Abstract: Newborn neutron stars, neutron star binary remnants, and gamma ray burst central engine accretion disks share many features: strong spacetime curvature, nuclear statistical equilibrium, strong shear flows, magnetorotational turbulence, and neutrino cooling. Numerical modeling with the Spectral Einstein Code is used to explore how these effects proceed and interact. This talk focuses on the underlying physics illustrated by these simulations. Some key results are 1) ejecta from spinning black hole-neutron star mergers is a robust source of r-process elements; 2) rapidly, differentially spinning neutron stars develop both small-scale turbulence and large scale nonaxisymmetric modes; 3) power from the neutrino glow of compact binary postmerger accretion disks is very high but can only be maintained for more than around 20ms by a turbulent energy cascade.

Bio: Dr. Duez’s research focuses on the dynamics of hot nuclear matter in strongly curved spacetime. Most of his published work concerns black hole-neutron star binary mergers, which are potentially important sources of gravitational waves, kilonovae, short duration gamma ray bursts (GRBs), and r-process elements. https://www.black-holes.org/about-us/people#matthew-d-duez