

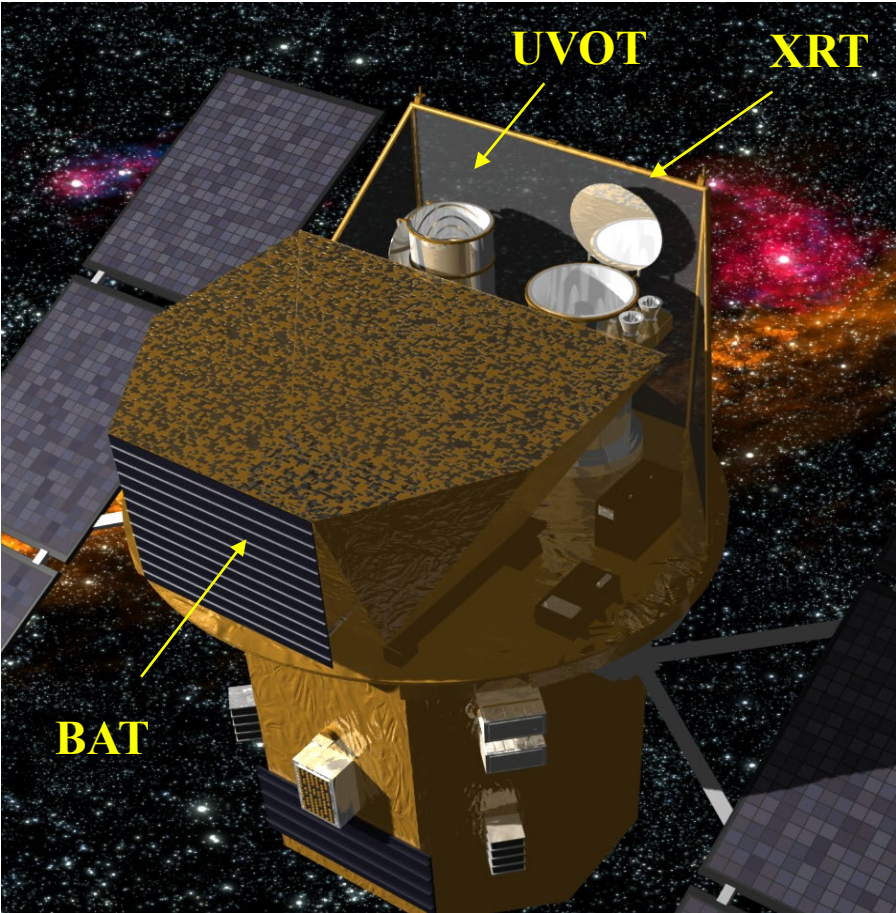
# Gamma Ray Burst Discoveries with the Swift Mission

Neil Gehrels  
NASA/GSFC

N<sup>2</sup>PS<sup>2</sup> - GWU  
June 16, 2008

# Swift Mission

## NASA MIDEX



### 3 instruments

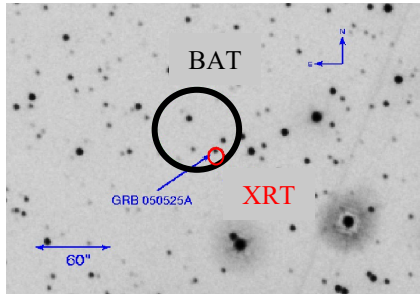
- BAT,  $\gamma$ -rays 15-350 keV
- XRT, X-rays, 0.2-10 keV
- UVOT, opt, 170-650 nm

