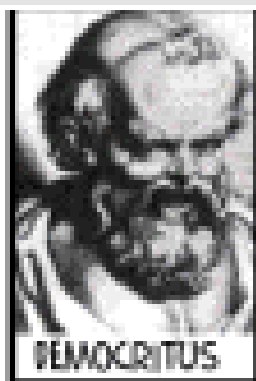


The Development of Atomic Theory



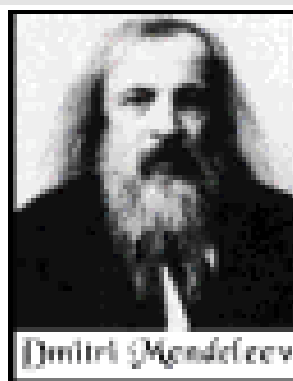
DEMOCRITUS

The Atom



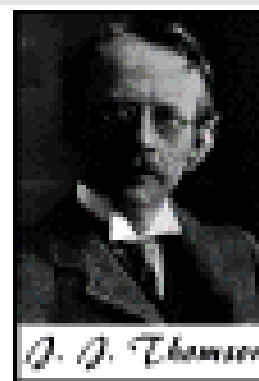
John Dalton

Atomic
Weight



Dmitri Mendeleev

The
Periodic Table



J. J. Thomson

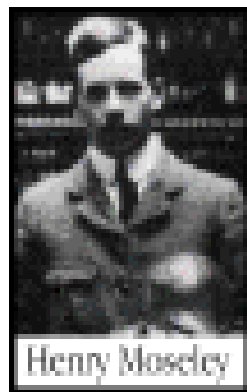
The Plum
Pudding Model

Fathers of Atomic Theory



Ernest Rutherford

The Planetary
Model



Henry Moseley

Atomic Number



Niels Bohr

The Bohr
Model



e- energy levels

1 2 3 4 5 6 7

nucleus

2 8 18 32 18 8 2

Max. number
of electrons

← EXIT

Ideas & Theories in Science Change

Our theory about the atom has changed over time as new studies are done.

Even though no one has ever seen an atom up close we are still able to make new discoveries.

Similar to how we have made new discoveries about dinosaurs.

Dinosaurs and Atoms

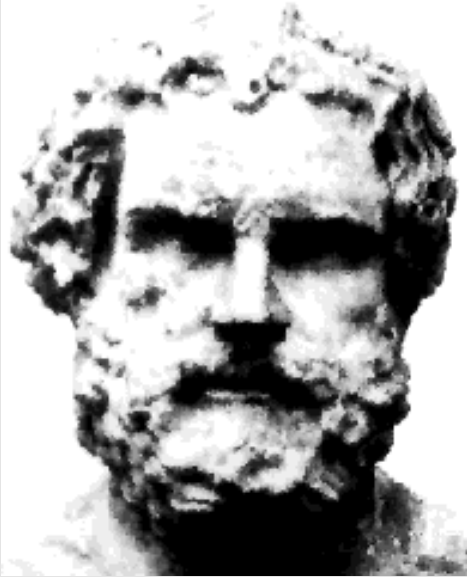
No one has seen an atom or a dinosaur directly. We know of their existence only by indirect evidence.



Our theories of both dinosaurs and atoms has changed over time based on this indirect evidence



This fossil evidence shows us that some dinosaurs may evolved into birds.



Democritus

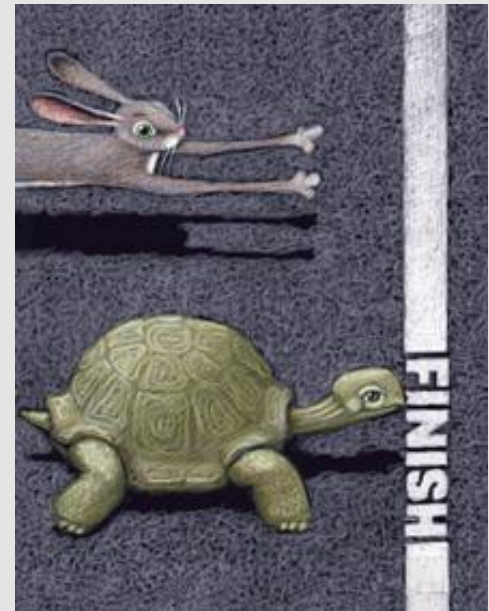
Ancient Greek philosopher.
460 - 370 B.C.

