SUBJECT TO CHANGE! Be sure to check back often.

Friday January 8

3:00 PM
AT 305

Dr. Ohad Shemmer

University of North Texas

Multiwavelength Insights into the Nature of Weak Emission-Line Quasars at High Redshift

The Sloan Digital Sky Survey has recently discovered ~60 quasars at z=2.7-5.9 with weak or undetectable high-ionization emission lines in their UV spectra (WLQs). I will present multiwavelength spectroscopic observations that provided insights into the nature of these remarkable sources. I will show that WLQs are unlikely to be dust-obscured quasars, broad-absorption line quasars, or high-redshift galaxies with apparent quasar-like luminosities due to gravitational lensing amplification. Additional monitoring data suggests that the weakness of the lines in WLQs cannot be explained by microlensing that amplifies the continuum relative to the emission lines in ordinary quasars. I will also argue against the idea that WLQs are the long-sought high-redshift BL Lacertae objects. Instead, I suggest that WLQs are quasars with extremely high accretion rates that suppress the formation of the high-ionization emission lines. Finally, I will discuss X ray and near-infrared observations required to test this scenario with implications for emission line formation and the accretion process in active galactic nuclei.

Friday January 15

3:00 PM
AT 101

Dr. Fernando Pena

Saint Mary's University

Inertial modes in convective planets & their indirect detection

Inertial oscillations occur inside rotating convective bodies, restored by the Coriolis force. They may explain a variety of phenomena, e.g., tidal circularization of hot Jupiters and binary stars, and spin-down of neutron stars. In this talk, after an introduction to the inertial oscillations, I will discuss another situation where inertial modes may be relevant: the rings of Saturn where some unexplained density wave features may be result of inertial modes inside the planet. If this hypothesis is correct, we can use Saturn's rings as a seismograph for the planet interior.

Friday January 22

3:00 PM
AT 101

Mr. Christopher Whitt

Jasco Applied Sciences

ANALYSIS AND DESIGN OF BROADBAND ACOUSTIC BEAMFORMERS

A beamformer is a signal processing system consisting of an array of transducers combined with appropriate signal processing to produce desired directional characteristics. Beamformers have applications in many areas including radar, sonar, geophysics, astrophysics, medical imaging, multimedia, and electroacoustics. Recently there is increased research on broadband beamformers, yet there is a lack of comprehensive summaries and tutorials of the state of the art in the field. This talk will start with the analysis of beamformer performance, and summarize classical narrowband design techniques. It will be shown how software simulation and visualization of beamformer performance builds an intuitive understanding of fundamental principles, allows direct comparisons of modern broadband design methods, and guides a designer in optimizing broadband beamformer design.

Friday January 29

3:00 PM
AT 101

Dr. Helen Kirk

Harvard-Smithsonian Center for Astrophysics

The Kinematics of Star Formation in the Perseus Molecular Cloud

Molecular clouds, the birthplace of stars, possess complex physical and dynamical structures. Within the last few years, observations of star formation have been able to expand from the small scale, focussing on regions of known star formation to the large scale, covering the entire molecular cloud in which the stars form. With these large surveys, global processes occurring within the cloud can be probed for the first time. I will show results from a spectral survey of dense cores, the progenitors of stars, and their larger environment within the nearby Perseus

molecular cloud. This survey shows that the dense cores behave mostly quiescently within their local environment. The observations are also compared with synthetic observations of a suite of thin sheet magnetohydrodynamical simulations of star-forming regions. This comparison suggests that the observations may provide a challenge for models of star formation that invoke strong turbulent motions to drive molecular cloud evolution and dense core formation, and may imply the need to account for the global effects of cloud evolution in turbulent simulations.

Friday February 5 ***** SPECIAL TIME ******

1:00 PM
AT 101

Dr. Dale A. Frail

National Radio Astronomy Observatory

Recent Progress in Gamma-Ray Bursts

I will review the current state of our knowledge of gamma-ray bursts and their afterglows. Special emphasis will be given to new insights into the energy release from GRB central engines and the study of GRBs at very high (z>6) redshifts.
If time permits, I will also present the scientific capabilities of NRAO facilities: ALMA, EVLA, VLBA and GBT, for addressing key astrophysical problems. Special emphasis will be given to the EVLA and ALMA. These are new projects for which there is significant Canadian involvement.

