

Spring 2018 Colloquium

Department of Physics & Astronomy, TAMU-Commerce

Feb 22, Thursday, 4-5 PM in Science Building 127

(coffee and cookies will be served at 3:50 PM)

Astronomy

Rapidly Spinning Neutron Stars and the Equation of State of Dense Matter

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Dr. Sharon Morsink earned her BSc in Physics from the University of Waterloo in 1991, and a PhD in 1997 in Theoretical Physics at the University of Alberta. Her PhD research was on the interiors of black holes. As a postdoc from 1997-1999 at the University of Wisconsin-Milwaukee her research moved to neutron stars. In 1999 she was hired as an Assistant Professor at the University of Alberta, where she is now an Associate Professor. Her research is focused on rotating neutron stars, with a particular interest on applications of general relativity that have relevance for X-ray observations. More information about Dr. Sharon Morsink and her research can be found at

<https://sites.ualberta.ca/~morsink/>

Abstract

Neutron stars are tiny stars with ultra-strong magnetic and gravitational fields and densities larger than nuclear. Their small size and large average densities allow them to spin at very rapid rates, with surface velocities that are a large fraction of the speed of light. The very large gravitational fields and relativistic rotation rates make it necessary to use Einstein's theory of general relativity to describe these stars. The pulsed X-ray emission from hot spots on the surface of a rotating neutron star contains encoded information about the neutron star's gravitational field and the properties of the spot's emission pattern. Disentangling these effects in the pulsed emission seen by X-ray timing observatories such as NICER, ASTROSAT, eXTP, and STROBE-X will allow the determination of the neutron star's mass and radius, leading (eventually) to a determination of the neutron star equation of state. In this talk I will review some of the aspects of relativity that make rapidly rotating neutron stars excellent targets for determining the equation of state of cold dense matter. I will introduce the method for extracting the neutron star's properties from its observed waveform, and discuss the types of neutron stars that NICER is observing, and other larger-scale missions will observe.