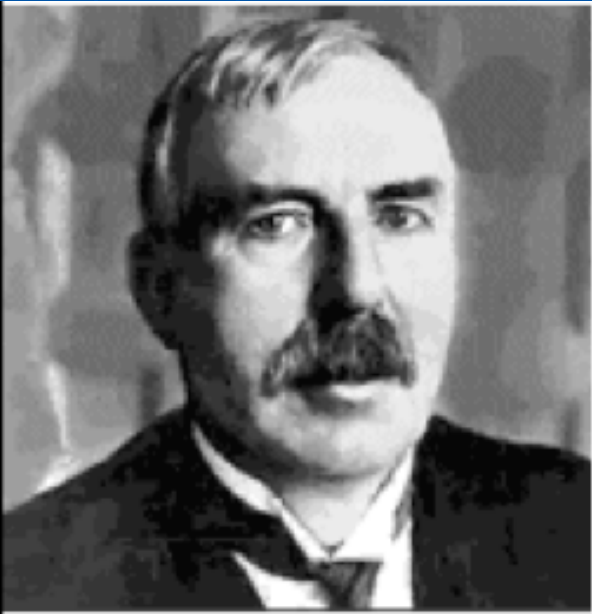


Atomic Models



Ernest Rutherford
1871-1937

Lesson 2 Rutherford's Model

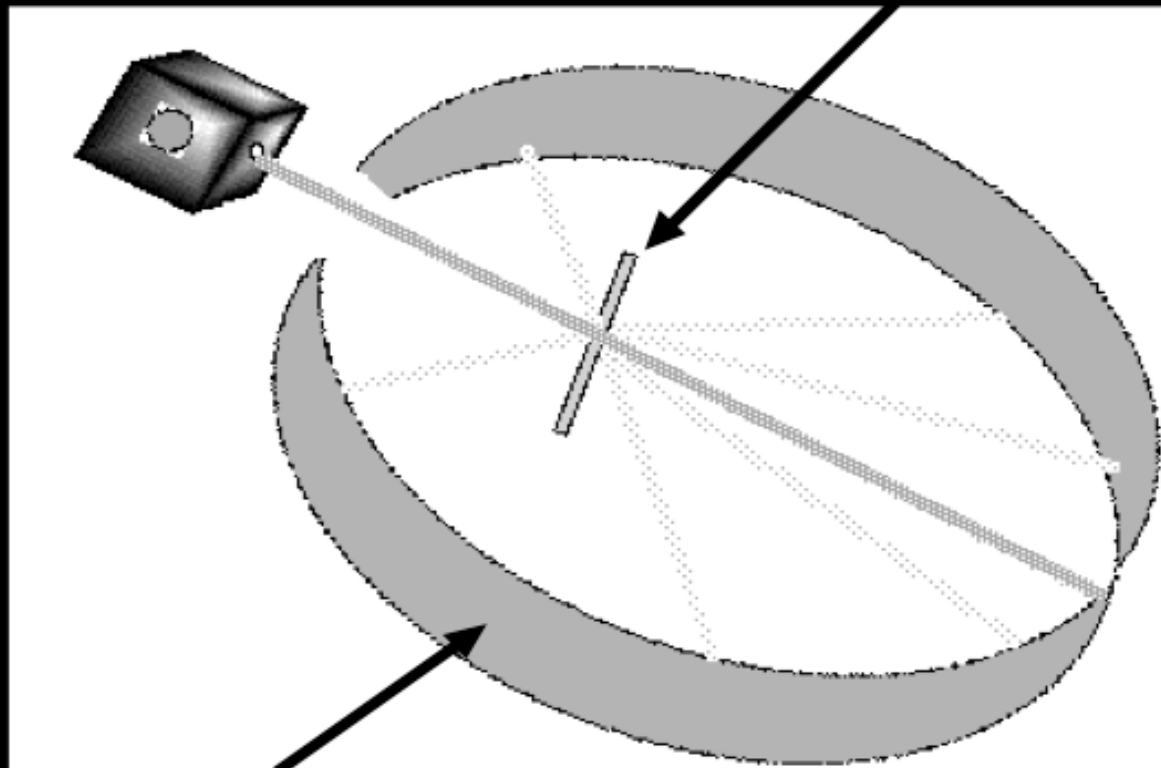
Gold Foil Experiment

- Rutherford was attempting to lend support to Thomson's atomic model by sending a beam of massive alpha particles at a sheet of very thin (approximately 400 atoms thick) gold foil.
- The expected result would be a majority of the atoms going straight through the foil and some scattering to a small degree.
- This is because the atom was believed to be mainly empty space

Set Up

**lead box with
alpha particle
source inside**

Thin Gold Foil



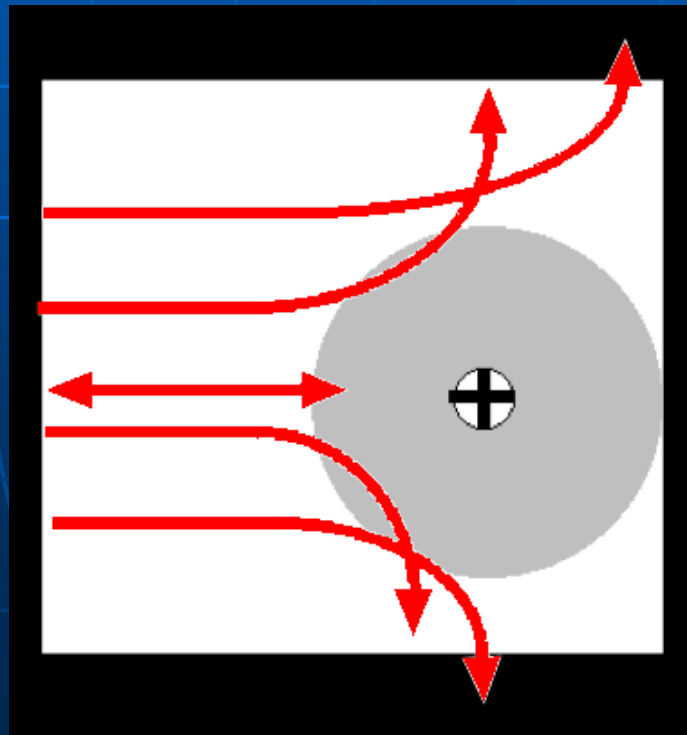
**Circular
Fluorescent screen**

Results

- Most of the particles went straight through, as expected
- Some particles were scattered at small angles
- Some scattered at large angles
- In rare cases particles were reflected straight back. Rutherford stated, "It was as if you fired a shell at tissue paper and it came back and hit you."

Results

- A study of the paths of the alpha particles revealed that they were curved rather than sharp.



Results

- After much studying, Rutherford came to the conclusion that the paths were most like objects being repelled by an electric force, not like those after a collision.
- This led him to believe that there was a large positive charge repelling the positively charged alpha particles. He said that it must be in the center of the atom and he called it the nucleus.

Nuclear Model

- Rutherford's experiment resulted in a new model of the atom in which a dense, positively charged nucleus was surrounded by orbiting negatively charged electrons.

Problems

- This model was not well received.
- Physicists knew that a body traveling in circular motion was accelerating. (Recall physics 20 and centripetal acceleration.)
- An accelerating charge emits EMR according to Maxwell's theory.
- If a charged particle is accelerating and therefore emitting EMR then it is losing energy.

Problems

- If an object is losing energy while traveling in a circular path then its orbit must decay.
- As a result, the electrons should spiral into the nucleus and the atom would collapse.
- Since atoms exist, the model must be wrong. It remained this way until Bohr made some additional observations.