Jamboree 2014

12:20 PM — Introduction

Norman Murray murray@cita.utoronto.ca	**CITA** Introduction to CITA
John Dubinski dubinski@cita.utoronto.ca	**Computing at CITA** I will briefly describe the computing resources and services available at CITA.

12:30 PM — Theoretical Astrophysics

Peter Martin pgmartin@cita.utoronto.ca	**Interstellar medium: from extragalactic foregrounds to star formation**
Norman Murray murray@cita.utoronto.ca	**Galaxy and Star formation** Cosmological zoom-in simulations by several groups over the last year have made great progress in reproducing the cosmic star formation rate, the stellar mass to halo mass ratio as a function of redshift, and the Kennicutt-Schmidt relation, none of which were captured by previous generations of simulations. I will describe what has allowed this to happen.
Ue-Li Pen pen@cita.utoronto.ca	**Pulsar VLBI Scintellometry** I describe pulsar VLBI as a new tool to achieve unprecedented astrometric precision of 50 picoarcseconds on pulsar emission, and potential implications for gravitational wave detection and the ISM.
Chris Thompson thompson@cita.utoronto.ca	**Topics in Astrophysical Radiation and Fluids** I am working on a variety of problems related to compact stars, gamma-ray bursts, supermassive black holes, planet formation, and accretion disks.

Matt Russo mrusso@cita.utoronto.ca	**When Protostellar Winds Meet Protoplanetary Disks** It's well known that some young stars have strongly magnetized winds but their direct interaction with protoplanetary disk material is largely unexplored. My work looks at how the wind's field can mix with a thin layer of disk material and be amplified at greater depths, with implications for the accretion rate and the density profiles in which planets form and migrate.
Yevgeni Kissin kissin@astro.utoronto.ca	**High field magnetic white dwarfs** White dwarfs with strong magnetic fields are quite common, but their formation mechanism is unclear. A long term dynamo at the base of the convective envelope can generate the required magnetic fields.
Ramandeep Gill rgill@cita.utoronto.ca	**Relativistic plasmas near compact objects** My research focuses on various aspects of relativistic plasmas near black holes in the context of GRB prompt emission and jet physics, AGNs, and neutron stars in the context of magnetar outbursts. I'm also interested in understanding the mode structure and damping of plasma waves in relativistic plasmas and how that leads to particle acceleration. Devising new techniques to constrain the properties of axion-like particles is one focus of my research.
Niels Oppermann niels@cita.utoronto.ca	**Statistics of magnetic fields** Magnetic fields are (thought to be) present everywhere in the Universe, however, they are observationally elusive. I will talk about ways to improve constraints on Galactic and extragalactic magnetic fields using observations together with rigorous statistical analyses.
Quang Nguyen Luong qnguyen@cita.utoronto.ca	**Star formation in extreme galactic environments** Molecular cloud complexes (100 pc scale) are the places where most star formation occurs. By combing large-scale observations across all wavelengths, I investigate the dependency of star formation rates of MCCs on its mass and and density. We suggest that there should be two modes of star formation also present in Galactic environment: starburst and normal mode.
Ian Parrish iparrish@cita.utoronto.ca	**Plasma Astrophysics** I am interested in a wide variety of astrophysical plasma processes. In terms of objects, my interests include galaxy clusters, accretion disks, the solar wind, and extrasolar planets. In terms of processes, these include convection, thermal instability, black hole feedback, and particle acceleration.

Linda Strubbe linda@cita.utoronto.ca	**"Stars, Black Holes, and Education"** Linda Strubbe studies the tidal disruption of stars by massive black holes; she is also very involved in science education, including an Order-of-Magnitude Problem Solving course at U of T this semester, and a workshop in Nigeria.
Emmanuel Jacquet ejacquet@cita.utoronto.ca	**Early solar system history: follow the meteorites** I study protoplanetary disks using constraints from chondrites. Most of my latest research bears on their mysterious chondrules.
Christa Van Laerhoven cvl@cita.utoronto.ca	**The Secular Character of Extra-solar Multi-planet Systems** For non-resonant multi-planet systems, the eccentricity behaviour of each planet is dominated by secular interactions. The underlying secular structure of a system can be determined without knowing the planets' eccentricities, making it a useful tool for characterizing interactions between planets.

1:15 PM — General Relativity

Harald Pfeiffer pfeiffer@cita.utoronto.ca	**Numerical Relativity** My goal is to understand gravity through computer simulations of Black Holes and Neutron stars. This involves developing computer codes to simulate these systems; simulating them; analysing the output (including graphics); using the results to learn about how gravity works; using the results to help detect and understand gravitational waves from black holes and Neutron stars.
Aaron Zimmerman azimmer@cita.utoronto.ca	**Perturbed Black Holes** Black hole perturbation theory governs motion and wave generation near black holes, and plays a central role in gravitational wave science. I'll talk about my recent work on perturbed black holes, focusing on the "ringdown" phase which follows the birth of a black hole, for example following the merger of compact objects.
Sergei Ossokine ossokine@cita.utoronto.ca	**Precessing binary black hole systems** Binary black holes are expected be the main sources for gravitational wave signals for gravitational wave detectors such Advanced LIGO and Virgo which are scheduled to come online next year. In systems where the black hole spin is misaligned with the angular momentum, the plane of the orbit will precess, producing interesting dynamics and imprinting this behaviour on the gravitational waveform. I will briefly summarize work on characterizing these systems in numerical relativity and Post-Newtonian theory.

