

APR16-2016-030115

Abstract for an Invited Paper
for the APR16 Meeting of
the American Physical Society

John Bahcall and the Solar Neutrino Problem

NETA BAHCALL, Princeton University

I feel like dancing, cheered John Bahcall upon hearing the exciting news from the SNO experiment in 2001. The results confirmed, with remarkable accuracy, Johns 40-year effort to predict the rate of neutrinos from the Sun based on sophisticated Solar models. What began in 1962 by John Bahcall and Ray Davis as a pioneering project to test and confirm how the Sun shines, quickly turned into a four-decade-long mystery of the 'Solar Neutrino Problem': Johns models predicted a higher rate of neutrinos than detected by Davis and follow-up experiments. Was the theory of the Sun wrong? Were Johns calculations in error? Were the neutrino experiments wrong? John worked tirelessly to understand the physics behind the Solar Neutrino Problem; he led the efforts to greatly increase the accuracy of the solar model, to understand its seismology and neutrino fluxes, to use the neutrino fluxes as a test for new physics, and to advocate for important new experiments. It slowly became clear that none of the then discussed possibilities error in the Solar model or neutrino experiments was the culprit. The SNO results revealed that Johns calculations, and hence the theory of the Solar model, have been correct all along. Comparison of the data with Johns theory demanded new physics neutrino oscillations. The Solar Neutrino saga is one of the most amazing scientific stories of the century: exploring a simple question of 'How the Sun Shines?' led to the discovery of new physics. John's theoretical calculations are an integral part of this journey; they provide the foundation for the Solar Neutrino Problem, for confirming how the Sun shines, and for the need of neutrino oscillations. His tenacious persistence, dedication, enthusiasm and love for the project, and his leadership and advocacy of neutrino physics over many decades are a remarkable story of scientific triumph. I know John is smiling today.