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THE UNIVERSITY of WISCONSIN MADISON

Department of Physics Colloquium

Friday, April 23, 2010 • 4:00 P.M. • 2241 Chamberlin Hall

cookies & coffee served at 3:30 p.m

The Transient Revolution in Astrophysics

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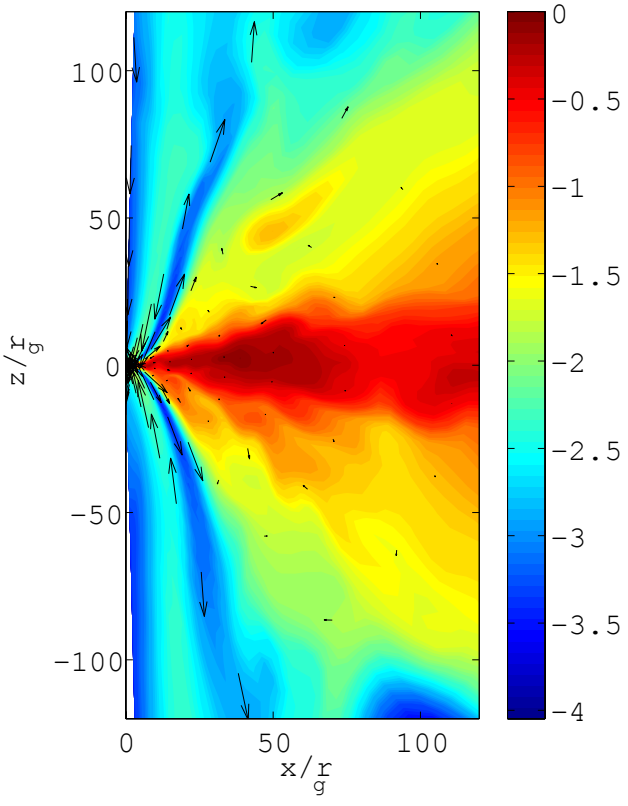

The advent of large astronomical surveys based on rapid advances in detector technology and data storage is generating an unprecedented amount of data on time-variable astronomical objects, up to 100 Terabytes per night in the coming decade. In addition to providing new insights into a wide variety of known phenomena (e.g., variable stars, supernovae, and black holes), historical analogues suggest that these surveys are likely to discover entirely new classes of astronomical objects. I will illustrate the discovery potential of the current generation of astrophysical transient surveys by focusing on two concrete examples of "known unknowns." The first is a "kilonova" produced by the decay of heavy elements created during the merger of two neutron stars or a neutron star and a black hole; a similar transient can be produced during the collapse of a white dwarf to a neutron star. These events are particularly interesting since they are the likely progenitors of some gamma-ray bursts and are also the primary target for km-scale gravitational wave observatories such as Advanced LIGO. The second "known unknown" I will highlight is a ~ week-long electromagnetic flare produced by the tidal disruption of a star that passes close to the event horizon of a massive black hole at the center of a galaxy. The study and characterization of kilonovae and tidal disruption events in the coming years will open up a new window onto the physics and astrophysics of compact objects in the universe.