

Fall 2022 Colloquium

Department of Physics & Astronomy, A&M-Commerce

Nov 3, Thursday, 4-5 PM in Science Building 127

(coffee and cookies will be served at 3:50 PM)

Astro-Physics

Quantum Entanglement and Astrophysical Neutrinos

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Dr. Balantekin earned BS (1975) and MS (1977) degrees in Physics at the Middle East Technical University in Ankara, Turkey, and a Ph.D. degree (1982) in Physics at Yale University. His Ph.D. research topic was on the intersection of nuclear and particle physics. He worked as a post-doc at MIT and was a Wigner Fellow at the Oak Ridge National Laboratory. He joined the University of Wisconsin, Madison in 1986 where he is now an Eugene P. Wigner Professor working on Multi-messenger Astrophysics and Quantum Information Science. He has served on the Council and Board of the American Physical Society and as an editor of Journal of Physics G, Physical Review C, and Physics Letters B.

Abstract

Many astronomical objects such as core-collapse supernovae and merging neutron stars produce copious numbers of neutrinos. These neutrinos not only affect the dynamics of those objects, but also control synthesis of elements produced in those settings. In this talk I first give an elementary introduction to neutrino physics and nucleosynthesis. The number of neutrinos in those environments are so large that one cannot ignore interactions between neutrinos, which are normally negligible in most other situations. I will then show that applying the tools of quantum information theory to the many-neutrino systems in those astronomical objects reveal new and interesting aspects of neutrino transport.