Physics & Astrophysics Colloquium

Multi-Messenger Black Hole-Powered Transients

Dr. Ore Gottlieb

Center for Interdisciplinary Exploration and Research in Astrophysics

Northwestern University

4:00 PM Friday, April 14, 2023, Room 211, Witmer Hall

Abstract:

Black hole (BH)-powered transients are abundant in the Universe, emerging from compact object mergers, collapsing stars, galactic cores and more. Upcoming LIGO runs and new electromagnetic detectors such as LSST and ULTRASAT place BH-powered multi-messenger events in the frontier of astrophysics. I will review the importance of these events in the light of the first binary neutron star merger detection GW170817. I will show that one of the main challenges in studying BH-powered explosions is the vast dynamical range between the BH and the emission site, which has prevented theoretical models from inferring the underlying physics from observations. I will present the first such models through state-of-the-art simulations that follow outflows from a newly formed BH to the photosphere. In particular, I will demonstrate how simulations of collapsing stars, which form BHs and relativistic jets, offer unique opportunities to study a wide range of cutting-edge astrophysical phenomena in an unprecedented way: heavy element nucleosynthesis, evolution of relativistic jets, natal properties of BHs, variety of cosmic fireworks, and prediction of new gravitational wave sources. These predictions will be essential for extracting the physics of transients from future gravitational wave/electromagnetic detections.

Refreshments at 3:30 PM in Witmer Hall, Room 215

For more information: Dr. Wayne Barkhouse, 701-777-3520, wayne.barkhouse@und.edu