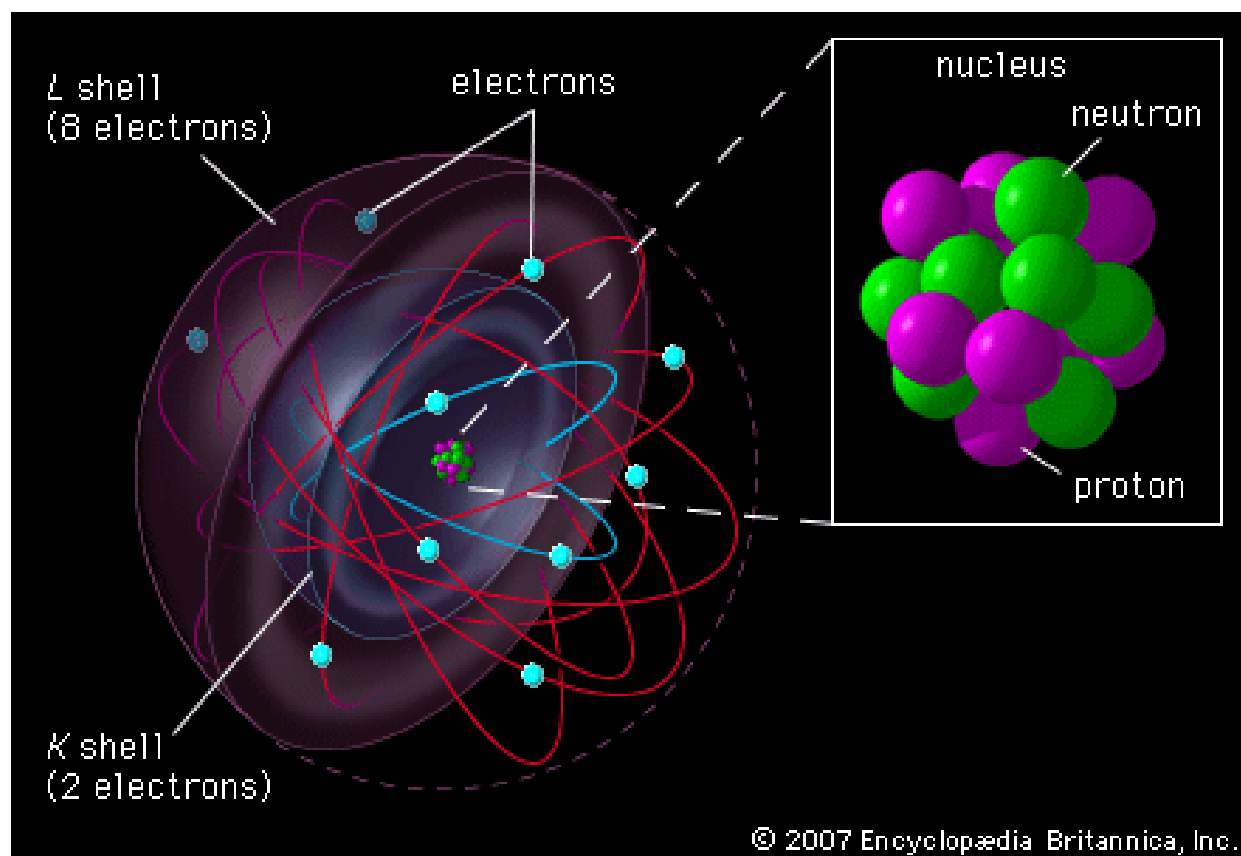


## Chapter 4 Atomic Structure



## History of the "Atom"



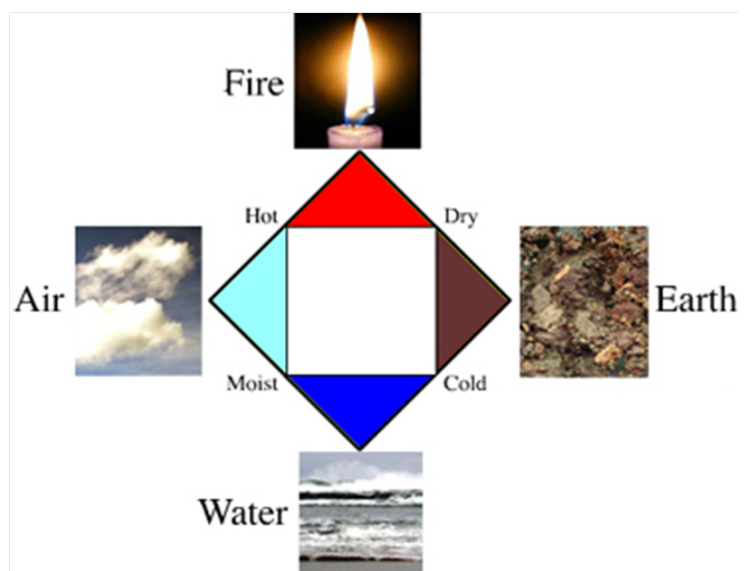
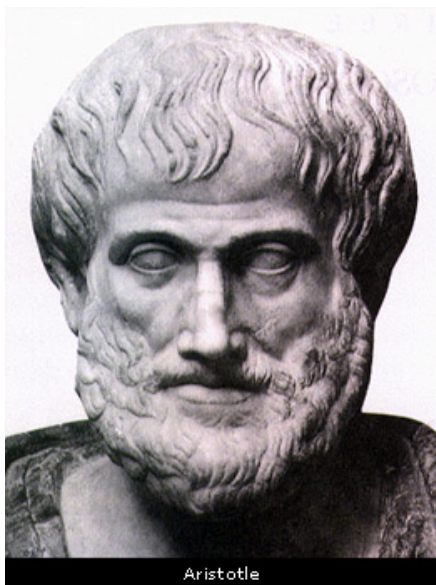
**Democritus** (460BC - 370 BC)

Atoms make up all matter

Atoms are small indivisible and indestructible.

## Aristotle

Disagreed with Democritus and said that matter was composed of 4 types of elements.



## Dalton's Theory

- Beginning of the 19<sup>th</sup> century.
- All matter is composed of tiny, indivisible particles called atoms.
- Atoms of an element have identical properties.
- Atoms of different elements have different properties.
- Atoms of two or more elements can combine to form new substances.



## “Pool Ball” Theory



## Atomic Theory

1897-1907

Scientist J.J. Thomson discovered that he could pass electricity through a gas in a vacuum.

This led to the discovery of negatively charged particles called "electrons"



## Chocolate Chip Cookie Model

- The new theory was the "atom" was similar to a chocolate chip cookie. The chocolate chips representing the electrons, and the rest of the cookie being positively charged.



- Other scientists like H. Nagaoka thought that the atom was more like the planet Saturn.
- The planet being the positively charged center, and the ring around being the electrons.

