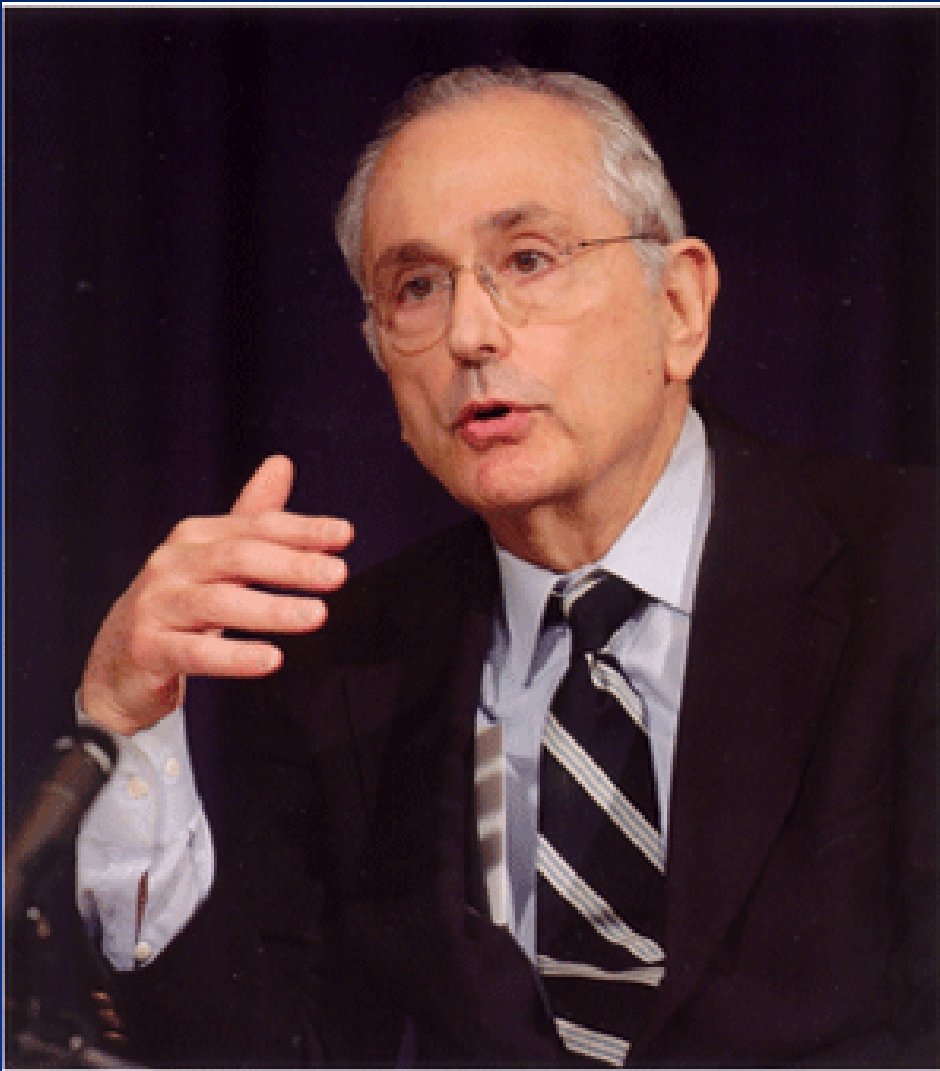


The Legacy of John Bahcall



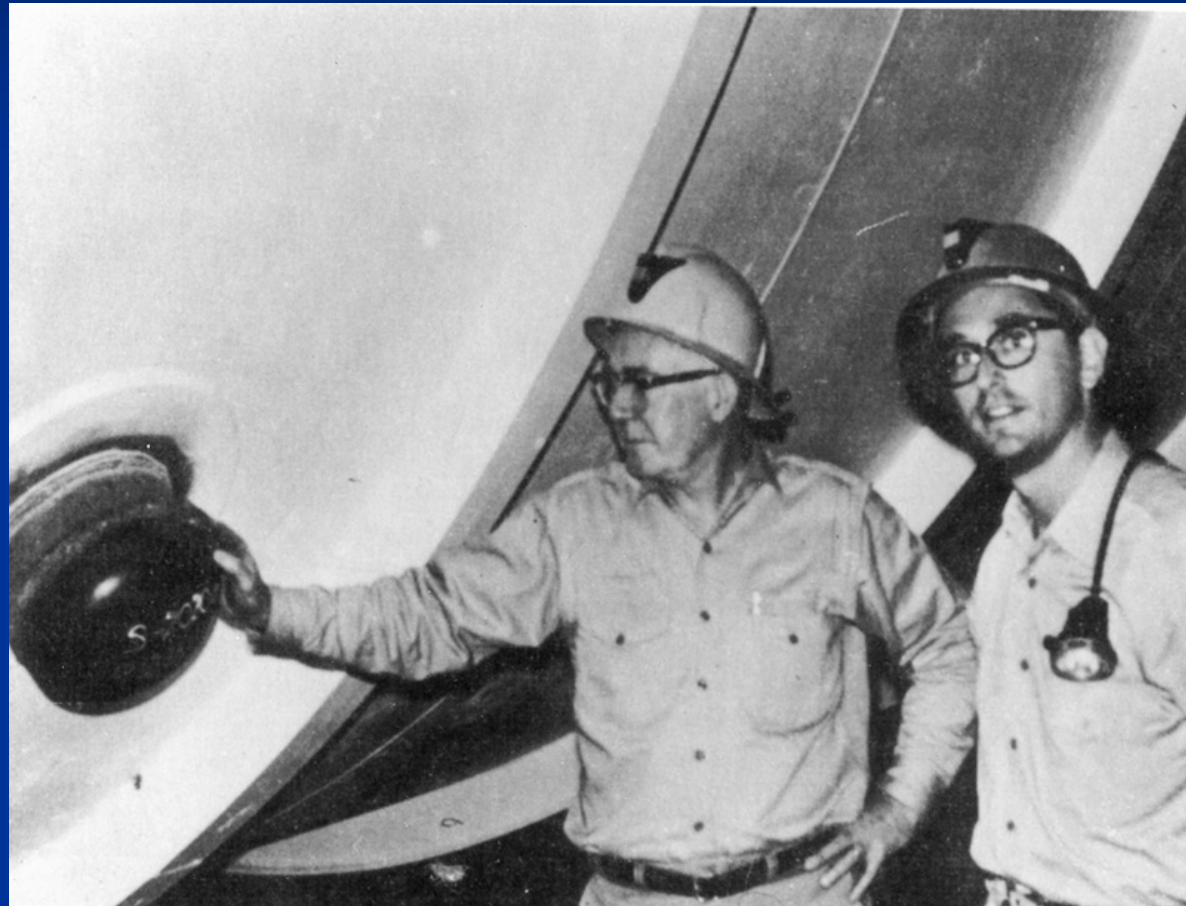
1934-
2005

Prolific Researcher

- John Bahcall made enormous contributions to a variety of crucial astrophysical problems
 - Solar neutrinos
 - Galactic structure
 - Quasar absorption line studies
- All of his work had a common theme:
 - Address important issues
 - Make the case for astrophysics as a rigorous discipline, especially in the physics community

Solar Neutrinos

- Fundamental Question: What is the energy source for the Sun?