He thought matter is like motion. It cannot be divided in half forever.

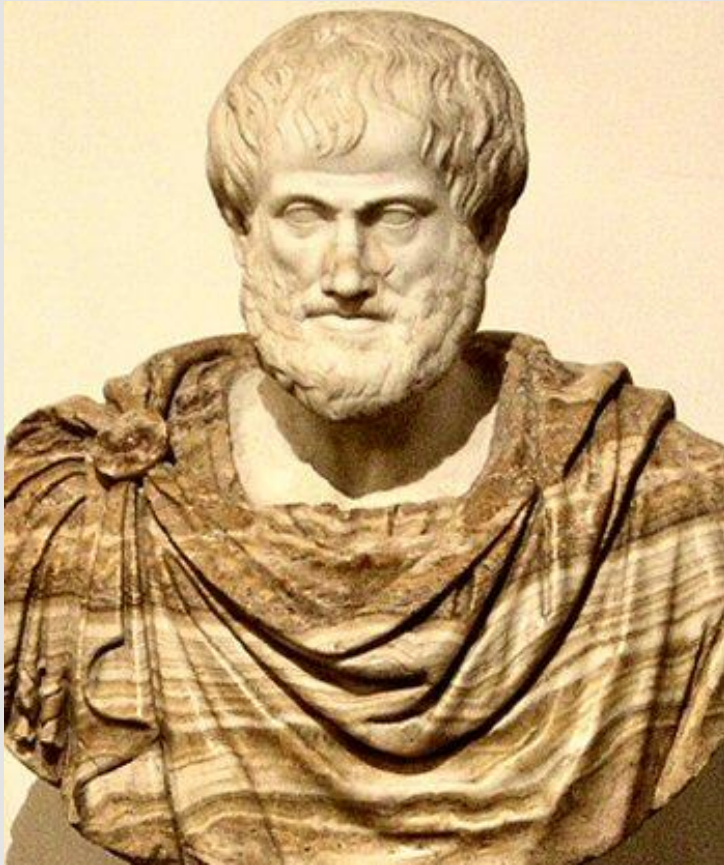
The tortoise and hare would never finish the race if you could keep dividing the distance to the finish line in half forever.

There was a limit to how far you could divide matter.

You would eventually end up with a piece of matter that could not be cut.



Why weren't Democritus's ideas accepted?



Aristotle believed that matter could be divided into smaller and smaller pieces forever.

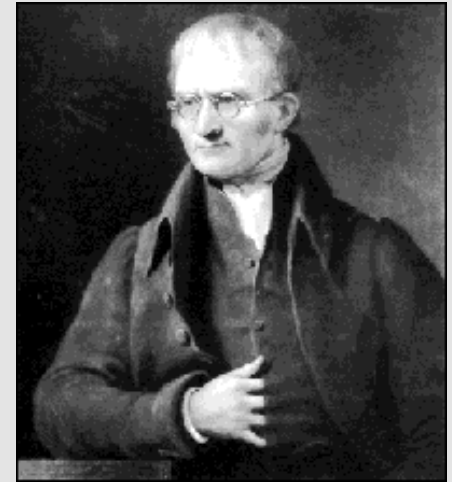
His strong influence on popular belief and his views on this were accepted for 2000 years.

Greek word Atomos

The Greek word “atomos” means not able to be divided or “indivisible.”

