

Alan J. Weinstein – Colloquium 2/15/2018

Title: The Detection of Gravitational Waves by LIGO and Virgo: astrophysical implications

Abstract: Over the last two years, the Advanced LIGO and Advanced Virgo detectors have observed a handful of gravitational-wave events from the inspiral and merger of binary black holes in distant galaxies. These events have resulted in the first measurements of the fundamental properties of gravitational waves, tests of General Relativity in the strong-field, highly-dynamical regime, and the population, masses and spins of black holes in the universe. Most recently, signals were detected from the inspiral of a binary neutron star system, GW170817. A multi-messenger view of GW170817 from ~ 100 seconds before merger through weeks afterward provides evidence of a "kilonova", and of the production of heavy elements. When we include EM observations, we are able to directly measure the speed of gravitational waves, constrain its polarization content, independently measure the Hubble constant, probe the validity of the equivalence principle, and gain new insight into the astrophysical engine driving these events.