Muon and Tauon Encyclopedia Article

Muon and Tauon

The following sections of this BookRags Literature Study Guide is offprint from Gale's For Students Series: Presenting Analysis, Context, and Criticism on Commonly Studied Works: Introduction, Author Biography, Plot Summary, Characters, Themes, Style, Historical Context, Critical Overview, Criticism and Critical Essays, Media Adaptations, Topics for Further Study, Compare & Contrast, What Do I Read Next?, For Further Study, and Sources.

(c)1998-2002; (c)2002 by Gale. Gale is an imprint of The Gale Group, Inc., a division of Thomson Learning, Inc. Gale and Design and Thomson Learning are trademarks used herein under license.

The following sections, if they exist, are offprint from Beacham's Encyclopedia of Popular Fiction: "Social Concerns", "Thematic Overview", "Techniques", "Literary Precedents", "Key Questions", "Related Titles", "Adaptations", "Related Web Sites". (c)1994-2005, by Walton Beacham.

The following sections, if they exist, are offprint from Beacham's Guide to Literature for Young Adults: "About the Author", "Overview", "Setting", "Literary Qualities", "Social Sensitivity", "Topics for Discussion", "Ideas for Reports and Papers". (c)1994-2005, by Walton Beacham.

All other sections in this Literature Study Guide are owned and copyrighted by BookRags, Inc.

Contents

Muon and Tauon Encyclopedia Article.....1

Contents.....2

Muon and Tauon.....3

Muon and Tauon

How does the atomic nucleus stay together? Since most nuclei contain two or more like-charge particles (protons), it would appear that they should be unstable, flying apart because of the force of electrical repulsion. In attempting to explain why that does *not* happen, the Japanese physicist Hideki Yukawa postulated in 1935 the existence of a mediating particle that could transmit a strong force of attraction between nucleons (protons and neutrons). Yukawa predicted that the particle would have a mass somewhere between that of the electron and the proton, around two hundred to three hundred times that of the former and about one-ninth that of the latter.

About a year after Yukawa's prediction, American physicist Carl David Anderson discovered a likely candidate for this particle in cosmic ray showers. Because its mass was " medium" compared to that of the electron and proton, the new particle was given the name *mesotron*, later shortened to meson. Unfortunately, later research showed that Anderson's meson does not interact with nucleons and, hence, cannot be the particle postulated by Yukawa.

Another twenty-five years passed before the true nature of Anderson's meson, now called the *mu meson* or muon, was recognized. Today, physicists classify the muon as a lepton, one of the two fundamental classes of particles (along with the quarks). The lightest lepton is the electron, a stable particle that can carry either a negative or positive charge. The positive electron is known as the positron.

The muon is similar in character to the electron except that it is heavier (about 206 times that of the electron), and it is unstable, decaying with a lifetime of about 2.2 x 10-6 second. Muons do not exist at the levels of energy available in everyday life, but are created in high-energy environments such as those that exist in cosmic ray showers and in particle accelerator reactions.

Martin Perl (1927-) discovered the third category of leptons, the tauons, in 1974 during the analysis of reactions in the SPEAR particle accelerator at the Stanford Linear Accelerating Center. The tauon is the heaviest of all leptons, with a mass about 3,491 times that of an electron, or seventeen times that of a muon. Its lifetime is even shorter than that of a muon, about 4.6 x 10-13 second. Tauons exist at only the highest energy levels produced in cosmic ray showers or in the most powerful of particle accelerators.