

Pulsars: precision tools for understanding the Universe

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DATE: Monday, January 11, 2016

TIME: 3:30 PM

PLACE: C2045

Donuts and coffee will be served before the seminar.

ABSTRACT: Pulsars, the neutron-star remnants of massive stellar collapse, are celebrated tools for performing a variety of precision astrophysical studies. I will discuss my primary research work on these fascinating objects, which focuses on observational tests of gravitational theory, and constraining models of compact stellar and binary evolution. High-precision pulsar timing provides some of the most stringent constraints on the predictions made by general relativity and alternative theories. I will describe tests on highly relativistic systems such as the astonishing double pulsar, as well as the effort to directly detect gravitational waves -- a "holy grail" in validating general relativity -- with the NANOGrav collaboration. The varying evolutionary and formation histories of compact binary systems leave detectable signatures in pulsar observations. I will discuss my work to distinguish the different evolutionary channels for pulsars in double-neutron-star and other binary systems, including the supernova events from which these systems emerged. Finally, I will briefly summarize other ongoing and future endeavours. This includes large international pulsar survey collaborations, as well as future instrumentation that will greatly benefit the above work, such as the Square Kilometre Array, which will represent a seismic shift in radio astronomy, and particularly in pulsar-related research.

ALL ARE WELCOME!