

The Discovery of Electrons

J.J. Thomson's Work

Matter has electrical properties

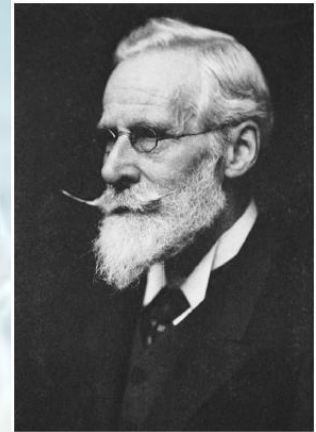
- Matter is electrically neutral, but it can become charged.
- A comb won't pick up bits of paper, at first, . . .
- But if you rub it, it will.



How can matter be neutral and electrical?

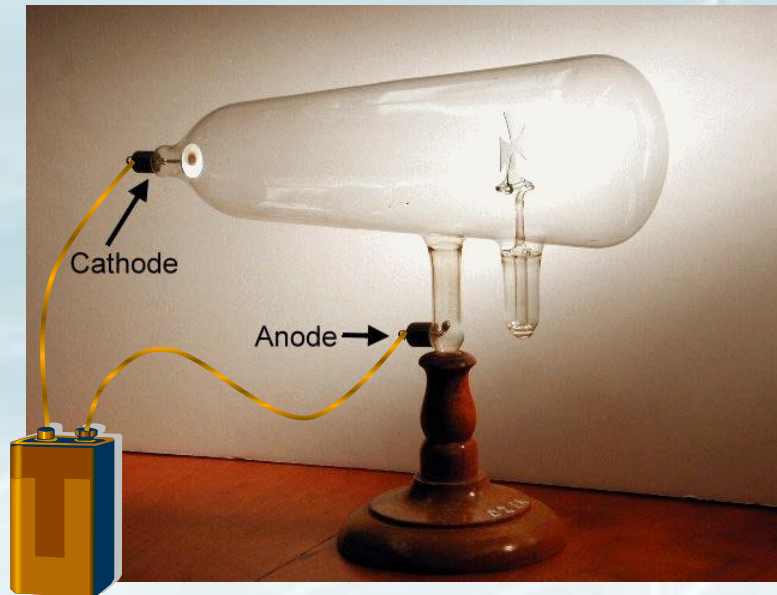
Historical Perspective

- Perhaps atoms are not indivisible as Dalton said, but contain charged particles such as electrons.
- Many scientists laid the foundation for the discovery of electrons, but the work of two is sufficient to make the discovery understandable. They are:
 - Sir William Crookes
 - Sir John Joseph Thomson



Crooke's Tube

- A Crooke's tube is an evacuated glass tube with a negative electrode (cathode), a positive electrode (anode), and a mask shaped like a Maltese cross. It is attached to a source of electricity.
- The tube begins to glow, casting a shadow opposite the cathode.



- This shows that the source of light is the cathode. The light is called a *cathode ray*

Thomson's Experiments

- Using a modified Crooke's tube, Thomson showed several things about cathode rays:
 - They respond to a magnetic field by bending.
 - They respond to electricity by bending away from the negative electrode.
 - The size of the response shows they are negative particles many times smaller than an atom.
 - The particles are identical regardless of what metal is used for the cathode.

They are small negative particles called electrons!

Thomson's Model

- Thomson needed to account for several observations:
 1. Atoms are neutral
 2. Electrons have a negative charge
 3. Electrons can be removed from atoms
- The *Plumb Pudding Model*
The atom is a positively charged cloud with negative electrons scattered throughout.

