

VI MAGNETS AND MAGNETISM:

A. Properties of Magnets:

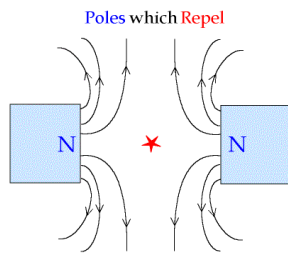


Name comes from **Magnesia**

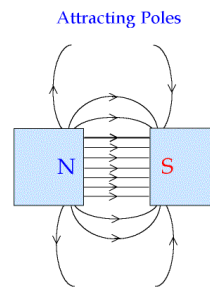
1. Stones that **attract** each other.
2. Most natural magnets contain **iron oxide** = Fe_2O_3
3. Strong natural magnets: **Iron Nickel Cobalt**
4. Magnetic Poles: the **ends** of the magnet (North and South)

a) The **end** of the magnet that points **north** is called the magnet's **north pole**.

b) **like poles** repel each other

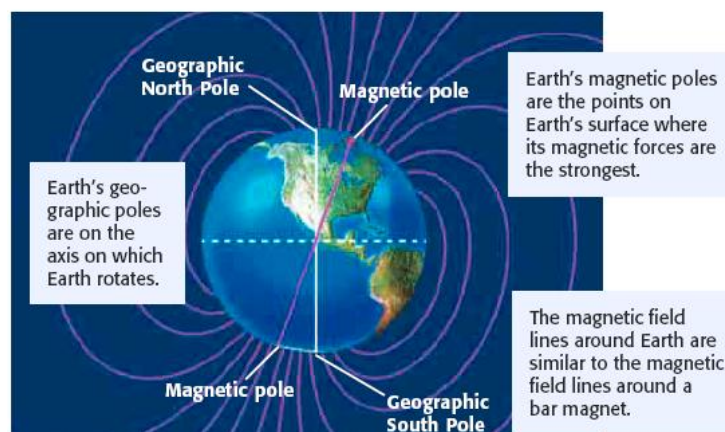
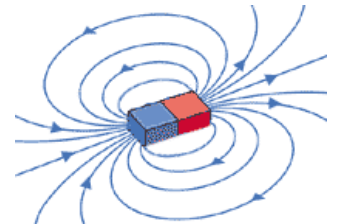


c) **opposite poles** attract each other



B. Magnetic Field:

1. The **unseen** force field around the magnet.
2. Earth's **magnetic** field is due to its core which is made of **iron** and **nickel**.
3. A suspended **magnet** will line up with the **magnetic** field.
4. Earth's **magnetic** north pole is different from the **geographic** north pole.



C. The Cause of Magnetism:

1. Individual **atoms** can be magnetic due to electrons **spinning**.

a) The electron **spins** as it orbits the nucleus.

2. *Nonmagnetic substances:*

a) Have **paired** electrons.

b) They spin in **opposite** directions.

c) They **cancel** each other out.

d) Examples: **glass plastic**

3. *Magnetic substances:*

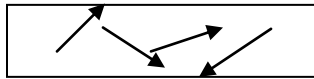
a) Have **unpaired** electrons

b) Examples: **iron nickel cobalt**

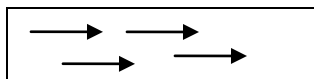
4. *Domains: (tip of arrow is North)*

a) Groups of **atoms** in tiny areas.

b) When domains are **randomly** arranged, it is **not magnetic**.

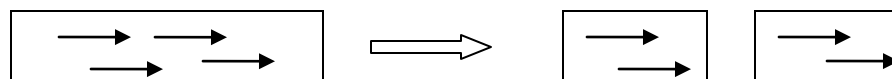


c) When domains are **lined up** the object is **magnetic**.



5. *Magnetic Evidence:*

a) If you **break** a magnet, the poles **stay** lined up.



b) Metals can be **magnetized**.

c) Metals can **lose** their magnetism by...

