Gamma Ray Encyclopedia Article

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By 1900, it had become apparent that nuclear radiation consisted of at least two parts, alpha rays and beta rays. These two types of rays were bent in opposite directions by a magnetic field and had, therefore, to consist of charged particles. The two rays were eventually identified, respectively, as streams of doubly-charged helium ions and of electrons.

In 1900, a third type of radiation was identified by the French physicist Paul Ulrich Villard. Villard discovered that this third form of radiation was unaffected by a magnetic field and was even more energetic than beta rays. Whereas alpha rays are stopped by a few centimeters of air and beta rays by a few centimeters of aluminum, Villard's new rays could only be stopped by a relatively thick piece of lead.

These rays eventually came to be called *gamma rays* although the source of this name is not clear. Villard, Ernest Rutherford, and others, have been credited with suggesting the name.

The nature of gamma rays was a topic of considerable dispute. Some scientists thought that they were composed of very energetic particles, as was the case with alpha and beta rays. Others suggested that they were a form of electromagnetic wave, similar to x-rays.

The resolution of this dispute was provided in an experiment by Rutherford and Andrade in 1914. A crystal was used to diffract a beam of gamma rays. The angle of diffraction permitted calculation of the rays' wavelength. The values obtained turned out to be similar to those of very short x-rays. Gamma rays were, therefore, a form of electromagnetic radiation even more energetic than x-rays.

In actual fact, there is no discernable difference between high energy x-rays and low energy gamma rays. As a matter of convenience, the term *x-rays* is reserved for radiation that originates outside the atomic nucleus and *gamma rays* for radiation that originates within it.

Gamma rays are released during alpha and/or beta decay. The rays are apparently produced as a result of changes in nuclear energy levels, just as x-rays are liberated during changes in electron energy levels.