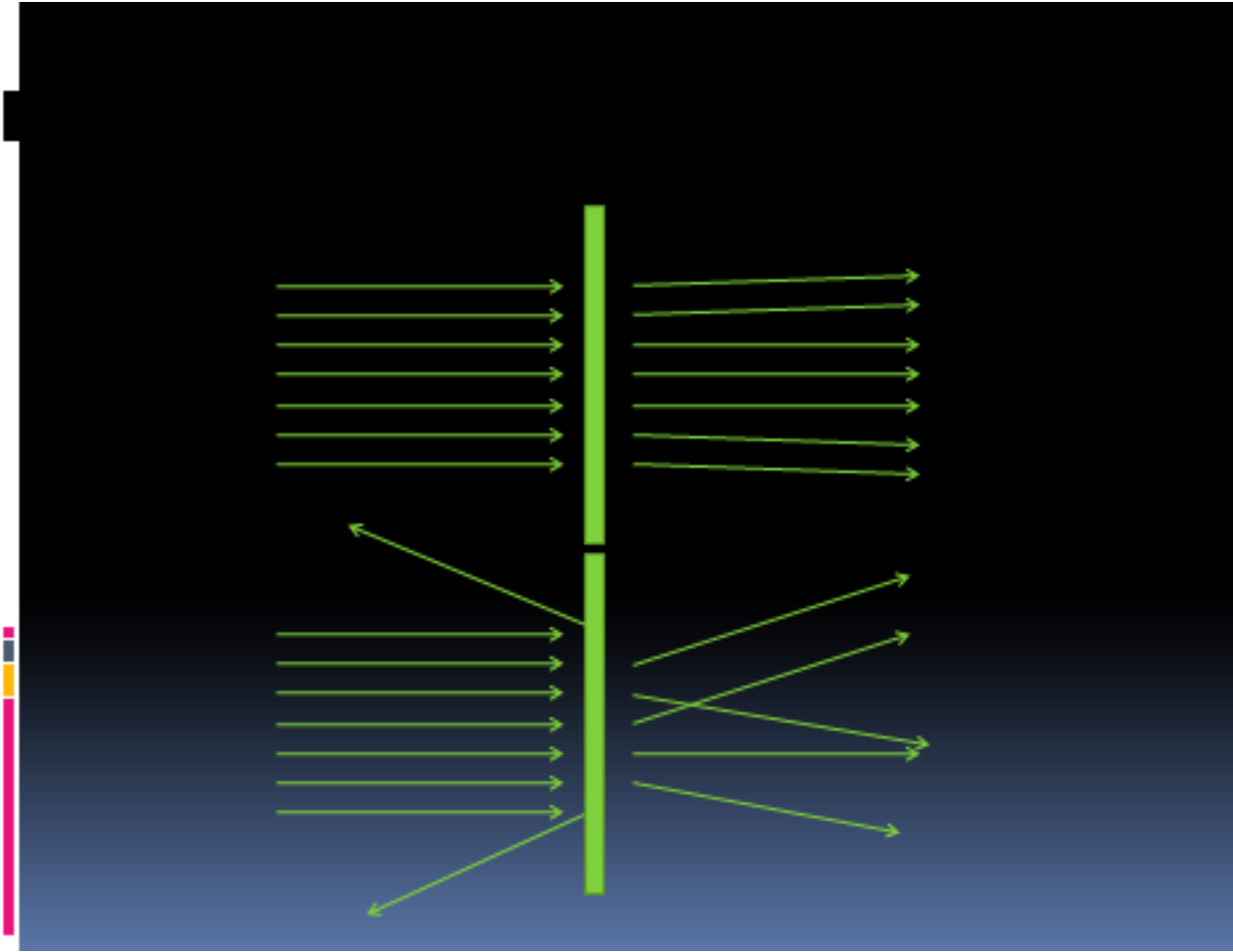




## Ernest Rutherford

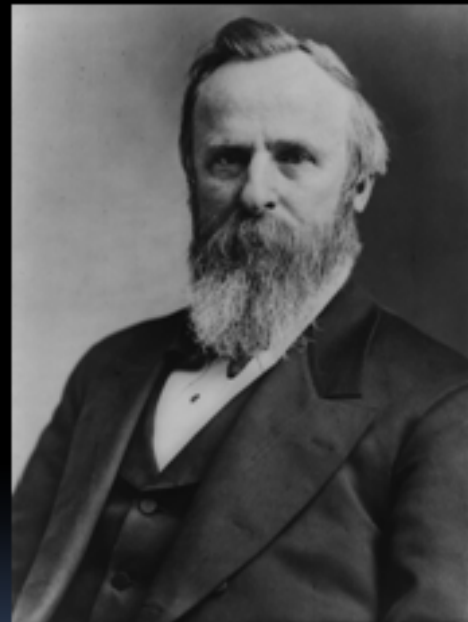
1911

- Testing the "atomic models" at McGill University.
- Designed a basic experiment shooting alpha particles through gold foil.
  - He expected that the would go directly through



## Atomic Theory

- From his experiment, Rutherford deduced that an atom must contain a tiny positively charged core, "The Nucleus".
- Rutherford coined the word "proton" as the subatomic particle with a positive charge.



# Periodic Table

- The discovery of the proton helped explain and give the periodic table more structure and meaning.

Periodic Table of the Elements

IA	IIA											IIIA	IVA	VA	VIA	VIIA	VIIIA
1 H																	18 He
2 Li	4 Be											13 B	14 C	15 N	16 O	17 F	18 Ne
3 Na	12 Mg											31 Al	32 Si	33 P	34 S	35 Cl	36 Ar
4 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	49 Ga	50 Ge	51 As	52 Se	53 Br	54 Kr
5 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	63 In	64 Sn	65 Sb	66 Te	67 I	68 Xe
6 Cs	56 Ba	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	86 Rn
7 Fr	88 Ra	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	

\* Lanthanide Series  
\* Actinide Series



## Henry Moseley

1912/13 - Used x-ray wavelengths to accurately predict the atomic number of each known element.

- Helped identify gaps in the periodic table that had yet been filled.

- Enlisted in the British army during WW1 and was killed in combat at the age of 27.

## James Chadwick

- 1932 – Discovered that there must be subatomic particles that have mass and are neutral.
- The “neutron”

