MONTANA STATE UNIVERSITY | College of LETTERS & SCIENCE

Physics Colloquium

Friday, April 1st
4:10 – 5:00 PM
Barnard Hall 103

Cosmology and astrophysics from gravitational-wave observations at 0.01-1 Hz

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Abstract:

Now is an exciting era for gravitational-wave astrophysics across the entire spectrum. In this talk, I would like to specifically highlight the prospects of observing gravitational waves in the 0.01-1 Hz band, achieved by utilizing the high-frequency sensitivity of LISA or by building a dedicated detector like TianGO. In particular, it can address three major science cases in cosmology and astrophysics. The first is to resolve or confirm the Hubble tension using standard-siren measurements. By jointly observing a stellar-mass binary black hole (BBH) first at 0.01 Hz in space and then at 10 Hz on Earth, we can localize the BBH to a single host galaxy, thereby simultaneously obtaining its luminosity distance and redshift without an electromagnetic counterpart. Second, it provides us a new window to probe supermassive black holes (SMBHs) using stellar-mass BBHs inspiralling in its vicinity. From modulations induced by the SMBH on the BBH's waveform, we can determine the properties of the SMBH even if the SMBH is electromagnetically quiescent. Lastly, it enables multi-messenger observations of Galactic white dwarf binaries. This will help us constrain the physics of tidal interaction and mass transfer, which will further shed light on the formation channel of type-Ia supernovae.

Host: Neil Cornish

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