Prayush Kumar prkumar@cita.utoronto.ca	**Finding gravitational waves from compact-object binaries** Gravitational waves are a form of radiation predicted by Einstein's theory of general relativity. The network of LIGO-Virgo observatories is preparing to detect gravitational waves from astrophysical binaries of black holes and/or neutron stars. My work is aimed at improving and devising novel techniques to increase the sensitivity of gravitational wave searches.
Nick Tacik tacik@cita.utoronto.ca	**Binary Neutron Stars with Arbitrary Spins in Numerical Relativity** I will discuss my work on creating constraint satisfying initial data used to simulate the inspiral and merger of binary neutron stars with arbitrary spins. I'll also show results from several evolutions of highly spinning systems.

1:35 PM — Cosmology

Dick Bond bond@cita.utoronto.ca	**The Entropic Universe** Cosmic Information Theory and Analysis (CITA) is a unifying theme in exploring how our Universe morphed from a coherently smooth Hubble-patch within a vast landscape into the intricate evolving complexity of the cosmic web. Sample problems from the great generation epochs of Information quantity, i.e., (non-equilibrium) entropy, in post-inflation heating, the cosmic infrared background, and the shocking web of groups and clusters, continue to puzzle and fascinate.
Zhiqi Huang zqhuang@cita.utoronto.ca	**Modelling and measuring CMB anomalies** I will talk about primordial CMB anomalies from modulated preheating models and our new stacking methods that can be used to test anomalies, systematics and foreground residuals in CMB maps.
Marcelo Alvarez malvarez@cita.utoronto.ca	**Structure Formation** I will discuss how we use large cosmological simulations to understand how tiny fluctuations produced in the early universe led to the large scale structure we see today, and how we create mock observations of the simulated universe for comparison to the actual one.
Dan Green drgreen@cita.utoronto.ca	**Doing particle physics with maps of the universe** Cosmology was once known as the 'poor man's particle accelerator'. With advances in both theory and experiment, cosmology today offers windows into the laws of nature that may never be accessible to a terrestrial experiment.

Joel Meyers jmeyers@cita.utoronto.ca	**Inflation: Theory and Observation** The paradigm of inflation solves some classical problems of the hot Big Bang scenario while also providing a natural mechanism for generating primordial cosmological fluctuations with the properties that we observe. It is unlikely that data will ever reveal exactly which model of inflation accurately describes our past, however, we can use observation to learn about the physical principles that governed the early universe.
Richard Shaw jrs65@cita.utoronto.ca	**CHIME** CHIME is a novel Canadian radio telescope being built in BC, which is designed to map the Universe across (nearly) the entire sky from z 1–3 using the 21cm line. This effort is challenging on all fronts: observationally, theoretically and computationally, but should yield exciting new constraints on dark energy, and the large scale structure of the Universe.
Liam Connor connor@cita.utoronto.ca	**Calibration of Cosmological 21cm Experiments** Cosmological 21cm experiments require calibration with unprecedented levels of precision due to the large dynamic range between the redshifted 21cm emission and our galaxy's radio foregrounds. I will discuss our effort to calibrate the Canadian Hydrogen Intensity Mapping Experiment (CHIME) and more generally about calibration algorithmics of 21cm experiments.
Philippe Berger	**Cosmology with CHIME** New PhD student working on CHIME
Takeshi Kobayashi takeshi@cita.utoronto.ca	**Magnetic Fields from the Early Universe** I am interested in the connection between early universe cosmology and microphysics. As an example, I will show how our universe can be magnetized (or not) in its earliest moments.
JD Emberson emberson@cita.utoronto.ca	**The Universe on Large and Small Scales** I will discuss my ongoing PhD research that focuses on studying the universe on both large and small scales at both early and late times. Recently, this has included studying the dynamics of infalling subhalos within the Milky Way, researching the effects of AGN feedback on the kSZ signal, and using galaxy catalogues as a cosmological probe of neutrino masses.

Derek Inman inmand@cita.utoronto.ca	**N-body Neutrino Simulations** Cosmological observations currently provide the best constraints on neutrino masses and potentially could tell us whether neutrinos are Dirac or Majorana particles. I simulate cosmological neutrinos using the CUBEP3M code in order to better understand how neutrinos are affected by large scale structures.
Alex Van Engelen engelen@cita.utoronto.ca	**Gravitational Lensing of the CMB** The gravitational deflections of CMB photons as they traverse the Universe affect the statistics of the observed CMB in a subtle but characteristic way. We apply estimators for the distribution of lensing matter to CMB data (in particular, ACTpol data), which can provide insight on the growth of structure at high redshift and on large length scales.