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NANO: THE BIG PICTURE, & PRINCIPLES

E 304

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Understanding the Atom

- 5th Century B.C. – Democritus & Leucippus
 - ▣ Atomos “unbreakable”
- 4th Century B.C. – Plato & Aristotle
 - ▣ Earth, Water, Air & Fire
- 3rd Century B.C. – Epicurus
 - ▣ “Atomism” is back
- 1st Century B.C. – Titus Lucretius Carus
 - ▣ “Atomism” in poetry
- 16th Century – French philosopher, Pierre Gassendi

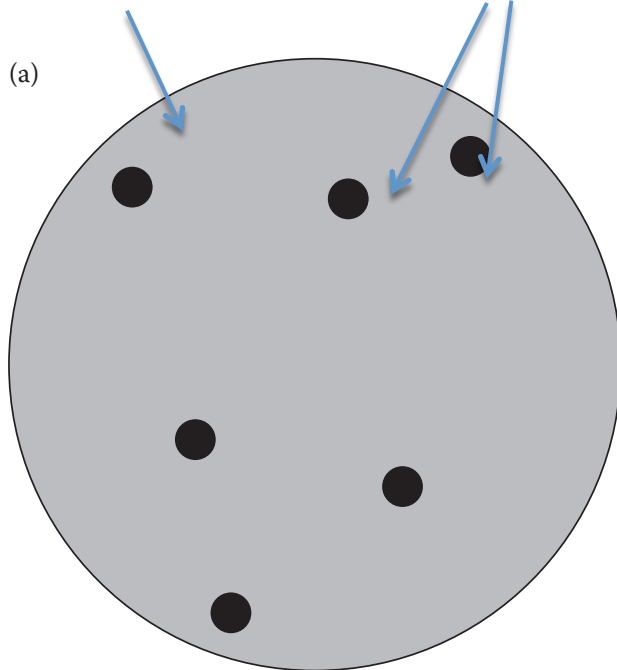
Scientific Evidence

- Robert Boyle (1627 – 1691)
 - ▣ Inverse relationship between pressure & volume
 - ▣ Pressure is due to atoms striking the walls
- Louis Proust (1754 – 1826)
 - ▣ Law of definite proportions – copper carbonate always broke down into the same proportions of copper, carbon and oxygen by mass
- John Dalton (1766 – 1844)
 - ▣ Law of multiple proportions – molecules are always made of fixed numbers of different atoms
 - ▣ CO always has one oxygen, CO₂ always has two