- Bold proposal: directly detect solar neutrinos
- Measure the central temperature of the Sun



Ray Davis & John Bahcall, 1964, Homestake Gold Mine

Challenges of Neutrino Astrophysics

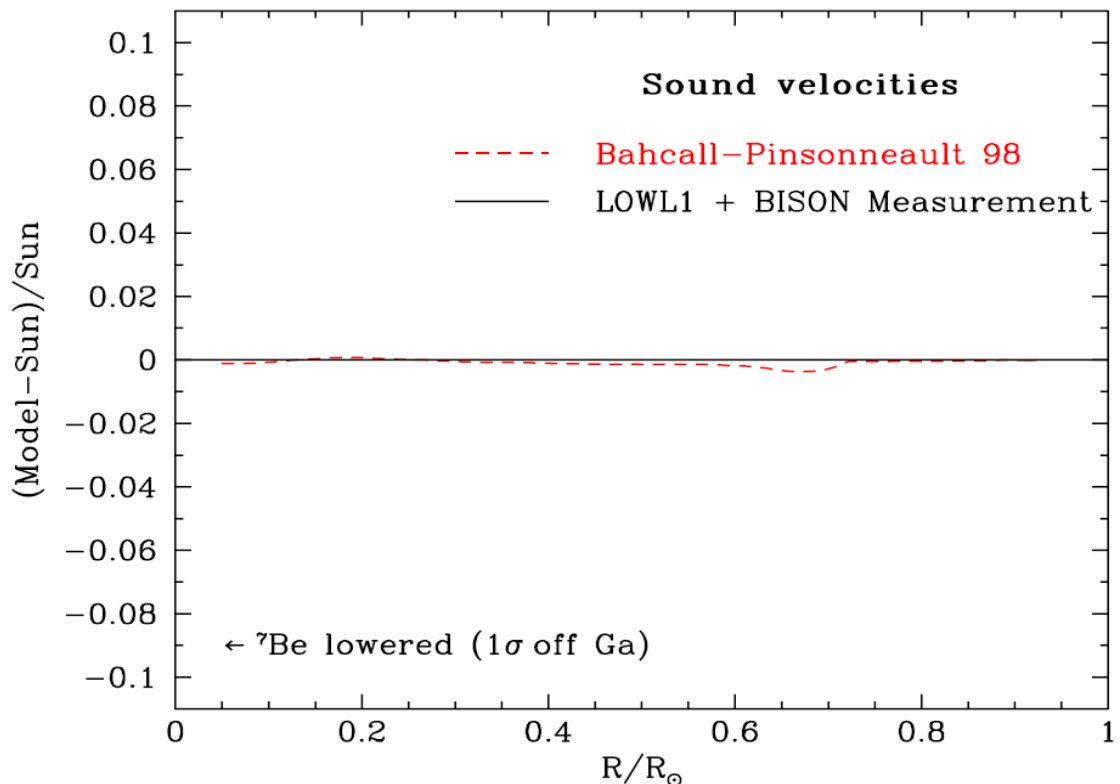
- Detection is incredibly difficult: the mean free path of a neutrino is 1 light-year in water
- “Nature does not always choose the path that is easy to compute”
- Signature Bahcall approach:
 - Compute the predicted fluxes rigorously
 - Work with talented experimentalists to determine what can be measured
 - Relentlessly search for ways to improve and test the theory

