

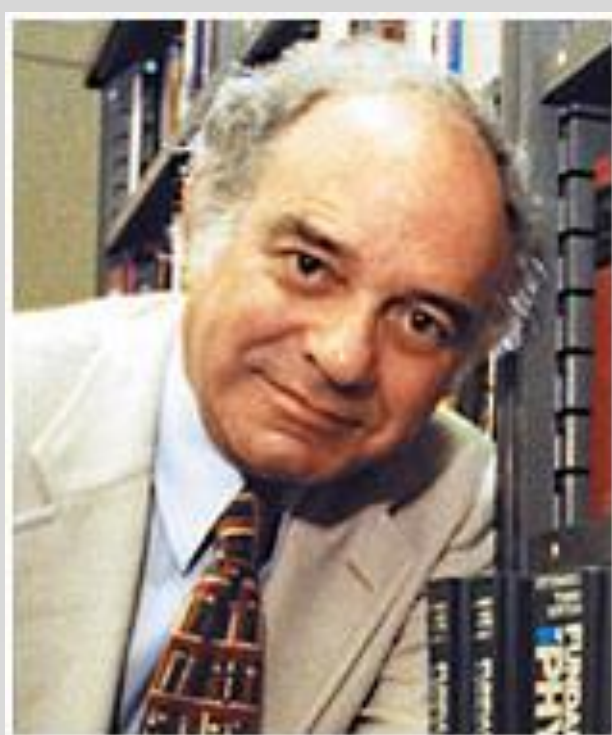
Dark Matter in the Universe

The Robert Resnick Lecture Series
Department of Physics, Rensselaer
Wednesday, November 15th, 2023, 4:00 PM, DCC 330
Reception at 3:30 PM

Katherine Freese

Director, Weinberg Institute for Theoretical Physics
Jeff & Gail Kodosky Professor of Physics
Director, Texas Center for Cosmology and Astroparticle Physics (TCCAP)
University of Texas, Austin, TX 78712

Abstract: The nature of the dark matter in the Universe is among the Longest and most important outstanding problems in all of modern physics. The ordinary atoms that make up the known universe, from our bodies and the air we breathe to the planets and stars, constitute only 5% of all matter and energy in the cosmos. The remaining 95% is made up of a recipe of 25% dark matter and 70% dark energy, both nonluminous components whose nature remains a mystery. I'll begin by discussing the evidence that dark matter is the bulk of the mass in the Universe, and then turn to the hunt to understand its nature. Leading candidates are fundamental particles including Weakly Interacting Massive Particles (WIMPs), axions, sterile neutrinos, light dark matter, as well as primordial black holes. I will discuss multiple experimental searches: at CERN in Geneva; in underground laboratories; with space telescopes; with gravitational wave detectors; and even with DNA. I'll tell you about our novel idea of Dark Stars, early stars made primarily of hydrogen but powered by dark matter heating, and the possibility that the James Webb Space Telescope has already discovered them. At the end of the talk, I'll turn to dark energy and its effect on the future of the Universe.



World-Famous Physics
Educator, 1923-2014
Alumni Hall of Fame 2003



Credit: CTIO/NOIRLab/DOE/NSF/AURA
Image captured by dark matter camera



THE COSMIC COCKTAIL
Princeton Univ. Press 2014