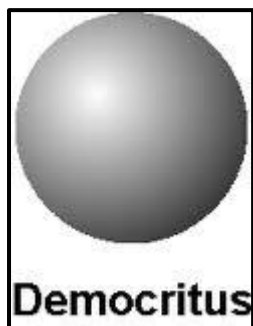


The History of the Atom

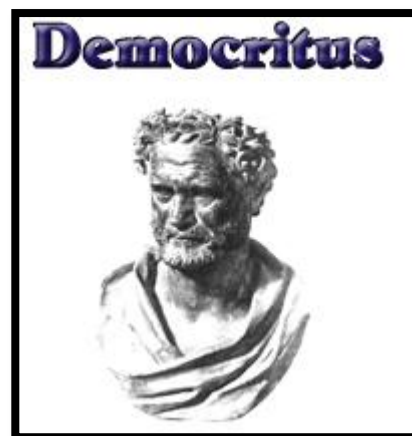
Timeline: 400 BC

Scientist: Democritus (Greek Philosopher)



Democritus was a Greek philosopher who was the first person to use the term **atom** (*atomos*: meaning indivisible).

He thought that if you take a piece of matter and divide it and continue to divide it you will eventually come to a point where you could not divide it any more. This **fundamental** or **basic** unit was what Democritus called an atom.



He called this the **theory of the universe**:

- All matter consists of atoms, which are bits of matter too small to be seen.
- There is an empty space between atoms
- Atoms are completely solid
- Atoms have no internal structure
- Each atom (of a different substance) is different in size, weight and shape.

Timeline: 1800's

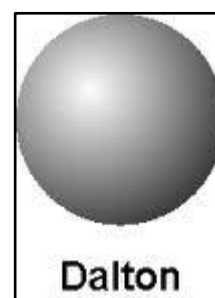
Scientist: John Dalton



John Dalton was the first to adapt Democritus' theory into the first modern atomic model.

JOHN DALTON'S ATOMIC MODEL:

1. All matter consists of tiny particles called atoms
2. Atoms are indestructible and unchangeable
3. Elements are characterized by the weight of their atoms
4. When elements react, it is their atoms that have combined to form new compounds



Timeline: 1890's

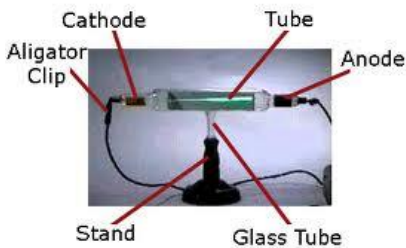
Scientist: J.J Thomson



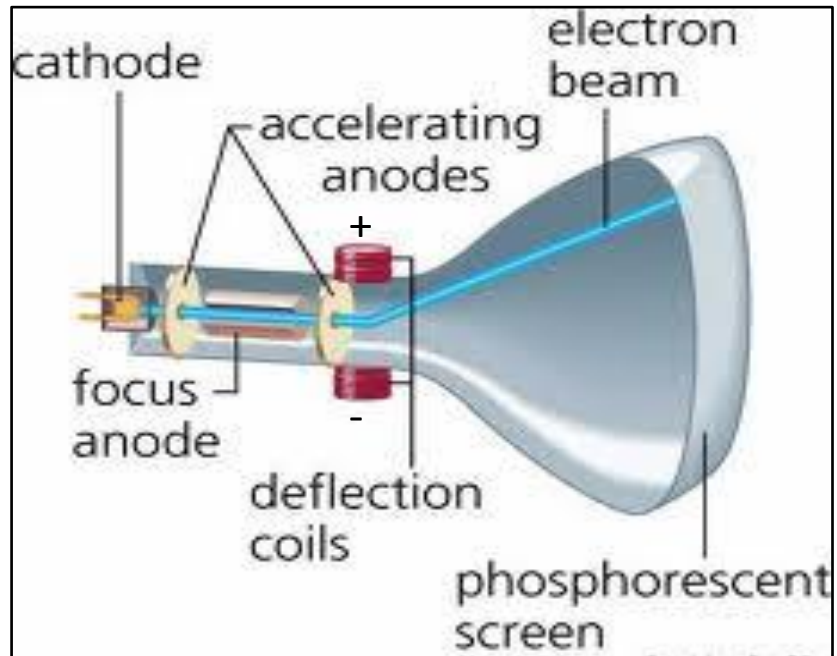
J.J Thomson was a physicist who is credited for discovering the **electron**. He used his research on **cathode ray tube** technology in this discovery.

