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The Profound Implications of Neutrinoless Double Beta Decay

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The observation of neutrinoless double beta decay, at any nonzero level, would imply that lepton number is not conserved, that neutrinos have Majorana masses, and that neutrinos are their own antiparticles. Majorana neutrino masses are physics far outside the Standard Model. Their existence would be evidence in favor of the see-saw model of the origin of neutrino mass, and evidence in favor of leptogenesis as the explanation of the baryon-antibaryon asymmetry of the universe. This talk will explain the physics of neutrinoless double beta decay, discuss what the observation of this process would teach us, and examine the nature of neutrinos that are their own antiparticles.