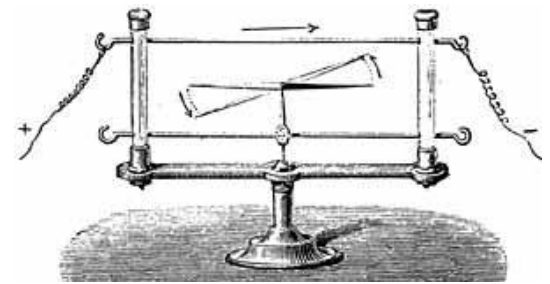
hammering or heating

D. Magnetizing Metals:

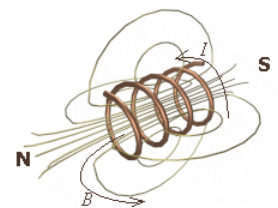
1. Metals remains in a **magnetic** field for a **long** time.
2. **Melt** a metal and then **cool** it in a magnetic field.
3. *Temporary Magnet:*
 - a) Can **lose** its magnetism. Example: **soft iron**
4. *Permanent Magnet:*
 - a) Does **not** lose its magnetism.
 - b) Examples: **ALNICO** Aluminum Nickel Cobalt

VII ELECTROMAGNETISM:A. Hans Oersted (1820):

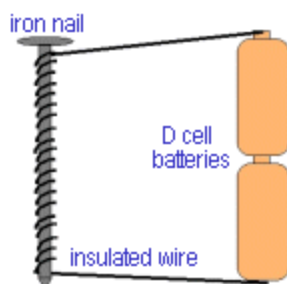
1. When a **compass** is held near current, it does **not** point north.
2. An **electric** current produces a **magnetic** field.
3. Electromagnetism: the **interaction** between **electricity** and **magnetism**.

B. Solenoid:

1. A **coil** of wire that **produces** a **magnetic** field when carrying a **current**.

C. Electromagnet:

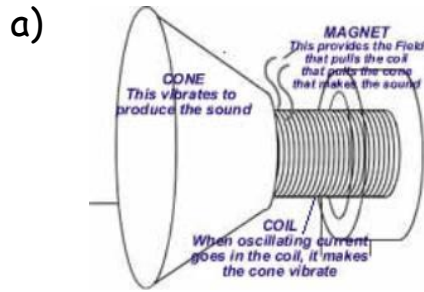
1. A **solenoid** wrapped around an **iron** core.



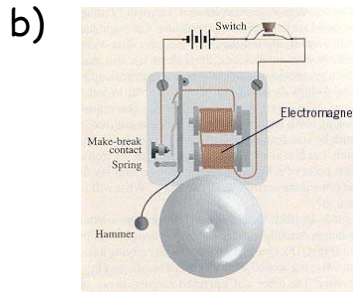
- a) **Stronger** than a solenoid
- b) The more **coils** the **stronger** it is.
- c) It can be turned **on** or **off**.



2. Electromagnet examples:



Speaker



Doorbell



Crane

3. Magnetic Force on a Wire:

- a) A **Current** carrying wire can make a **compass** move.
- b) A **magnet** can make a current carrying wire **move**.

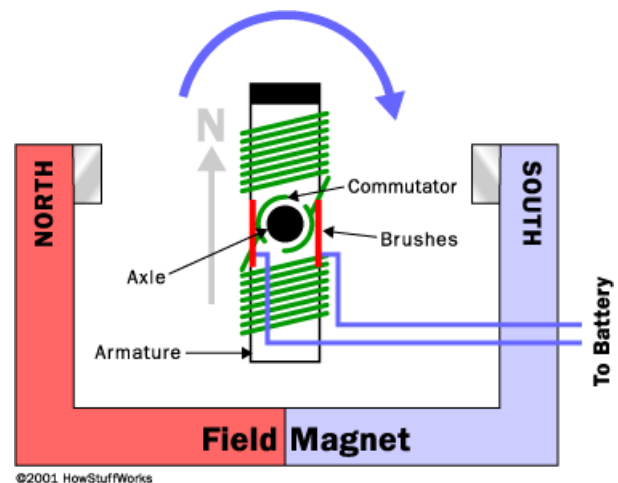
D. Electric Motor:

1. Changes **electrical** energy into **mechanical** energy.

- a) *Armature*: a **coil** of wire that can rotate.
- b) *Commutator*: **changes** the direction of current. Used when batteries power the motor.