CATHODE RAY TUBE

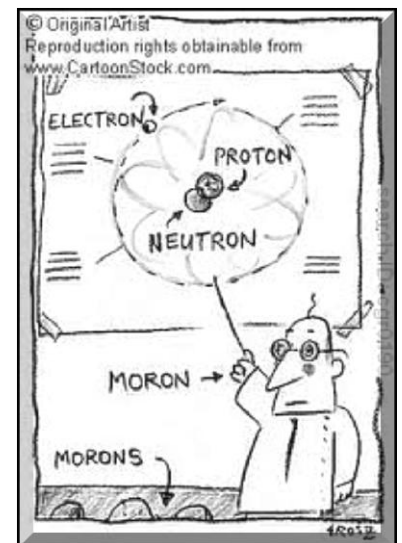
How does this Tube Work?



Modern Day Tube



1. Nearly Empty tube (Air has been sucked out)
2. An electric charge is passed through the tube. Travels from cathode to anode
3. The charge is invisible, so to see where it traveled a fluorescent screen is placed at back of tube. Where the beam hits, a dot will appear on the screen. You could also use a fluorescent gas and the whole tube will light up.
4. This beam will always travel straight if not interfered with.
5. The deflection coils each have a specific charge. One is positive and the other is negative.
6. Thomson showed (as in the diagram above) that the charge would deflect away from the negative coil. He then stated that this charge was thus a negative charge.



J.J Thomson was an excellent physicist and thus did not stop when he had found this **negative charge**. Through a series of clever experiments he was able to predict the mass of this charge.

SCIENTIFIC INTERPRETATION AT ITS BEST

He then found out that this charge was **1000** times lighter than a hydrogen atom. He made a bold statement saying that this **negative charge** must be inside an **atom**. This negative charge (he called *corpuscles*) later became known as the **electron**.

THOMSON'S ATOMIC MODEL

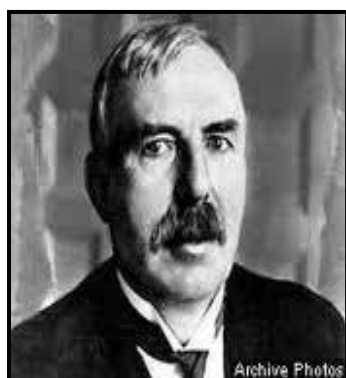


Using what he had discovered, Thomson predicted what an atom should look like. These are the key points to Thomson's Atomic Model:

1. Because of its design this model is known as the plum pudding model
2. Each atom is a sphere filled with positively charged 'fluid'. This resembles the sticky jam part of a pudding.
3. Corpuscles (later called electrons), are the negatively charged particles suspended in this 'fluid'. This resembles the plums in the pudding.
4. He did not predict the movement of these electrons

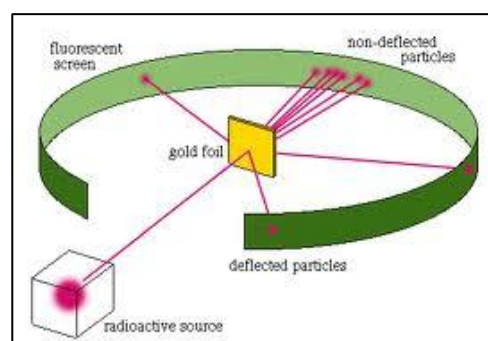
Timeline: 1910's

Scientist: Ernest Rutherford

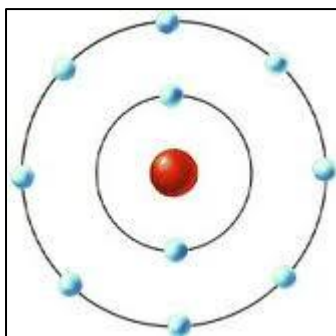


Ernest Rutherford was not convinced about the model of the atom proposed by Thomson. He thus set up his now famous **Gold Foil Experiment**.

1. He fired alpha particles (positively charged) at a gold foil.
2. He measured the deflection as the particles came out the other side.
3. Most of the particles did not deflect at all. Every now and then a particle would deflect all the way back.
4. He said that there must be a positive centre of the foil. He called this centre the **nucleus**.



RUTHERFORD'S ATOMIC MODEL (AKA THE PLANETARY MODEL)



1. The nucleus of the atom is a dense mass of positively charged particles.
2. The electrons orbit the nucleus
3. A problem raised was: Why are the negatively charged particles not attracted by the positively charged nucleus

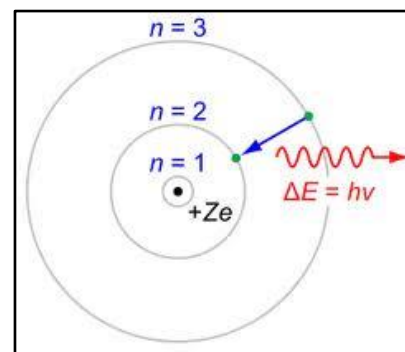
4. Rutherford stated that the atom was like a mini solar system and that the electrons orbited the nucleus in a wide orbit. That is why it is known as the planetary model.

