Don Campbell

Radar Studies of Satellites

Prof. Campbell's research involves studies of planetary surfaces primarily using radar. Possible projects for an REU student relate to studies of the surfaces of Titan and the Moon. Work on Titan would involve correlating properties of the surface derived from Earth based radar observations with more detailed imagery obtained by the radar system on the Cassini Saturn system orbiter. The lunar work would involve the interpretation of very high resolution, 20 m, radar multi-polarization imagery of the lunar poles and other regions on the Moon.

David Chernoff

New Methods in Astrophysical Simulations: Putting Graphics Processing Units To Work

The student will investigate how to harness the processing power of modern graphics game cards. Applications will include particle and fluid simulations in theoretical astrophysics.

The applicant must be a student strong in theoretical physics; it would be helpful if he/she has some experience in computer science also.

Martha Haynes and Riccardo Giovanelli

Arecibo Legacy Fast ALFA Survey

Members of the Cornell ExtraGalactic Group are leading the Arecibo Legacy Fast ALFA survey, underway since 2005, which aims to conduct a complete census of gas-rich galaxies in the local universe with applications in observational cosmology and galaxy evolution studies. The survey is currently about 40% complete and available for the design of student-based projects. A possible project might involve the comparison of the gas and dynamical masses extracted from ALFALFA with stellar masses and indicators of star formation and active galactic nuclei derived from the Sloan Digital Sky Survey for galaxies in several nearby groups and clusters which span a range of X-ray luminosity.

Jim Houck

The Spitzer Space Telescope is the last element in the "Great Observatory Program."

Cornell designed and built the Infrared Spectrograph, IRS, for Spitzer. This coming summer the areas of interest are: Planetary Nebulae, Dwarf Galaxies and HII Regions in the Galaxy. The successful applicant will work on one of the three programs. He/she can select their own area of interest, learn to reduce data from the IRS and participate in preparing the manuscript for publication.

Jean-Luc Margot

Mercury as seen by MESSENGER

This project will focus on the integration of ground-based data and of new data obtained by the MESSENGER spacecraft during its first flyby of the planet Mercury on Jan 14, 2008. The prime science objective is to characterize the interior of the planet using gravity and topography data in combination with high-precision ground-based measurements of the spin state of the planet (Margot et al., Science 316, 2007). Images and topography obtained at Arecibo (Harmon and Campbell, Mercury, 1988; Harmon, Space Science Reviews, 2007) will be compared and contrasted to MESSENGER data.

The successful applicant will become familiar with the dynamical state of the planet, with the spacecraft flyby trajectories, and with software tools to register ground-based and spacecraft data to planetocentric coordinates. Analysis will include imaging data, radar data, and topography data.

Gordon Stacey

Star formation in the Early Universe: the Next Generation Submillimeter Spectrometer
Our group has developed a submillimeter grating spectrometer, ZEUS designed to detect cooling lines from distant (z>1) hyperluminous galaxies. These galaxies are likely the progenitors of giant elliptical galaxies in today's universe undergoing a global burst of starformation at rates > 1000 time that of the Milky Way galaxy. Our spectroscopic studies tell us about the spatial extent and intensity of star formation in these galaxies "protogalaxies". We are currently developing a more powerful "next generation" version of this instrument (ZEUS-2) and are looking for an energetic person interested in instrumentation (low temperature physic, electronics, optics, mechanical devices, software), or data reduction—and of course, the science!

Yervant Terzian

The Interstellar Medium
The space between the stars is not empty and is a most interesting laboratory to study the evolution of our galaxy. One way to do so is to observe radio recombination spectral lines that are emitted from interstellar clouds and from the diffuse interstellar medium. We are starting an observing survey program using the Arecibo radio telescope to detect such spectral lines from the plane of our galaxy. This project may involve a trip to the Arecibo Observatory in Puerto Rico.

Joe Veverka

Geologic History of Saturn's Icy Satellites
We use high resolution images being returned by the ISS camera on Cassini to unravel the geologic history of Saturn's icy satellites. Our focus will be on separating exogenic and endogenic processes that have shaped the surface of Saturn's two-faced satellite Iapetus and to determine a general chronology of events based on regional crater counts.