

Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy

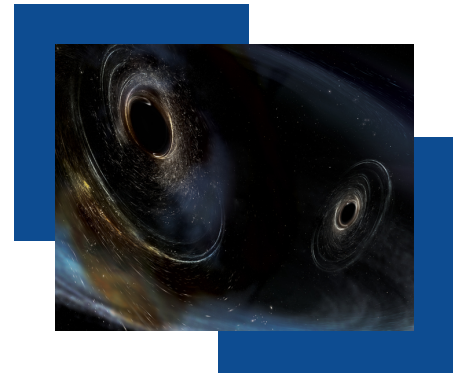
September 13 - December 17, 2021

Scientific Overview

The field of Relativistic Astrophysics has witnessed a major revolution with the historical Nobel-Prize-winning observation of Gravitational Waves (GWs) from a binary black hole merger and the first GW observation of the merger of two neutron stars. The latter was followed by electromagnetic detections from the ground and space, triggering an unprecedented multi-instrument observational campaign. These detections have led to the beginning of GW astronomy and the era of multi-messenger astrophysics. Progress in multi-messenger astrophysics is driven by observations with increasingly more sensitive telescopes, high-energy neutrino detectors, and GW detectors on Earth and in space. Another major element of advance is provided by the theoretical studies of Einstein's General Relativity equations to explain those observations. Processing and interpreting the anticipated huge number of forthcoming GW detections will pose a significant challenge and will require close interaction between mathematical modelers, waveform developers, numerical relativists, data analysts, and theoretical and observational astrophysicists. The aim of this program is to connect efforts of the mathematical and physical sciences communities to address new challenges on the understanding of multi-messenger astronomy.

Long Program Schedule

- Opening Day. September 13, 2021.
- Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy Tutorial. September 14-21, 2021.
- Workshop I: Computational Challenges in Multi-Messenger Astrophysics. October 4-8, 2021.
- Workshop II: Mathematical and Numerical Aspects of Gravitation. October 25-29, 2021.
- Workshop III: Source Inference and Parameter Estimation in Gravitational Wave Astronomy. November 15-19, 2021.
- Workshop IV: Big Data in Multi-Messenger Astrophysics. November 29 - December 3, 2021
- Culminating Workshop at Lake Arrowhead. December 12-17, 2021.



Organizers

Manuela Campanelli (Rochester Institute of Technology), **Marco Cavaglia** (Missouri University of Science and Technology), **Jose Antonio Font** (University of Valencia), **Igor Rodnianski** (Princeton University), **Susana Serna** (Universitat Autònoma de Barcelona), **Gunther Uhlmann** (University of Washington)

Participation

This long program will involve senior and junior researchers from several communities relevant to this program. You may apply for financial support to participate in the entire fourteen-week program, or a portion of it. We prefer participants who stay for the entire program. Applications will be accepted through May 31, 2021 but offers may be made up to one year before the start date. We urge you to apply early. Mathematicians and scientists at all levels who are interested in this area of research are encouraged to apply for funding. Supporting the careers of women and minority researchers is an important component of IPAM's mission and we welcome their applications. More information and an application is available online.

