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## **Neutrinos** – **Going to extremes** JOHN F. WILKERSON, University of North Carolina

Like the Southeastern Section of the APS, neutrinos are also septuagenarians, having been "born" in 1930 as a means of solving the apparent violation of energy and angular momentum in nuclear beta-decay. Because of their elusive nature, we have had a limited grasp of their intrinsic properties. However, in the past decade our understanding of neutrinos and their role in the universe has undergone a remarkable transformation. We have discovered that neutrinos morph from one species to another as they journey through matter and space. And based on these observations we know that neutrinos are not massless particles, but have tiny masses, being at least 250,000 times lighter than electrons. Yet even with such diminutive masses, neutrinos play important roles in shaping the largest scales of the cosmos. Today much remains unknown about neutrinos indistinguishable from one another (Majorana particles), indicating lepton number violation? Might neutrinos account for the matter – antimatter asymmetry observed in the universe? Future neutrino experiments aim to address these questions, but the extreme nature of neutrinos presents daunting experimental challenges. The consequences of deciphering neutrino properties will be profound, guiding us to the formation of a new "standard model" of fundamental particle interactions, impacting our models of astrophysics and cosmology, and perhaps holding the key to understanding our existence.