

Winter 2009
Astronomy & Physics - Colloquia Abstracts

SUBJECT TO CHANGE! Be sure to check back often.

Friday January 9

3:00 PM

SB 260

Mr. Jonathan Ramsey

Saint Mary's University

Jets launched from Keplerian discs extended to observational length scales

Jets and outflows are an integral part of the current star formation paradigm and are observed wherever star formation is ongoing. The importance of these objects lies in their ability to remove angular momentum from matter accreting onto a central protostar. While observations easily resolve these objects on scales of thousands, or even several hundred, of AU, the launching and collimating mechanism (which is < 10 AU in size) remains unresolved and is often obscured by a dusty disc or torus. In recent years, there have been many simulations of the jet launching mechanism, but they have not extended to spatial scales resolvable by existing observations. As such, there is a disconnect between the simulation and observation of protostellar jets and in this talk I will discuss how I am bridging the gap between the two. I will present preliminary results of simulations with AZEuS, an adaptive mesh refinement version of the ZEUS fluid code. AZEuS allows me to simultaneously model both the small jet launching region and large observational length scales. I will highlight new results which were not possible without AZEuS, where this project is going in the near future, and the importance of synthetic observations.

Friday January 23

3:00 PM

SB 260

Dr. Jolie Cizewski

Rutgers University

Probing reactions in stars with beams of radioactive nuclei

About half of the elements heavier than iron are understood to be produced in rapid neutron capture, r process, nucleosynthesis. The most likely isotopes to be created, those along the r-process path, have considerably more neutrons than their stable counterparts. Relatively little is known about their properties or the important neutron-induced reactions. Recently, we have begun a program to measure nuclear reactions on nuclei on or near the r-process path to provide some of the basic nuclear physics input into understanding r-process nucleosynthesis. The present talk will describe this new research program and present the first results.

Friday January 30

3:00 PM

SB 260

Dr. Larry Morgan

Saint Mary's University

Triggered Star-Formation in Bright-Rimmed Clouds

The photo-ionisation of molecular clouds by nearby massive stars and subsequent dynamical effects may directly lead to the formation of a secondary (tertiary) generation of stars through a process known as radiatively-driven implosion. The contribution of this mode of star-formation to both the Galactic stellar population and the interstellar mass function is significant, yet poorly understood. The last few years have yielded a wealth of new

L 173

Dr. Jason Kalirai

Space Telescope Science Institute

Stellar Remnants as Astrophysical Probes

White dwarfs represent the eventual end products of 98% of all stars. As such, their luminosity and mass distributions can be used to understand the properties of their progenitor populations (e.g., the initial mass function of stars). In this talk, I will summarize recent results from two large imaging and spectroscopic surveys aimed at uncovering these stellar cinders in nearby resolved clusters. With ultra-deep HST/ACS imaging of globulars, we have now firmly established the ages of the first structures to form in the Galactic halo and disk. A similar survey of white dwarfs in rich open clusters (over a large range of age and metallicity) has uncovered hundreds of these objects that can be spectroscopically studied. The data have led to unprecedented constraints on the initial-to-final mass relation (i.e., what mass main-sequence star maps to white dwarf mass) over a large mass range ($M_{\text{initial}} = 1 - 7 M_{\text{sun}}$), and therefore are a powerful input to chemical evolution models of galaxies including enrichment in the interstellar medium. Finally, I will discuss direct empirical evidence that stellar mass loss is much more efficient in high metallicity environments. This result is critical in interpreting the UV upturn in elliptical galaxies, the dearth of planets around white dwarfs, and the different rates (and properties) of type Ia SNe in elliptical vs spiral galaxies.

Friday March 6

3:00 PM

SB 260

Dr. Hendrik Schatz

Michigan State University

Rare isotopes on accreting neutron stars: from thermonuclear explosions to cold fusion

Matter accreted onto a neutron star undergoes a series of extreme transformations that involve the most exotic nuclei produced by nature. In X-ray bursts ordinary nuclei are transformed into extremely short lived neutron deficient isotopes for the short duration of the explosion. As the ashes is incorporated into the neutron star crust, the nuclei are then converted into extremely neutron rich rare isotopes, which turn out to be stable under the stellar conditions. Modern rare isotope facilities can now produce many of the extreme nuclei participating in the nuclear reactions in accreting neutron stars. I will discuss the role of rare isotopes in the astrophysical environments, recent progress in experiments producing and studying them, including new results obtained at the National Superconducting Cyclotron Laboratory, and give an outlook of the bright future of this field in light of new facilities on the horizon.

Friday March 13

3:00 PM

SB 260

Dr. Brian Mason

National Radio Astronomy Observatory

Probing the Evolution of Galaxy Clusters with the GBT and the Cosmic Background Imager

Measurements of the Cosmic Microwave Background (CMB) angular power spectrum in the past decade have precisely characterized the conditions in the early universe and strongly support

a picture in which present day structures result from the gravitational collapse of initial density perturbations generated in an early inflationary epoch. The power spectrum of CMB fluctuations on small angular scales is suppressed by photon diffusion in the early universe; this small-angle regime nevertheless carries important imprints of processes occurring in the more recent past, such as the scattering of CMB photons off of the hot plasma in galaxy clusters (the Sunyaev-Zel'dovich Effect or SZE). The Cosmic Background Imager (CBI) is a 30 GHz, small-angular scale CMB experiment which has detected an excess of power over that expected from intrinsic CMB anisotropy. The excess signal seen at 30 GHz is consistent with what is expected from an SZE signature of massive galaxy clusters. An important limiting factor in this measurement is the precision with which extragalactic foregrounds are known. To improve our knowledge of these foregrounds we have conducted an extensive survey of extragalactic radio sources with the Green Bank Telescope (GBT). I will discuss the implications of this survey and the most recent CBI power spectrum measurements. Finally I will briefly discuss prospects for detailed, high resolution imaging of the SZE with MUSTANG, the 90 GHz bolometer array which has recently been commissioned on the GBT.

Friday March 20

3:00 PM

SB 260

Dr. Chris Cameron

Saint Mary's University

Asteroseismic Tuning of the Magnetic Star HR 1217: Understanding magnetism and stellar structure through MOST spacebased photometry

The chemically peculiar A (Ap) stars show extreme examples of astrophysical processes that have only recently been studied in detail in one other star - the Sun. These stars exhibit spectral

Chandra X-ray observations revealed powerful re