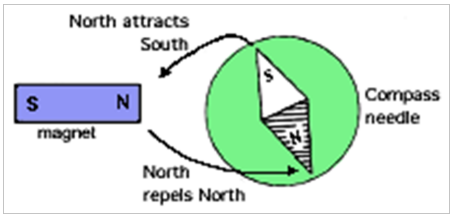
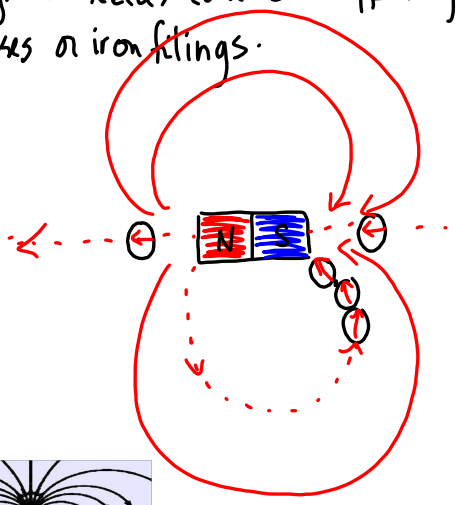
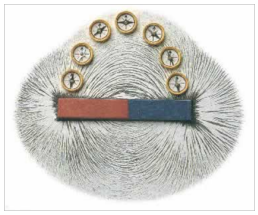
§6-3 Magetic Force + Field

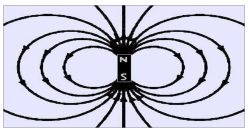
- A "magnetic material" is one which is attracted to a magnet. A "non-magnetic" material is not attracted to a magnet.
- materials made of iron, cobalt, nickel
- magnets have a pole at either end (north + south poles)
- like poles repel / unlike poles attract.
- permanent magnets (made of steel) retain their magnetic properties over time.
- magnets that quickly lose their magnetism are made of soft iron and are called temporary magnets.
- a compass needle is a small permanent magnet and points to the Earth's magnetic poles.
- magnetic poles can be induced in soft iron (like a nail) by holding it near a permanent magnet or rubbing it with a permanent magnet.
- a magnetic field is a region in which a small test compass experiences a magnetic force and the direction of the field is the direction of the force on the north pole of the compass (red).



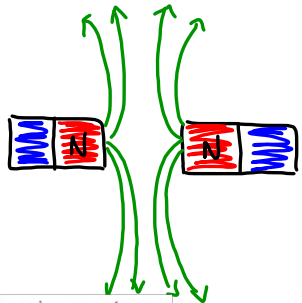
- magnetic fields can be mapped by using small compasses or iron filings.

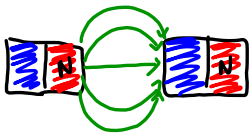


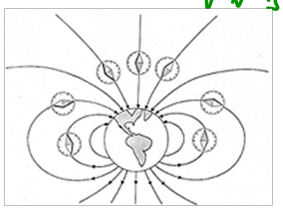




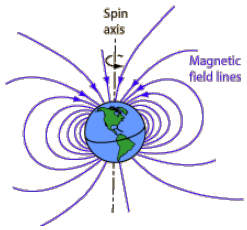
Field lines are drawn from north to south poles







The Earth's north pole is really near a magnetic south pole



A long time ago..... it was once a north magnetic pole.

The magnetic pole doesn't align with "true north"

Think of the Earth as being a huge bar magnet.

} Magnetic Domain Theory.

Magnetic Field

- determined with a test compass
- vector quantity
- cannot test the field with an isolated "test pole" as no isolated pole exists.
- can also be determined with a "test current element"

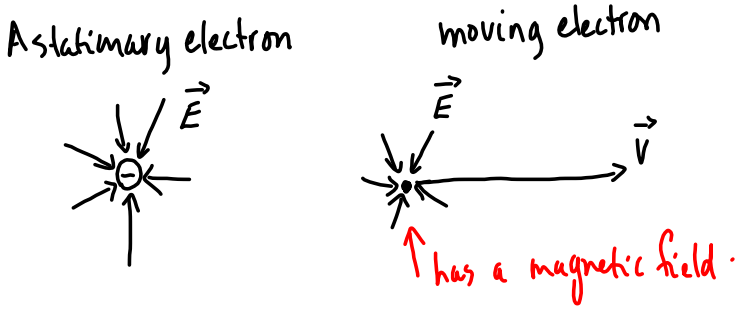
$\vec{g}$ → gravitational field strength

$\vec{E}$ → electric field strength

$\vec{B}$ → magnetic field strength

Moving Charges create a magnetic field

- 1820, Oersted noticed than an electric current caused a compass needle to deflect.
- up until then, electricity + magnetism were thought to be separate and unrelated phenomena.
- his discovery led to the birth of electromagnetism.



Cathode Ray Tube used by Thompson in the discovery of the electron → the stream of negatively charged particles was deflected by an external electric field and by an external magnetic field

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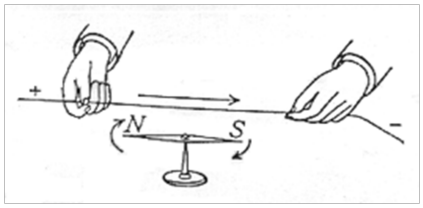
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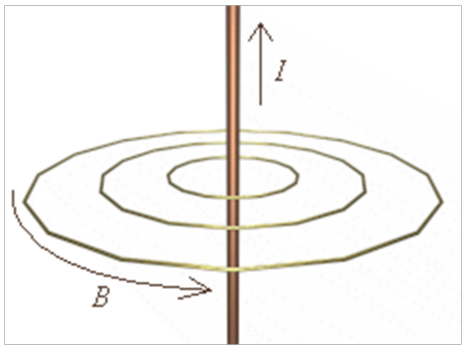
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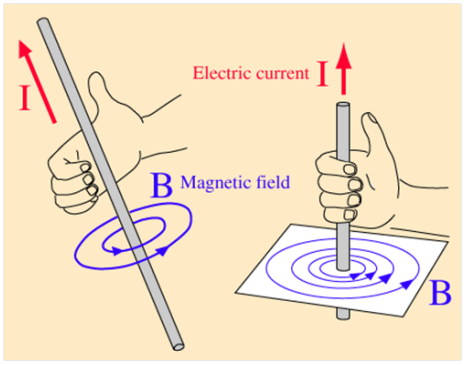
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Electric current I
B Magnetic field
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