

October 17, 2025**4:10 – 5:00 PM****Barnard 103****Creating a Galactic Scale Gravitational Wave Detector****Deborah Good****University of Montana****Abstract:**

A decade ago, the scientific community celebrated the first direct detection of gravitational waves with LIGO, marking the opening of a new era in multi-messenger astrophysics. Like electromagnetic radiation, there is a spectrum of gravitational radiation, arising from different astrophysical sources. At the low-frequency (nanohertz) end of the spectrum, we require a Galactic scale gravitational wave detector. Such detectors are known as pulsar timing arrays (PTAs), which are created through long-term high-precision observation of rapidly rotating neutron stars, known as millisecond pulsars (MSPs). In 2023, Pulsar Timing Arrays around the world presented evidence of a nanohertz stochastic gravitational wave background, likely arising from the cosmic history of supermassive black hole mergers.

In this talk, we will expound on the process of creating a gravitational wave detector from an array of MSPs located throughout the Galaxy. We will discuss the basics of pulsar timing, understanding how pulsars are observed and pulsar timing models are constructed. We will then provide an overview of PTA gravitational detection. Finally, we will preview the upcoming International Pulsar Timing Array (IPTA) third data release, which will combine the latest pulsar timing array data releases from around the world, encompassing more than a dozen observatories on five continents. The IPTA data release will be the most sensitive dataset ever constructed at these gravitational wave frequencies.

Host: Amy Reines**** Refreshments served in the Barnard Hall second floor atrium at 3:45 PM ****