John Dalton

British Chemist
1776-1844



He performed many experiments to study how elements join together to form new substances

He proposed 3 new ideas about the atom:

- All substances are made up of atoms which are small particles that cannot be created, divided, or destroyed.
- Atoms of the same element are exactly alike and atoms of different elements are different.
- Atoms join with other atoms to form different substances



J.J. Thomson

1856-1940

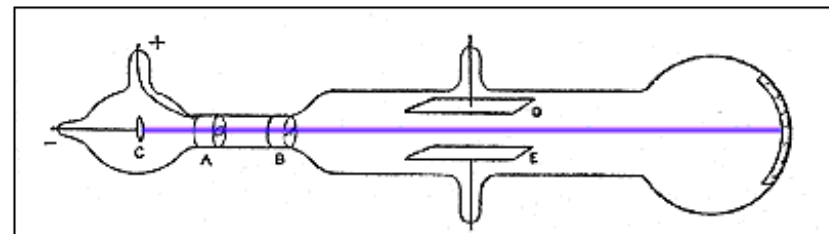


Atoms are **made of smaller negatively-charged particles called electrons.**

Thomson's discovery was the result of doing experiments with "cathode ray tubes"

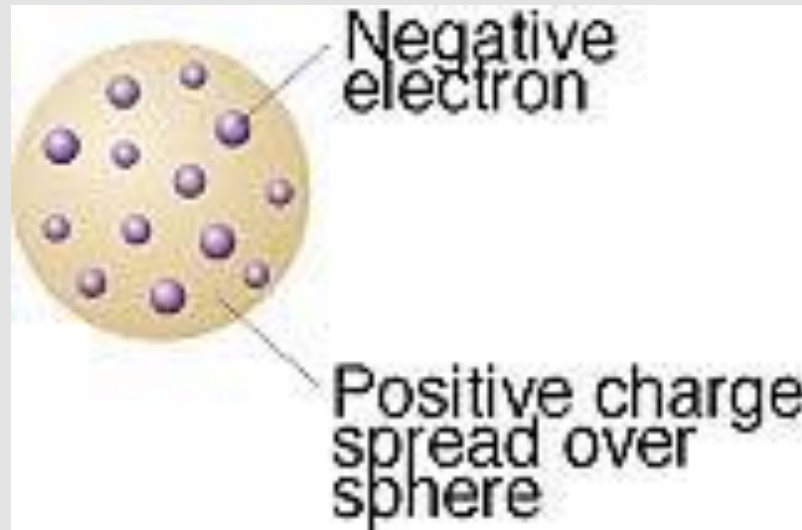
"What are these particles? are they atoms, or molecules, or matter in a still finer state of subdivision?" -Thomson

Stream of electrons is attracted to positively charged plate here.



The Plum Pudding Model

Thomson did not know how the electrons in an atom were arranged. **He believed they were mixed throughout an atom.**



He proposed that the atom was a sphere of positively charged material and negatively charged electrons spread throughout.

Similar to plums in a pudding or chocolate chips in ice cream.

Ernest Rutherford

1871 - 1937



Was a student of J.J. Thomson but disagreed with the “Plum Pudding Model”.

Awarded the Nobel Prize in Chemistry for his discovery of alpha particles, positively charged particles emitted from radioactive elements.

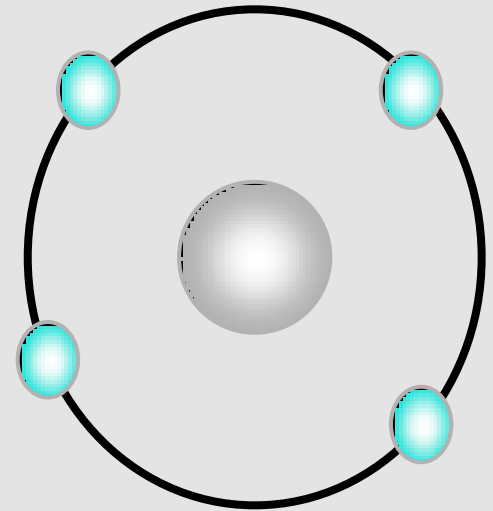
Devised an experiment to investigate the structure of positive and negative charges in the atom.

