2009 CfA Summer Colloquium Series

The Summer Colloquium series provides a broad introduction to the research going on at the CfA. Summer interns and other junior staff are particularly encouraged to attend but all are welcome.

June 18: Near-Earth Objects and the Minor Planet Center

Dr. Tim Spahr
Harvard-Smithsonian Center for Astrophysics

The Minor Planet Center, (MPC), is responsible for the collection, processing and distribution of all positional measurements of asteroids, comets, and outer satellites of the major planets. As of this writing, the MPC maintains a database of around 65 million observations, pertaining to about 500,000 different objects. While most operations are handled autonomously, a small fraction of objects, particularly those of near-Earth Objects (NEOs), need special attention. One such object was 2008 TC3, a small (2-meter object) that impacted the Earth last October 6 just 19 hours after discovery. I will discuss 2008 TC3, routine operation of the MPC, and how things are likely to evolve in the next generation of large-scale minor planet surveys.

July 2: Gamma Ray Bursts: The Biggest Explosions Since the Big Bang

Prof. Edo Berger
Harvard-Smithsonian Center for Astrophysics

Gamma-ray bursts (GRBs) are rare but powerful explosions that easily outshine whole galaxies. They occur a few times per days in the Universe, and are currently detected by several NASA and international satellites. Over the past decade we have come to recognize that some GRBs mark the death of very massive stars and the birth of black holes, while others likely arise from the violent merger of two neutron stars. At the same time, the extreme luminosity of GRBs allows us to use them as powerful tools for the study of the early Universe. In this talk I will summarize our understanding of the GRB phenomenon, and will describe how we recently smashed the cosmic distance record with the discovery of a GRB at a redshift of 8.3.

July 9: NASA Goes Green; How We Recycled the Deep Impact Spacecraft

Dr. Jessie Christiansen
Harvard-Smithsonian Center for Astrophysics

The EPOCh (Extrasolar Planet Observation and Characterisation) project forms part of the EPOXI mission of opportunity utilising the Deep Impact flyby spacecraft. The aim of the project was to observe known transiting extrasolar planets, each target for several weeks at a time, to construct high cadence, high precision light curves. We analyse these data for evidence of additional planets in several ways - by searching for additional transits, and by searching for transit timing variations. We also use the data to refine our knowledge of the known transiting planet, including attempting to learn more about the atmospheric properties by looking for signals of reflected light at secondary eclipse.

July 16: New Frontiers in Gravitational Lensing

Dr. Rosanne Di Stefano
Harvard-Smithsonian Center for Astrophysics

Gravitational lensing is a clear prediction of Einstein's theory of gravity. While the first verification of the theory was provided by the deflection of light by the Sun, six decades passed before additional astronomical observations of lensing became possible. Today, lensing is used as a tool to study distant galaxies, measure the mass of intervening clusters of galaxies, and to search for dark matter and planets in our own Galaxy. New observational programs, including Pan-STARRS, LSST, and KMTNet will allow us to take astronomical lensing studies to an even higher level. I will discuss these projects, concentrating on their ability to discover the time-dependent phenomena that signal microlensing and mesolensing. Lensing studies of the near future will play an ever-increasing role in the discovery of planets and will also find populations of black holes and neutron stars within a kpc of Earth.

July 23: Ten Years of Chandra

Dr. Pat Slane
Harvard-Smithsonian Center for Astrophysics

Following fresh on the heels of the discovery of X-ray emission from celestial sources other than the Sun, with X-ray astronomy just barely in its infancy, an almost unimaginably-bold proposal was put forth to build a visionary space-borne observatory based on X-ray optics whose resolution and sheer size represented leaps by orders of magnitude over any such mirrors ever built. Following a series of smaller, but ever-improving X-ray observatories, this vision was fully realized in July of 1999 with the launch and deployment of the Chandra X-ray Observatory. As we mark the completion of its first decade of observations, in which breakthrough science has been carried out on objects ranging from nearby planets to distant quasars, I will look back on the development and early operation of Chandra and provide a sample of highlights from its ever-increasing scientific legacy.

July 30: Supermassive Black Holes, Dark Energy & Other Stories

Dr. Elizabeth Humphreys
Harvard-Smithsonian Center for Astrophysics

Supermassive black holes (SMBHs) are thought to exist at the center of most galaxies, including the Milky Way. With masses of millions to billions of solar masses, it is now widely accepted that SMBHs can affect the structure of galaxy cores, and that SMBH and galaxy formation are closely entwined. In this talk, I will discuss how the highest angular resolution observing technique in the world, radio and submillimeter wavelength Very Long Baseline Interferometry, is being used to measure the mass of SMBHs and has the potential to provide the most direct evidence yet of SMBH existence via the detection of the "shadow" of a black hole. I will also discuss how the very accurate distances we can obtain to some SMBHs will help to constrain the nature of dark energy, the mysterious energy source behind the current acceleration of the expansion of the Universe.