G. MILTON WING LECTURE SERIES
MARCH 2018

GRAVITATIONAL WAVES:

PREDICTING AND OBSERVING BLACK HOLE COLLISIONS

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Thunder and Lightning from Cosmic Titans in the Era of Multi-Messenger Astronomy

Monday, March 5,
5–6 p.m., Wegmans Hall, Room 1400

Public Lecture

The recent observation of gravitational waves by the advanced LIGO-Virgo detectors has ushered in a new era of exploration and discovery. Not only did these discoveries further validate Einstein's theory of gravitation, but they also brought astronomy into a new era by providing an entirely novel way to observe the most fascinating and powerful events in the universe—colliding black holes and neutron stars, exploding stars, and even the birth of the Universe itself. With the advent of gravitational wave observations, multi-wavelength, time-domain astronomy, and neutrino observations of astrophysical sources, we have now truly entered the era of multi-messenger astronomy. In this lecture, intended primarily for the general public, I will explain what we have learned to date and the prospects for future discoveries.

Getting the Thunderstorm Right: Solving Einstein's Equations with Numerical Relativity

Tuesday, March 6,
5–6 p.m., Wegmans Hall, Room 1400

Numerical relativity simulations of binary black hole mergers played a crucial role in the calculations of the gravitational wave signals that were just observed by the advanced LIGO and Virgo detectors. In this talk, I will briefly review the history of simulation efforts to model these systems and provide an overview on the field of numerical relativity, including the development of key ideas that led the 2005 computational breakthrough. I will also present some of the most recent progress and challenges in calculating gravitational radiation waveforms for interpreting gravitational wave observations.

Computing the Lightning from Massive Black Hole Mergers

Wednesday, March 7,
5–6 p.m., Hylan Building, Room 1106A

Multi-messenger astronomy promises to revolutionize our understanding of the universe by providing dramatically contrasting views of the same objects. Black holes are the most fascinating and ubiquitous objects in the universe. Unlike stellar-mass black holes, it is generally expected that supermassive black holes lurking at the center of most galaxies will merge in a gas-rich environment, because galaxies merge from time to time. In this talk, I will review the history of simulation efforts to model binary black holes in their astrophysical environments and also present some exciting new results in the context of magneto-hydrodynamics simulation.

Lecture Series Sponsored by the Department of Mathematics

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