Neutrinos (ν) - Lepton

Fermions ↔ Bosons

Leptons

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<td>quarks</td>
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 Charged Neutral

\[
\begin{array}{c}
\ell^+ \quad \ell^- \\
(\text{Anti-particles})
\end{array}
\]

\[
\begin{array}{c}
\nu_e, \nu_\mu, \nu_\tau
\end{array}
\]

- Difference between charged leptons via mass: mass operator eigenstates
- Neutral leptons are not discernable in mass: weak force eigenstates
- Neutral leptons can only be observed through the weak force
- Neutrino oscillation is responsible for an apparent 3/7 loss of neutrinos

In sun (sage boson)

\[ p \rightarrow n + \nu^+ + e^- \]

To measure lighter

Perform what the sun does in reverse (making sure that all momentum is conserved)

Example: Converting chlorine to argon

To measure heavier

\[ \nu_e \rightarrow e^- \]

Take an electron (from some atom) and merge it with a neutrino from the sun. Using a gauge boson, the two particles swap types. Doing this causes the new electron to give off charmon radiation (as the new electron is free). The light given off by this radiation can be measured by photodetectors (water is typically used for the source of electrons)