2. Motors are found in..

**Fan blender vacuum cleaner
dishwasher**



VIII ELECTRICITY FROM MAGNETISM:

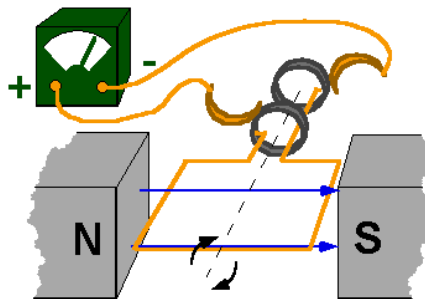
A. FARADAY:

1. He learned that you get an electric current if you...:
 - a) move a **magnet** in a coil of **wire**.
 - b) move **wire** in a **magnetic** field.
2. He discovered electromagnetic induction.
3. The electric current can be increased if....
 - a) You move the magnet **faster**.
 - b) You add more **coils** of **wire**.



B. ELECTRIC GENERATORS:

1. An electric generator uses **electromagnetic** induction to change **mechanical** energy into **electrical** energy.



2. The electric current produced by a **generator** changes **direction** each time the **wire** makes a **half** turn.
3. Generators make **alternating** current.



4. Large generators usually move the **wires** instead of the **magnets**.

4. Power Plants:

a) Steam generators:

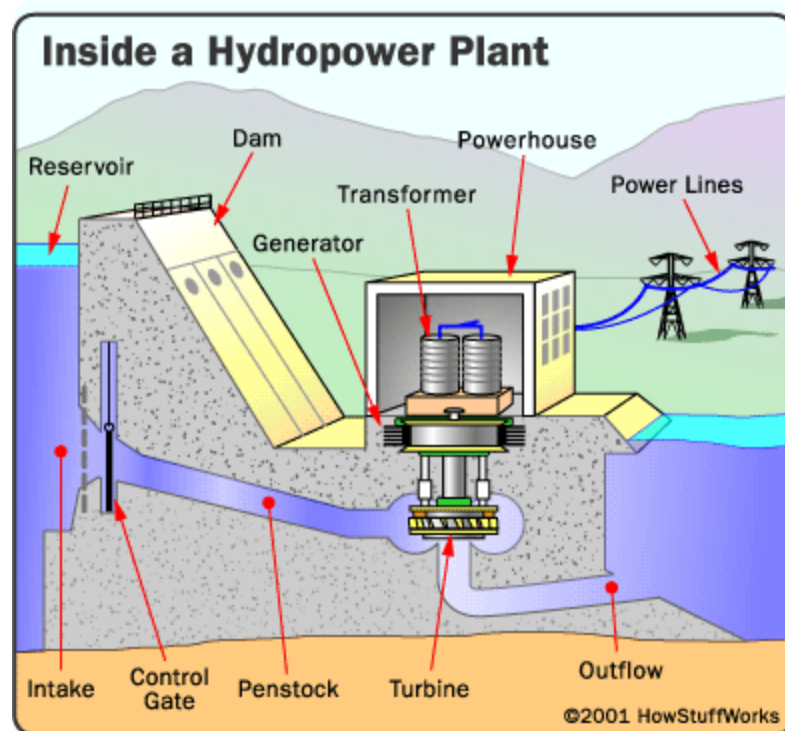
* **thermal** energy makes **steam** which turns the **turbine** which turns the **wires** of the generator.

* Nuclear plants use **uranium** as fuel.

* Fossil fuel plants use **coal** , **oil** , or **natural gas**.

b) Mechanical generators:

* use moving **water** or **wind** to spin the **turbines**



5. Transformers:

a) can **decrease** or **increase** voltage

b) needed to **decrease** the voltage from the road wires before the current enters your house.

