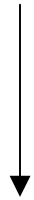
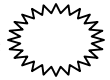
Carbon 14 and Radiometric Dating

Cosmic Rays From Outer Space



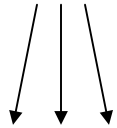
Cosmic rays are composed of protons (83%), helium nuclei called (α) alpha rays (16%), elemental nuclei, and electrons traveling at the speed of light. These high-speed particles are emitted from the sun and supernova explosions.

Atmosphere



These rays strike the atoms in the upper atmosphere, mostly oxygen and nitrogen atoms.

Secondary Rays



They form secondary rays from broken up particles of the oxygen and nitrogen atoms. These secondary rays include slow moving neutrons.

neutrons

C^{14} formation ($N^{14} \rightarrow C^{14}$) C^{14} is formed when these neutrons strike the nitrogen atom causing the emission of a proton. The nitrogen is then converted into C^{14}. Over a period of time the carbon, as shown in the picture, decays back into non-radioactive, stable N^{14} (Russo 2000).

Assumptions in C14 and other dating methods

- The decay constant, the rate of radioactive disintegration, and the number of radioactive atoms are all unchanged.

Factors that can affect Radiometric dating

- The rate of cosmic radiation may have varied. Supernova explosions can affect the cosmic ray rate.
- Composition of the atmosphere may have changed. Volcanoes may have put more carbon in the atmosphere.
- The Earth's magnetic field may have changed. This field shields the earth from many cosmic rays.