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Neutrinos, Dark Matter and the Standard Model (student talk)

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The Standard Model, was formulated in the beginning of the '70s but only became empirically establish in the '80s, although it has not been able to describe the gravitational interaction yet, it succeeded in describing the electromagnetic interaction, the weak interaction and strong interaction. The three different types of neutrinos that exist in the Universe are in the exact number predicted by the Standard Model of elementary particles. They are like "small children" capable of never seen incredible tricks such as transforming themselves into each other as they travel in space. Despite the various experiments performed to understand their behavior and interaction with the remaining particles, physicists keep up on their quest for the "sterile" neutrino. This fourth type of neutrino would explain a big set of question marks left in the air. It would be much more massive than the other remaining three types, which have very low masses, and it's interaction with matter would only be through the force of gravity, which would make it a strong candidate as the constituent of dark matter. This discovery would also be the first clear manifestation of physics beyond the Standard Model.

Summary

Although the Standard Model answer several questions of the structure of matter, it does not answer to all of them. Some discussion arise, about why we observe matter and nearly no antimatter, if we believe there is a symmetry between the two in the universe. Physicists have not yet found the answer to how does gravity interact in all of this and why the dark matter has a visible gravitational effect in the cosmos. They, do not know how is the observed pattern for particle masses explained and also why it's assumed that there are only three generations of leptons and quarks, as well as, if they are composed by even more fundamental particles, or if they themselves are fundamental particles.

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