

# Department of Physics and Astronomy Colloquium Series

**Tuesday December 3<sup>rd</sup>, 2024, 2:30pm in PSE 317**

**Speaker:** Sashwat Tanay

**Institution:** Paris Observatory

**Title:** Gravitational wave detection via analytical solutions of binary black hole trajectories

**Abstract:**

Gravitational waves (GWs), predicted by Einstein nearly a century ago, were first observed in 2015 by the LIGO collaboration. Beyond confirming Einstein's theory of general relativity, GWs provide a wealth of information about their sources, namely binary black holes (BBHs). This information includes intrinsic properties of BBHs, such as their mass and eccentricity, as well as their distribution in the universe. Beyond these astrophysical insights, GWs also impact our understanding of cosmology and fundamental physics. Detecting GWs relies critically on their accurate modeling, which, in turn, depends on the precise modeling of the trajectories of the source BBHs. In this talk, I will present our analytical solutions for BBH trajectories. These analytical solutions are preferred over numerical solutions since the latter are computationally expensive and are prone to numerical errors.