Video: https://www.youtube.com/watch?v=5pZj0u_XMbc

Rutherford's Revised Atomic Theory (1911)

***Result:** Most of the positively charged particles went straight through the gold foil.*

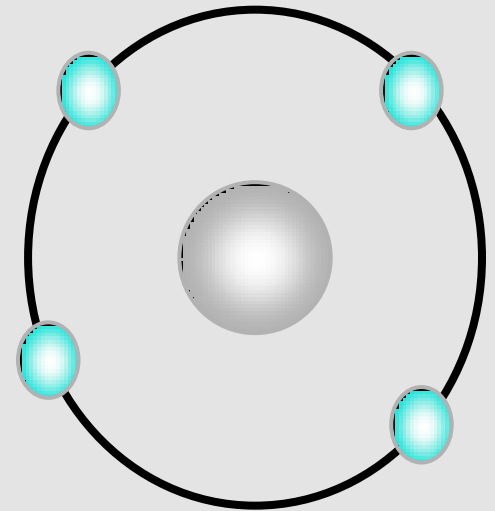
***Atomic Theory:** Most of the matter of the atom is found in a **very small** part of the atom. This is called the **nucleus** of the atom. It is very tiny and extremely **dense**.*



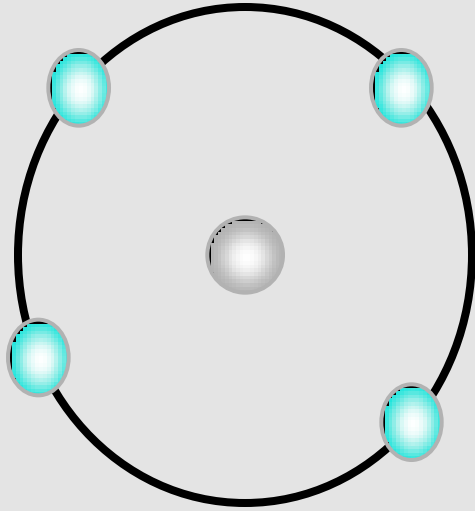
Rutherford's Revised Atomic Theory (1911)

***Result:** Some of the positively charged particles were deflected or even bounced back.*

***Atomic Theory:** Like charges repel so the nucleus must have **a positive charge**. If electrons have a negative charge they could not be in a positively charged nucleus. Electrons must **surround the nucleus at a distance**.*



Rutherford's Revised Atomic Theory (1911)



Result: *The diameter of the nucleus is 100,000 times smaller than the diameter of the entire gold atom.*

Atomic Theory: Atoms are mostly *empty space* with a tiny, *massive nucleus at the center* .