Bahcall, 1960



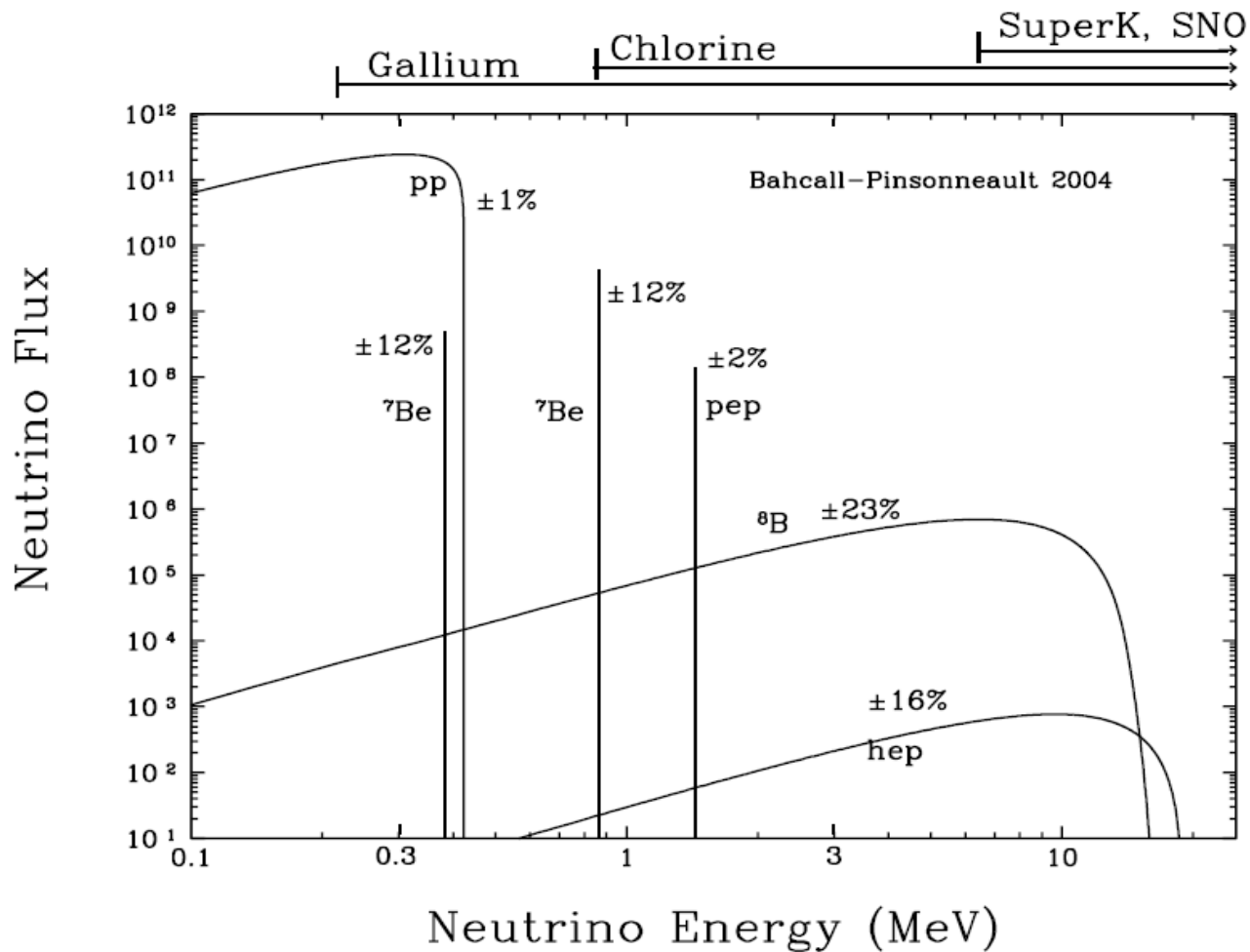
Initial Results: Too Few Neutrinos!

A comparison of theoretically predicted and observed solar sound speeds; the scale is chosen to represent the magnitude required to significantly alter neutrino predictions.



- Compute the errors, improve the physics
- New experiments
- New ideas: neutrino oscillations
- An important advance: use helioseismology to test solar models

The Solar Neutrino Spectrum



SNO: Proof of Neutrino Oscillations



Behind the Scenes

- HST
- Support for experimental efforts
- Mentoring & IAS
- Decadal Report