Timeline: 1910's

Scientist: Niels Bohr



Niels Bohr agreed with the planetary model of the atom, but also knew that it had a few flaws. Using his knowledge of energy and quantum physics he was able to perfect Rutherford's model. He was able to answer why the electrons did not collapse into the nucleus.



BOHR'S ATOMIC MODEL (AKA THE RUTHERFORD-BOHR MODEL)



1. Electrons orbit the nucleus in orbits that have a set size and energy.
2. The lower the energy of the electron, the lower the orbit.
3. This means that as electrons fill up the orbitals, they will fill the lower energy level first.
4. If that energy level is fill (or at capacity), a new energy level will begin.

5. Radiation is when an electron moves from one level to another.

Problems with this theory:

Electrons do not travel on a specific orbit or path.

Timeline: 1920's

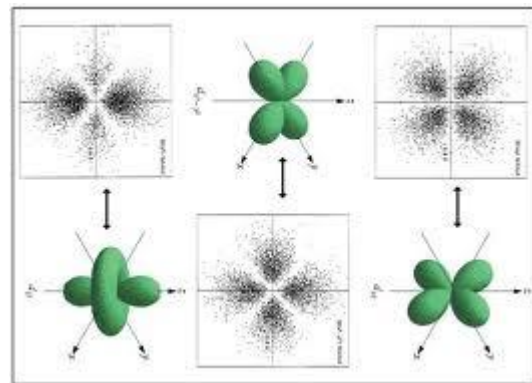
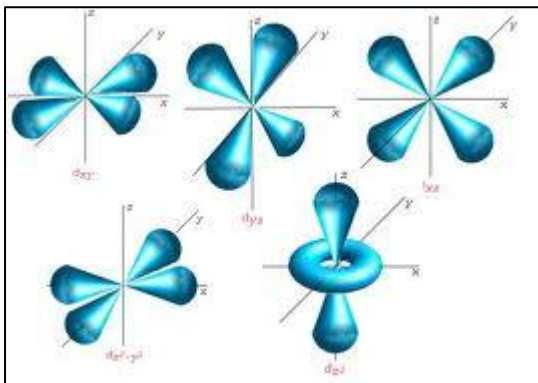
Scientist: Erwin Schrödinger



Erwin Schrödinger was a revolutionary physicist who used Heisenberg's uncertainty principle to come up with the atomic model that we still use today.

SCHRÖDINGER'S ATOMIC MODEL (AKA THE CLOUD MODEL)

1. An electron does not travel in an exact orbit
2. We can predict where it will probably be
3. We cannot say for certain where it is, but only where it ought to be.
4. The type of probability orbit is dependent on the energy level described by Bohr

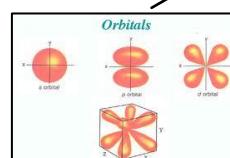
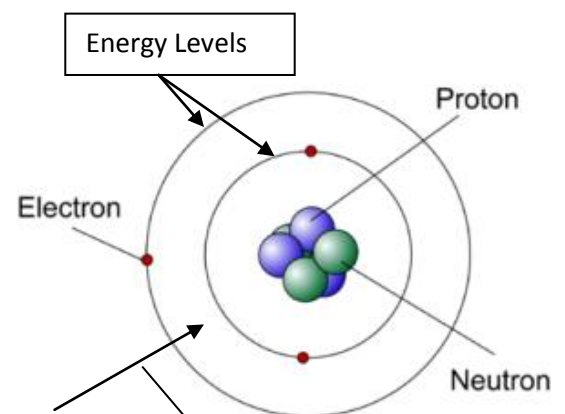
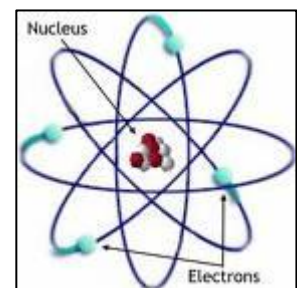


SUMMARY OF ATOM

- The smallest part of an element is called an atom
- Each atom (of an element) is different in structure from other atoms (of other elements)
- An atom can be divided in smaller subatomic particles:

Protons, Electrons and Neutrons

- The nucleus is the centre of an atom. It contains protons and neutrons.
- Electrons orbit the nucleus
- As we go up the periodic table, an electron and proton is added.
- Electrons occupy a certain energy level (of a certain size)
- Once the energy level is full, a new level begins
- Within each of these levels are special types of orbitals. These depend on the energy level
- Each orbital can contain two electrons



Within these energy shells are different shapes of orbitals