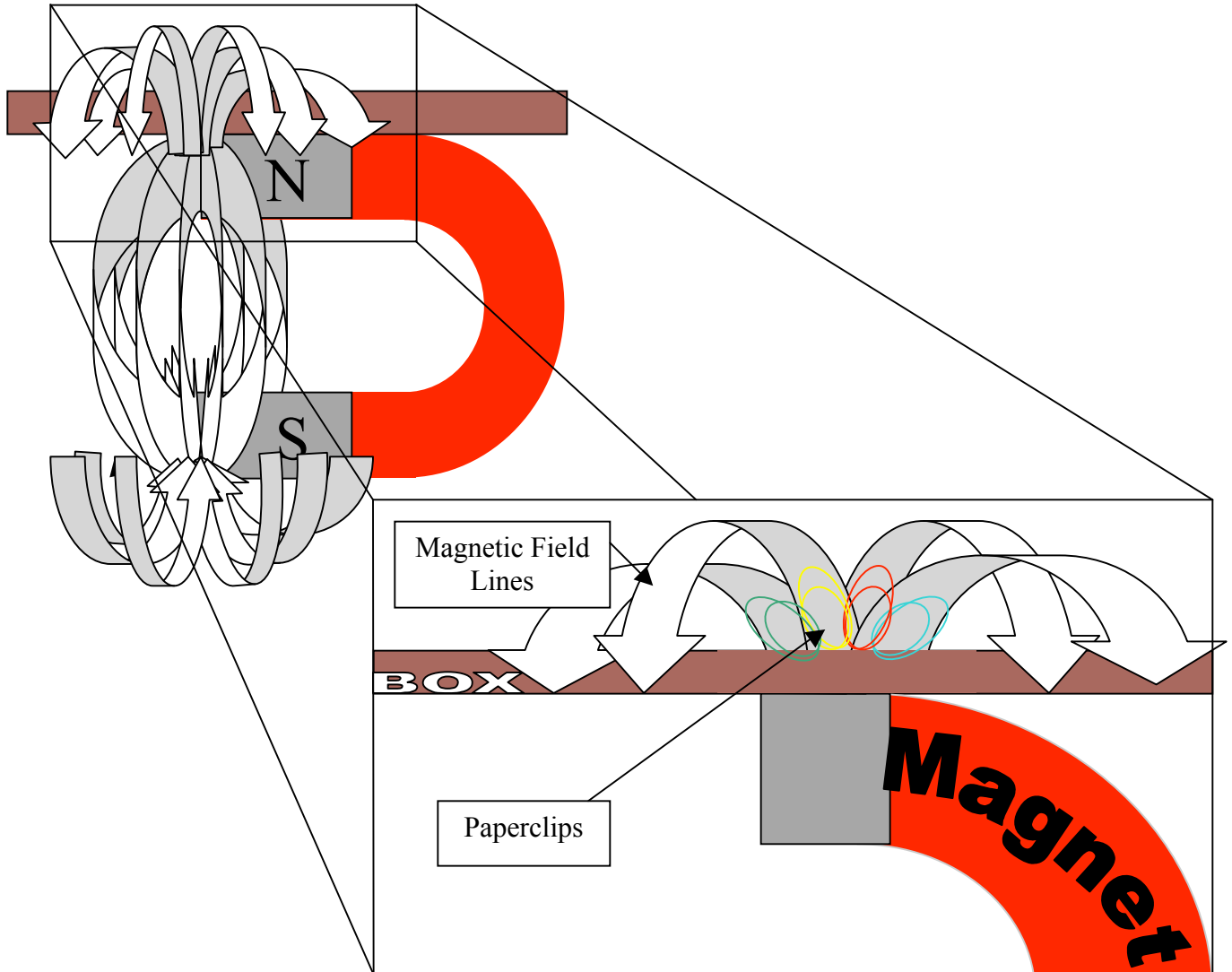
A magnet is placed beneath a box and paperclips are tossed into the magnetic field and appear to defy gravity. Are the paperclips really defying gravity? Why are they standing as opposed to lying down? How could this be applied in real life?

HOW THE EXHIBIT WORKS

The basic assembly of the exhibit is quite simple. A magnet is placed inside a box as close to the top as possible. Paperclips are tossed onto the top of the box where they remain standing up if they are metal or show no reaction if they are plastic. The paperclips that stay standing appear to defy gravity because they are standing up. But these pieces of metal do not have any magical powers that would allow them to defy gravity. There is something else acting on these paperclips

FUNDAMENTAL PRINCIPLES

As you know, magnets attract certain objects. Every magnet has two poles that attract particular items. Magnetic Field Lines are what cause objects to react to magnets the way that they do. They travel from one pole of a magnet (north) to the other (south). These lines take many different routes on the journey from pole to pole, which include the ones seen in the diagram on the next page. The lines come off of the pole of the magnet at many different angles, creating concentric rings of field lines. When a paperclip is tossed into the field, it wants to travel along one of the field lines, and get all the way to the pole of the magnet. The path that the paperclip takes is curved, because the field lines are curved. But it cannot get all the way to the magnet due to the friction of the box separating the paperclip from the magnet. With the box blocking the path to the magnet, the paperclip stays in the magnetic field, still on the field line. The paperclip remains in the curved, angled position because it is still trying to travel on the curved field line.



REAL LIFE APPLICATIONS

For thousands of years people have used the idea that certain materials will follow magnetic field lines, for their benefit. The most common usage of this idea is the compass. Because the earth is just a giant magnet, it has magnetic field lines going from pole to pole (they go from the South Pole to the North Pole, meaning the North Pole is a magnetic south pole because the field lines go towards it. Magnetic north poles cause the field lines to go away from it rather than go towards it, so the names of the earth's poles are backwards) Due to the magnetic field lines of the earth, a magnet that can rotate without friction, like one on a piece of wood floating in water, will follow these lines, and point North. This is the idea behind the compass and this concept of a magnet showing which direction is north has been used for millennia to help sea-goers navigate their ships.

