

Friday, October 13th**4:10 – 5:00 PM****Barnard Hall 103****Spin and Tide: Constructing Accurate Waveform Models for
Gravitational Wave Observations****Dr. Hang Yu**
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Abstract: We are witnessing an exciting era in gravitational wave astrophysics, marked by the detection of nearly 100 events by LIGO-Virgo-Kagra so far. To extract precise source information from the data, it is crucial to employ accurate waveform models that account for various physical phenomena. In this colloquium, I will discuss advancements along two key directions aimed at enhancing our waveform models. In the first part, I will present a new construction of waveforms that incorporate orbital precession in spinning binary black holes. Our method involves an efficient numerical solution to the post-Newtonian precession equations, enabling the accurate determination of the evolution of the orbital plane's orientation. Together with a recalibration of the coprecessing modes, our new waveform model improves existing ones in both efficiency and accuracy. This positions our model as a valuable tool for GW event searches, parameter estimation analyses, and the inference of underlying population properties. The second part will concentrate on refining models for tidal interactions in binary neutron stars. We underscore the significance of nonlinear hydrodynamic interactions in potentially resolving a discrepancy between numerical relativity simulations and previous linear tide theories. The nonlinear interactions can thus be a crucial component for understanding dynamics in regions of extreme spacetime curvatures and for constraining the supranuclear equation of state based on observations.

Host: Anton Vorontsov

**** Refreshments served in the Barnard second floor atrium at 3:45. ****