Feynman diagrams

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Feynman diagrams

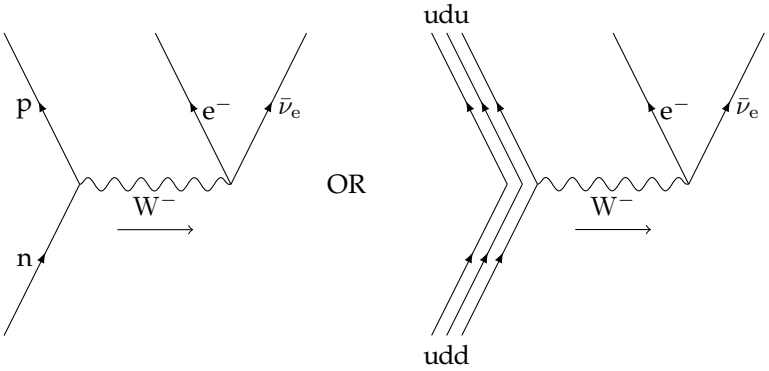
When the American physicist Richard Feynman wanted to calculate the probability of interactions occurring, he drew a set of diagrams to show all possible outcome. These apparently simple diagrams allow very complex calculations to be solved easily.

Feynman diagrams represent particle interactions – the angles between the particle lines are not significant, only the sequence of events. The interaction itself is shown via an exchange particle.

β^- decay

A neutron decays into a proton (a down quark changes into an up quark), emitting a beta particle and an antielectron neutrino:

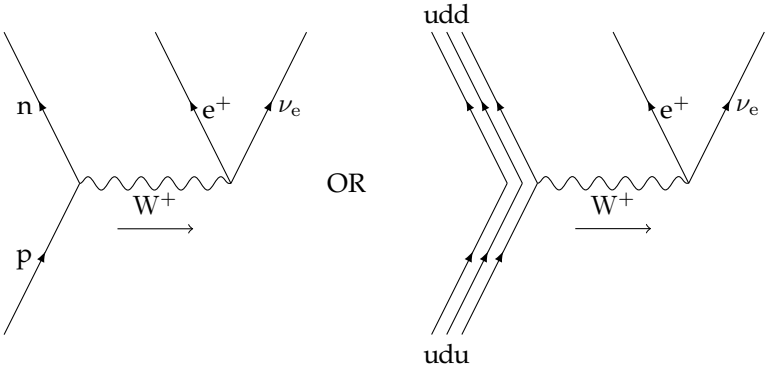
$$\mathrm{n} \longrightarrow \mathrm{p e^- \bar{\nu}_e}$$



β^+ decay

A proton decays into a neutron, emitting a neutrino and positron:

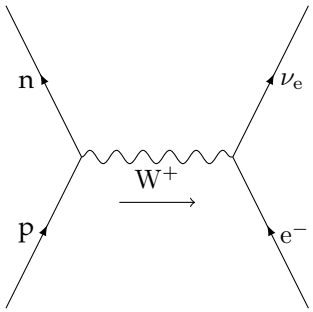
$$\mathrm{p} \longrightarrow \mathrm{n e^+ \nu_e}$$



Electron capture

An orbiting electron can be absorbed by a proton in the nucleus:

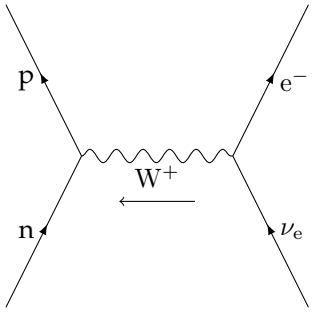
$$\mathrm{p e^-} \longrightarrow \mathrm{n} \nu_\mathrm{e}$$



Neutrino–neutron collisions

A neutron can absorb a neutrino, turning into a proton and electron:

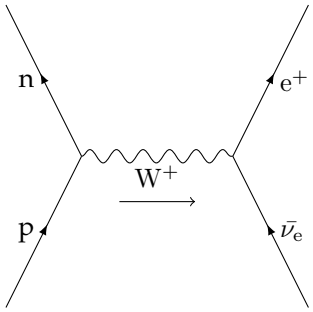
$$n\nu_e \longrightarrow pe^-$$



Antineutrino–proton collisions

A proton can absorb an anti electron neutrino, becoming a neutron and emitting a positron:

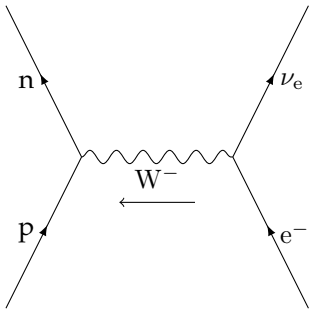
$$p\nu_e \longrightarrow ne^+$$



Electron–proton collisions

An electron can collide with a proton, emitting a neutron and a neutrino:

$$pe^- \longrightarrow n\nu_e$$



All of the above interactions involve the weak interaction, and they have all been experimentally observed.