

UCLA Department of Physics & Astronomy
COLLOQUIUM

Thursday, November 6 at 4 p.m.
1-434 PAB

**From Black Holes to Neutron Stars: Modeling the
Extreme Plasma Physics of Spacetime Collisions**

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Relativistic fluids and plasmas are central to some of the most energetic phenomena in the Universe. When they accrete onto black holes or neutron stars, they can power luminous transients, while the collisions of neutron stars generate not only intense electromagnetic radiation but also strong gravitational waves. Relativistic plasma dynamics provides a unified framework for studying these systems—from global accretion and outflow behavior to microphysical processes such as shocks and reconnection that convert kinetic and magnetic energy into observable emission.

In this talk, I will review recent computational advances in modeling extreme plasma phenomena around compact objects. Emphasis will be placed on compact binary mergers across both the stellar-mass and supermassive regimes, and on how plasma physics informs predictions of high-energy electromagnetic counterparts to current and future gravitational-wave detections. Examples will include some of the strongest shocks in the Universe, the formation of relativistic jets, hidden topological structures of plasmas inside neutron stars, and the electrodynamic nature of gravity itself.

Refreshments at 3:30 p.m. on the PAB Patio. Undergraduates Welcome!