Radioactivity (1)

- 1896: Henri Becquerel – discovery of radioactivity

  Photographic plates blackened when placed near certain minerals (uranium salts). Radioactivity could not be explained by e-m (or gravity), and was one of the unsolved problems.

- 1898: Marie and Pierre Curie – discovery of Polonium and Radium (much more radioactive than uranium)

  *Becquerel and the Curies shared the Nobel Prize in Physics in 1903.*

  *Later, Marie Curie isolated metallic radium and received the Nobel Price in Chemistry in 1911.*
2.7 g of Radium (in the dark)

Source: www.aip.org/history/curie/curie.pdf
Radioactivity (2)

Ernest Rutherford – “the father of nuclear physics”

- 1899: Rutherford shows 2 types of radiation exists and calls them $\alpha$ and $\beta$.
- 1900: Villard gives evidence for a 3$^{\text{rd}}$ type of radiation coming from radium and calls it $\gamma$.
- 1902: Curies show that $\beta$ radiation consists of electrons.
- 1904: Rutherford shows $\alpha$ particles are helium.

Ernest Rutherford was awarded the Nobel Prize in Chemistry in 1908 "for his investigations into the disintegration of the elements, and the chemistry of radioactive substances".

“I have dealt with many different transformations with various periods of time, but the quickest that I have met was my own transformation in one moment from a physicist to a chemist.” E. Rutherford (Nobel banquet 1908).
Radioactivity (3)

- The behavior of the three types of particles as they pass through the electric field between two charged plates.

- The extent to which the path of a particle is bent as it passes through an electric field depends on its mass and its charge: the larger the charge (mass) on the particle, the further (less) it is bent.

- While $\alpha$ particles were determined to have a larger charge than the $\beta$ particles (+2 versus -1), they also have over 7000 times the mass of the $\beta$ particle; their path is bent much less than that of the $\beta$ particle.

For the first time it became apparent that atoms might be composed of smaller particles and might have a structure that could be analyzed.
Radiation - Penetration of Matter

Being near an unshielded source of gamma radiation for a short period of time is very dangerous!

http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/radact.html