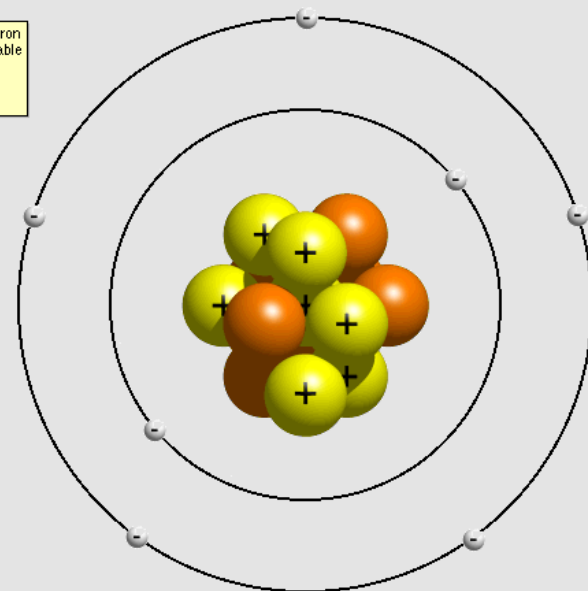
Niels Bohr

1885 - 1962

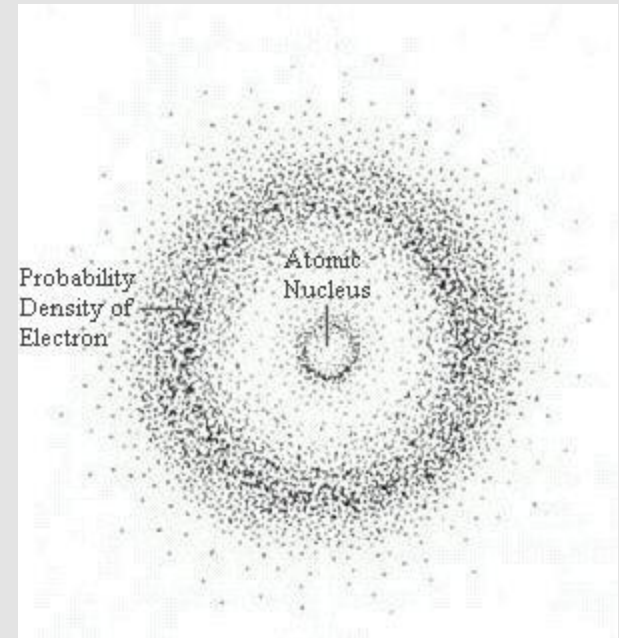
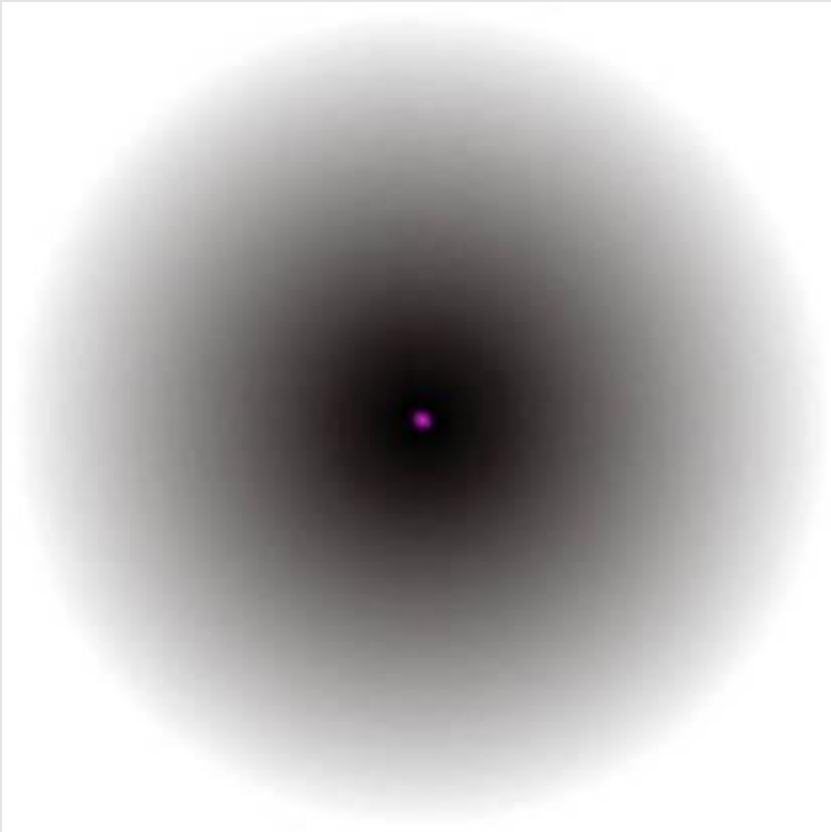
Niels Bohr stated that electrons move in different orbits, or energy levels, around the nucleus like planets orbit the sun.

Each energy level is located a specific distance from the nucleus and contains a certain number of electrons.

Nitrogen's Electron
Configuration Table
 $1s^2$
 $2s^2 2p^3$



Currently



This model is based upon Bohr's model, except that electrons orbit the nucleus in random patterns.

The region where these particles are found is referred to as the electron cloud.