

FUNDAMENTALS OF SUPERNOVA COSMOLOGY

By

Professor Robert P Kirshner

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Abstract

Since the surprising discovery of cosmic acceleration in 1998, subsequent observations of the cosmic microwave background and the large-scale distribution of galaxies have converged on a picture in which the universe has ~2/3 dark energy and ~1/3 dark matter. Ordinary baryons, lost in the round-off error, are only about 4% of the mass-energy in the universe. Over the past decade, larger samples of supernovae have made the existence of this negative-pressure component of the universe more secure. Now our effort has shifted to determining the properties of the dark energy. Alas, theory has nothing much to offer as a plausible hypothesis to test. One simple question seems worth answering: "Is dark energy a constant, like a modern version of Einstein's cosmological constant, or has it changed over cosmic time?" Supernova samples are now large enough that systematic errors dominate over statistical uncertainties, so better understanding, not just a larger sample, is required to make progress on this question. The largest systematic errors in supernova distances come from the pernicious effects of interstellar dust absorption. New observations carried out at near-infrared wavelengths promise to reduce these errors and lead to a more certain knowledge of the nature of dark energy. This talk will sketch the present constraints on dark energy, illustrate how these can be improved with near-infrared measurements of supernovae, and speculate on the best strategy for future measurements with the proposed Joint Dark Energy Mission.

Brief Biography

Brief Biography: Robert P. Kirshner is Harvard College Professor of Astronomy and Clowes Professor of Science at Harvard University. He graduated from Harvard College in 1970 and received a Ph.D. in Astronomy at Caltech. He was a postdoc at the Kitt Peak National Observatory, and was on the faculty at the University of Michigan for 9 years. In 1986, he moved to the Harvard Astronomy Department. He served as Chairman of the Department from 1990-1997 and as the head of the Optical and Infrared Division of the CfA from 1997-2003. He was Master of Quincy House, one of Harvard's undergraduate residences from 2001-2007. In 2007, he was on sabbatical at the Kavli Institute for Theoretical Physics at UC Santa Barbara.

Professor Kirshner is an author of over 200 research papers dealing with supernovae and observational cosmology. His work with the "High-Z Supernova Team" on the acceleration of the Universe was dubbed the "Science Breakthrough of the Year for 1998" by Science Magazine. Kirshner and the High-Z Team shared in the Gruber Prize for Cosmology in 2007. A member of the American Academy of Arts and Sciences, he was elected to the National Academy of Sciences in 1998 and the American Philosophical Society in 2004. He served as President of the American Astronomical Society from 2003-2005. Kirshner was given the Distinguished Alumni Award by Caltech in 2004.

Kirshner is a frequent public lecturer on science. His popular-level book "The Extravagant Universe: exploding stars, dark energy, and the accelerating cosmos" was published by Princeton University Press. It won the AAP Award for Best Professional/Scholarly Book in Physics and Astronomy and was a Finalist for the 2003 Aventis Prize. The Extravagant Universe is now available in paperback and has been translated into Japanese, Portuguese, Spanish, and Czech.

Professor Kirshner will give a Public Lecture the same day at 6.30 pm in the Union Hall.

EVERYONE WELCOME

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