

1.3: Earliest Stages

The early part of the 20th century saw the development of quantum theory and nuclear physics, of which particle physics detached itself around 1950. By the late 1920's one knew about the existence of the atomic nucleus, the electron and the proton. I shall start this history in 1927, the year in which the new quantum theory was introduced. In that year β decay was discovered as well: Some elements emit electrons with a continuous spectrum of energy. Energy conservation doesn't allow for this possibility (nuclear levels are discrete!). This led to the realisation, in 1929, by Wolfgang Pauli that one needs an additional particle to carry away the remaining energy and momentum. This was called a neutrino (small neutron) by Fermi, who also developed the first theoretical model of the process in 1933 for the decay of the neutron

$$n \rightarrow p + e^- + \bar{\nu}_e$$

which had been discovered in 1931.

In 1928 Paul Dirac combined quantum mechanics and relativity in an equation for the electron. This equation had some more solutions than required, which were not well understood. Only in 1931 Dirac realised that these solutions are physical: they describe the positron, a positively charged electron, which is the *antiparticle* of the electron. This particle was discovered in the same year, and I would say that particle physics starts there.

This page titled [1.3: Earliest Stages](#) is shared under a [CC BY-NC-SA 2.0](#) license and was authored, remixed, and/or curated by [Niels Walet](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.