Rapid slewing spacecraft

Launch November 20, 2004



UVOT Position -  $< 1$  arcsec



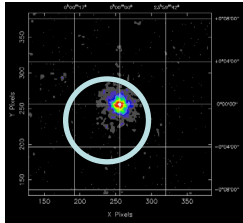
**T < 2 min**

BAT Position - 2 arcmin



**T < 10 sec**

XRT Position - 5 arcsec



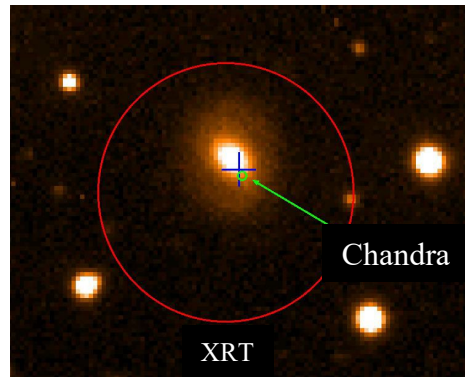
**T < 90 sec**



# Short GRBs: NS-NS Mergers

First afterglow  
and identification  
from *Swift*

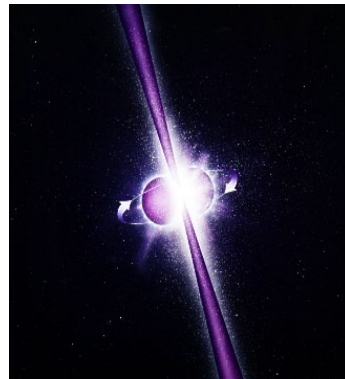
**GRB 050724**  
elliptical host



In non-star  
forming galaxies

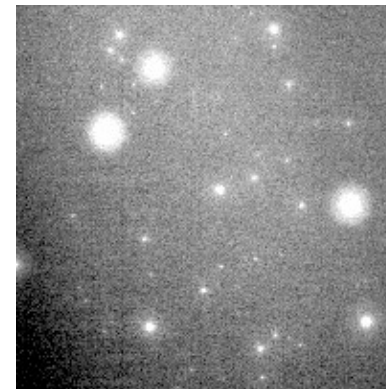
**No supernovae**

**Merger model**



# Long GRBs: Massive Star Core Collapse

**GRB 080319B**  
"naked eye: burst

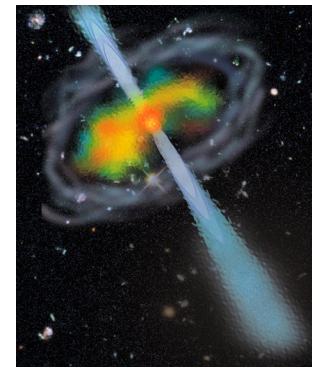


Brightest objects  
in universe:  
- 5.5 magnitude  
@ 7.5 billion lt yrs

In star forming  
galaxies

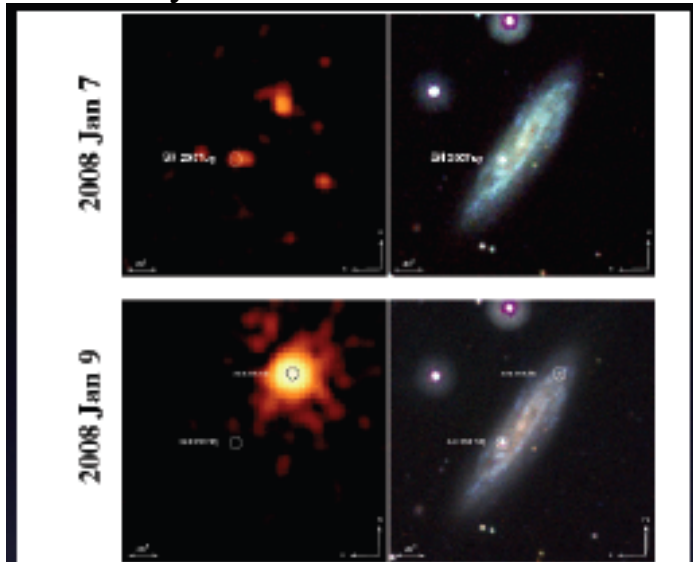
**Accompanied by  
supernae**

**Collapsar model**



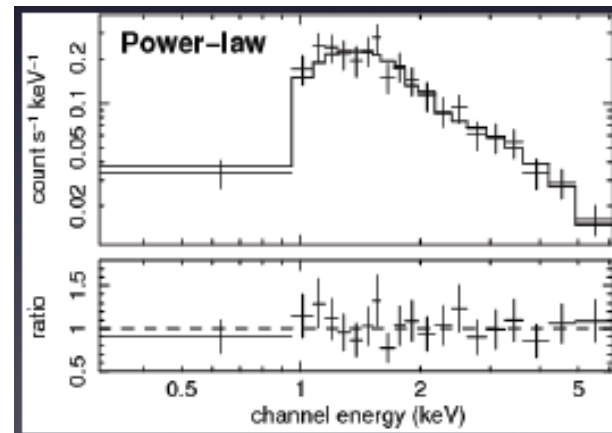
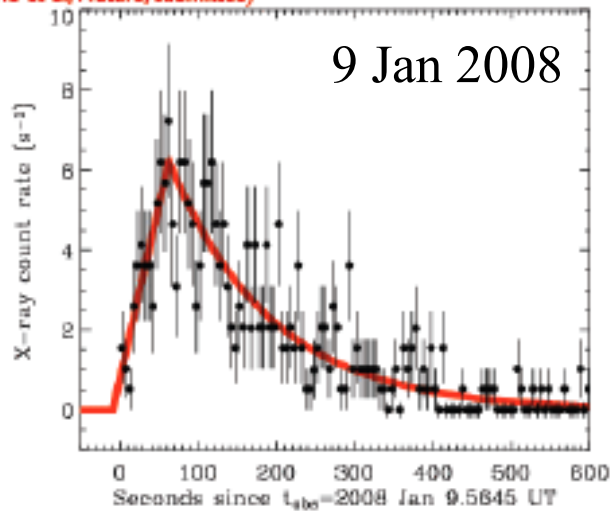
# SN 2008D Shock Breakout

SN 2007uy



- XRT monitoring of NGC 2770 (27 Mpc) revealed extremely luminous X-ray outburst
- No BAT detection (i.e., not a GRB)
- UVOT detection of SN rising 90 min later
- Supernova 2008D
- Shock breakout. May occur for all SN

(AMS et al, Nature, submitted)



Soderberg et al. 2008