J.J. Thomson Atom

Volume of
positive charge

Electrons

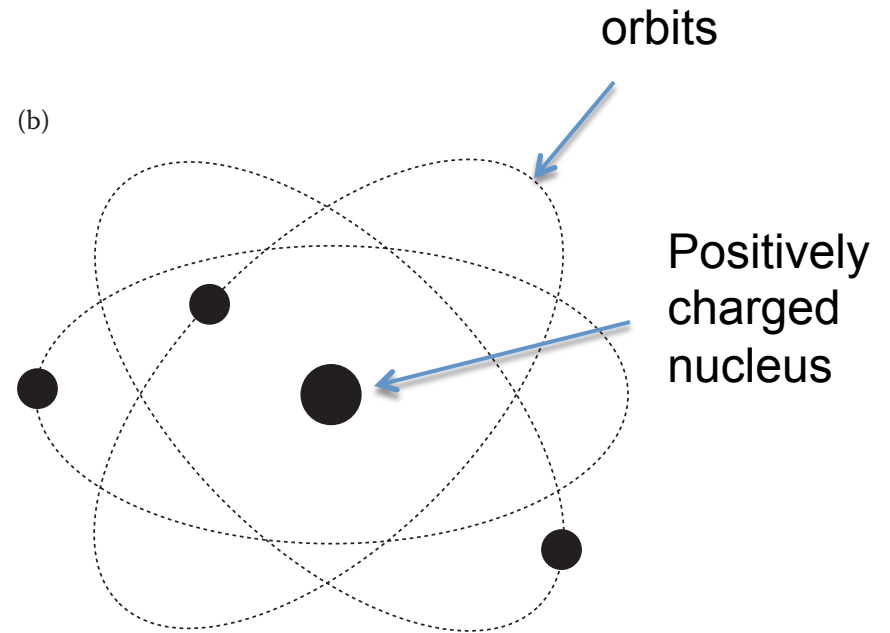


1856 - 1940

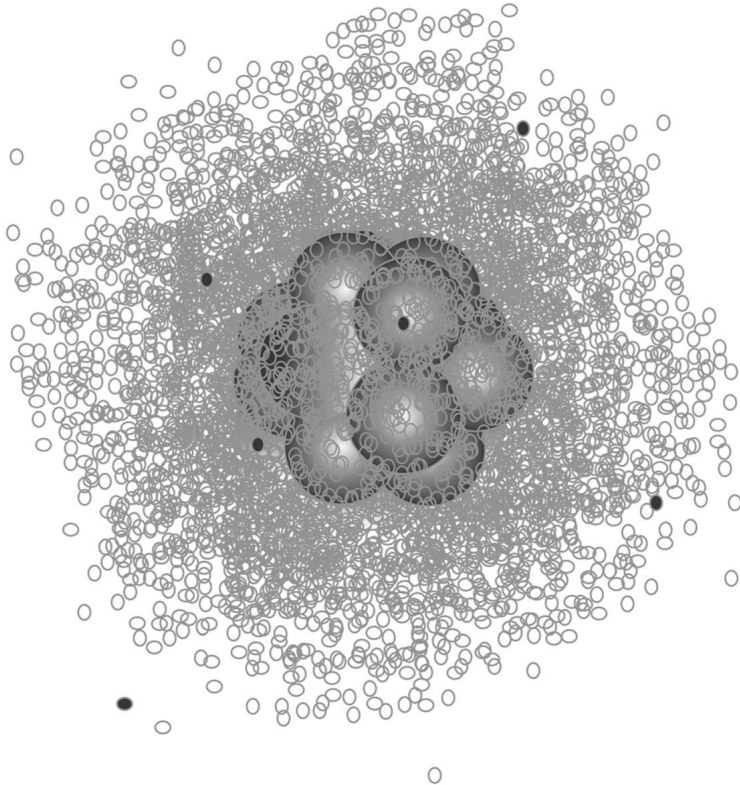
Rutherford Atom



1871 - 1937



Modern Atom – Orbitals not Orbits



- Albert Einstein
- Niels Bohr
- Heisenberg
- Many others...

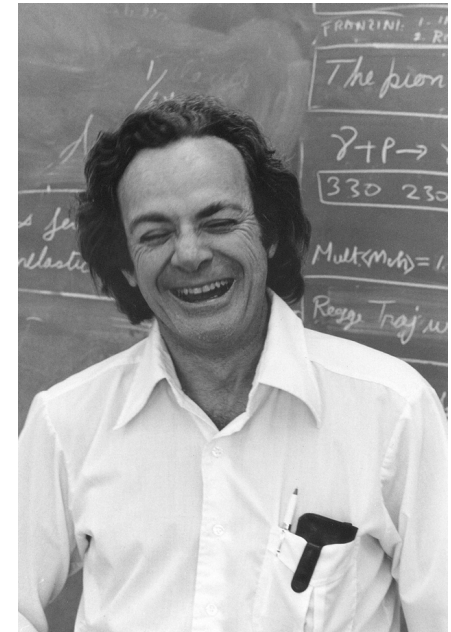
Nanotechnology – The Word

- First used in a paper by Norio Taniguchi – 1974
 - ▣ “On the basic concept of nano-technology”



Richard Feynman

- 1959 talk @ APS meeting
 - “There is plenty of room at the bottom”
 - \$1000 awards promised
 - 1st motor smaller than $1/64$ ”
 - 24 volumes of Enc. Brittanica on a pinhead
 - <http://www.youtube.com/watch?v=4eRCygdW--c>



Additional Questions

- How dangerous is nanotechnology?
- Could it even conceivably get out of control?
- What products have nanotechnology in them now?
- What are the 5 categories of most US Patents in nanomaterials? (what do they mean)
- What role are you best suited to play in the nano-future?

Carbon Nanotube Prices