Friday February 12

3:00 PM
AT 101

Dr. Con Beausang

University of Richmond

Progress towards GRETA: The future of gamma-ray spectroscopy and the use of surrogate reactions to elucidate cross sections on unstable nuclei

One of the frontiers of research in low energy nuclear physics focuses on the properties of nuclei far from stability, particularly on nuclei with a large excess of neutrons. Such neutron-rich nuclei are pathways to heavy element production in explosive nucleo-synthesis. However, many properties of such systems are unknown leading to uncertainties in the predictions for element abundances in nature. Some such systems will become available to study in next generation rare (radioactive) isotope facilities such as FRIB in the US, FAIR in Europe, RIKEN in Japan and TRIUMF in Canada. To fully exploit such facilities a new generation of gamma-ray spectrometers, so called tracking arrays, is being developed. Here I will review progress towards GRETA, the Gamma Ray Energy Tracking Array and indicate some of the potential physics themes it can address. The first phase (1π) of GRETA, GRETINA is nearing completion in the US. The second theme of my talk will focus on what progress we can make now, prior to the arrival of GRETINA and FRIB, with stable beam facilities and modest detector arrays, to elucidate the properties of unstable nuclei via the use of surrogate reactions.

Friday February 19

3:00 PM
AT 101

Dr. Taro Sato

Saint Mary's University

Gone with the Wind: Galaxies with Low-ionization Winds at z < 0.6 from AEGIS/DEEP2

Incorporating baryonic processes into theoretical models of galaxy formation in ways that closely match observations remains among the most pressing issues in extragalactic astrophysics. This is a very challenging task for both theorists and observers, given the intricacy of physics involved and the difficulty of interpreting detectable imprints that those processes leave on galaxy spectra. In this talk, I will report on a systematic search for low-ionization gas outflows in the spectra of the z < 0.6 objects in the Extended Groth Strip (EGS) portion of the DEEP2 redshift survey. This is a very first attempt to detect galactic-scale winds of low-ionization baryonic gas using a relatively unbiased sample of galaxies, preselected only by the signal strength of the target absorption-line complex (Na I D). I will describe the nature of the galaxies which host winds and what they may imply in view of our current understanding of galaxy formation.

Friday March 5

3:00 PM

AT 101

Dr. Parandis Khavari

University of Toronto

Regge Calculus as a Numerical Approach To General Relativity

Regge Calculus is a finite element approach towards General Relativity. This method relies on approximating n-dimensional manifolds with n-dimensional simplices, which are higher dimensional replicas of triangles and tetrahedra. Once an n-dimensional manifold is `skeletonised' by n-dimensional simplices, the geometry becomes flat everywhere except where two or more simplices meet.
One important question that arises in skeletonising a manifold is with regard to the lengths of the edges used in the process of skeletonisation. This question is indeed concerned with the restrictions that must be satisfied by the lengths of the edges so that the geometry inside the blocks is Minkowskian. Similarly, in Euclidean geometry, three edges can form a flat triangle only if they satisfy the celebrated Triangle Inequality.
In this talk, I will give an introduction to Regge calculus and then will discuss some of the constraints that must be satisfied by the lengths of the edges used in the construction of skeletonised space-times.

Friday March 12

3:00 PM
AT 101

Dr. Arne Henden

American Association of Variable Star Observers

Twinkle, Twinkle, Little Star: I Wonder How Bright You Really Are!

The position of stars in the sky is a well-known parameter, with many surveys over the decades that not only provide coordinates, but also how stars move relative to one another (their proper motion). However, there is no current catalogue covering the entire sky that provides an accurate measurement of the brightness of stars in an astrophysically meaningful manner. The AAVSO has undertaken the challenge and is currently surveying the entire sky at multiple wavelengths, standardizing the brightness of stars to two well-known systems: the Johnson/Cousins system and the Sloan Digital Sky Survey. This talk highlights the hardware and software required to perform such a survey in a minimal amount of time, and provides some examples of how such photometry can be used in your own research.

Friday March 19

3:00 PM
AT 101

Dr. Shantanu Basu

University of Western Ontario

Galactic Star Formation: Magnetized, Turbulent, and Inefficient

Star formation is a lively field of modern astrophysics, requiring a synthesis of many areas of fundamental physics. The formation of a star must overcome important barriers due to magnetic flux and angular momentum. Observations of Galactic star formation, on many different scales and with many different techniques, show that that it is a highly inefficient process. I review numerical simulations performed by our group that has clarified the role of magnetic fields and nonthermal motions in understanding the star formation efficiency, core mass function, and observed core kinematics. I review how these results fit into the overall picture of modern star formation theory, and discuss some of the open questions in the field.

Friday March 26

3:00 PM
AT 101

Dr. Kaitlin Kratter

University of Toronto

The role of disks in the formation of stellar systems

Accretion disks mediate the flow of gas and angular momentum from molecular clouds down to the protostar. When the infall rate becomes large, the disk can no longer transport all of the material onto the central star, causing its mass to increase. When they become too massive, disks can fragment. Using global numerical experiments, I show

that we can characterize the onset of instability and fragmentation as a function of the infall rate. I describe the role of disks in the formation of binary and multiple systems, and the subsequent evolution of their orbital parameters. Finally, I discuss the implications of disk instability for the upper mass limit of stars, and for the formation of massive, wide-orbit planets.

Friday April 9
3:00 PM
AT 101
Dr. Pascal Elahi
Saint Mary's University
TBD
TBD