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THE UNIVERSITY of WISCONSIN MADISON

Department of Physics Colloquium

Friday, October 16, 2009 • 4:00 P.M. • 2241 Chamberlin Hall

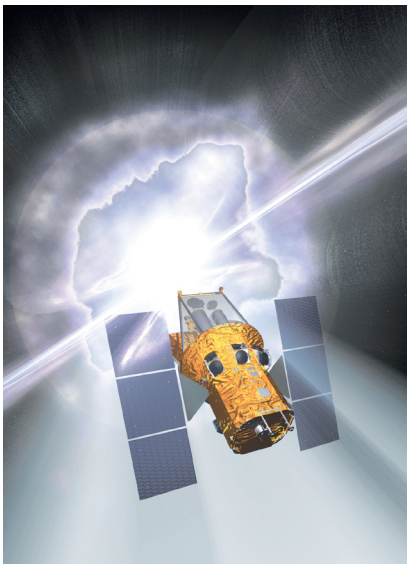
cookies & coffee served at 3:30 p.m

Gamma Ray Bursts and the Birth of Black Holes

Neil Gehrels

NASA/GSFC

Hosts: Ogelman



Black holes have been predicted since the 1940s from solutions of Einstein's general relativity field equation. There is strong evidence of their existence from astronomical observations, but their origin has remained an open question of great interest. Gamma-ray bursts may the clue. They are powerful explosions, visible to high redshift, and appear to be the birth cries of black holes. The Swift and Fermi missions are two powerful NASA observatories currently in orbit that are discovering how gamma-ray bursts work. Evidence is building that the long and short duration subcategories of GRBs have very different origins: massive star core collapse to a black hole for long bursts and binary neutron star coalescence to a black hole for short bursts. The similarity to Type II and Ia supernovae originating from young and old stellar progenitors is striking. Bursts are tremendously luminous and are providing a new tool to study the high redshift universe. One Swift burst at z=8.3 is the most distant object known in the universe. The talk will present the latest gamma-ray burst results from Swift and Fermi and will highlight what they are teaching us about black holes and jet outflows.