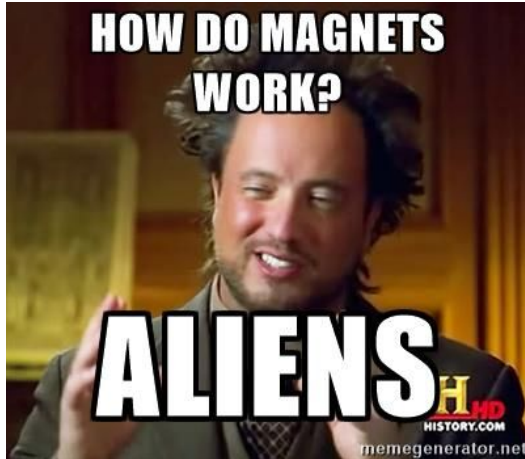


It's Attractive ...or repulsive

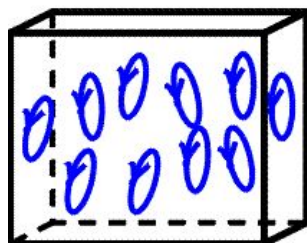


What is a magnet and how do they work?

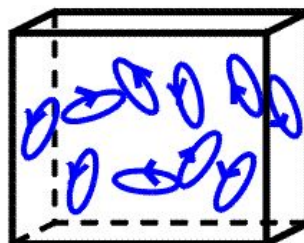
You know that north and north don't like each other, and north and south are attracted to each other. Seems like a very good analogy with electricity.

This is not a coincidence. Why say north / south for magnets and positive / negative for electricity? This is an arbitrary human constructed distinction. There is not a real difference. Magnets work like current... we could just as easily have called the north side of the magnet positive and the south side negative.

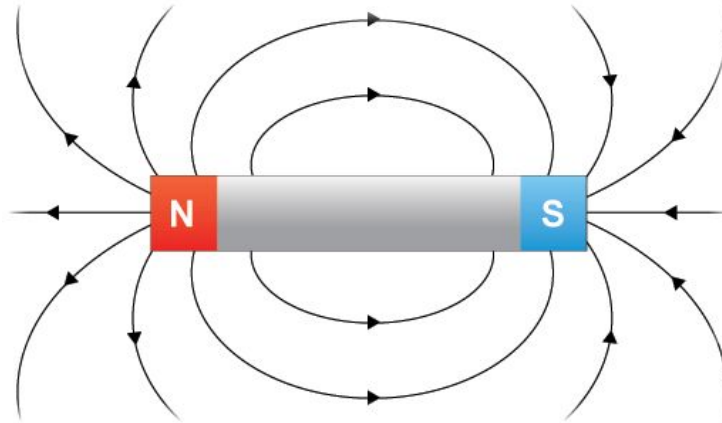
Magnetic



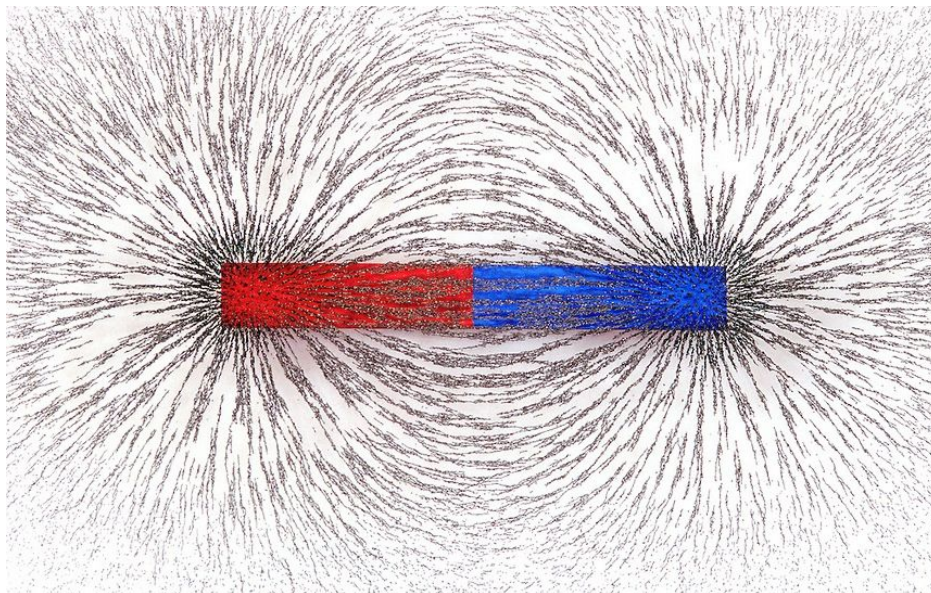
Non-Magnetic



We even use the same direction for magnets as we did for proton / neutron field lines. Out from positive / north and into negative / south.



Again, as with electricity, these lines are not fictitious. You may remember an experiment in middle school about magnets and iron filings. The filings do indeed take this shape. And, the density of field lines is proportional to the strength.



Magnets have been in use for a very long time. They were a key component in sailing... everywhere looks the same, how do you chart a course? Magnets! (more specifically a compass)

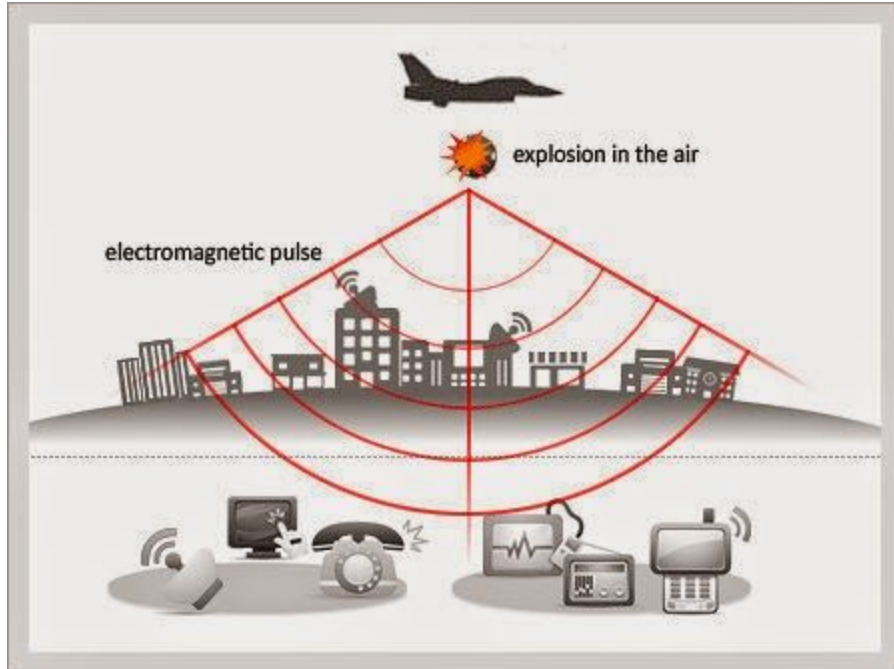


This is due to the Earth's magnetic field. $\approx 0.5\mu T$ (Teslas). For comparison a small bar magnet is $\approx 10mT$.

Check out what the [strongest magnet on Earth](#) (10T) can do!

Magnetic force and electrical force are in essence the same thing - just perpendicular to each other.

We send current through a wire, and all around the wire we have a magnetic force. Put a compass next to a wire and you can see the magnet deflect with the magnitude of deflection proportional to the distance.



Isaac Asimov did a Sci Fi story about this, *The Feeling of Power*, where one dude figured out a human could do math without a calculator...

Let us look at the difficulty in going down this magnetic rabbit hole. Look at the trouble that one of the smartest humans to have ever lived has when asked about magnets.

[Feynman on Magnets](#)