

# Formal Education for the aLIGO Era

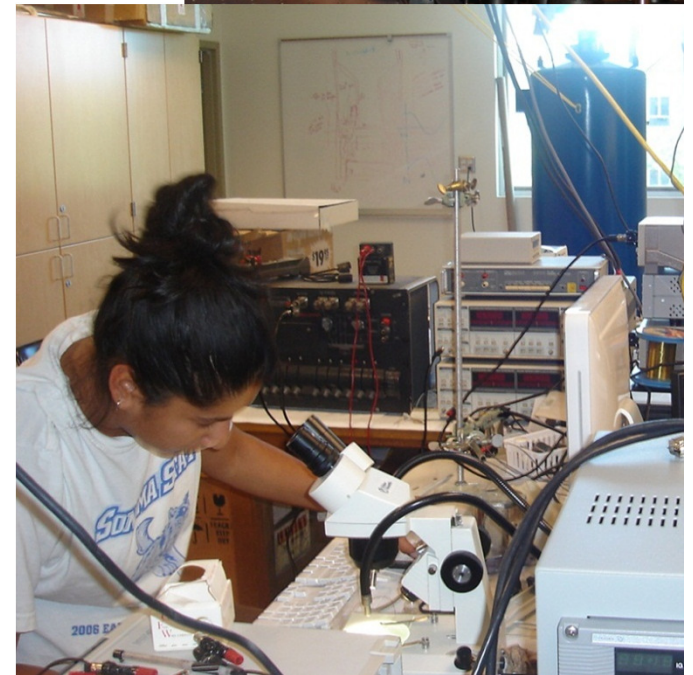
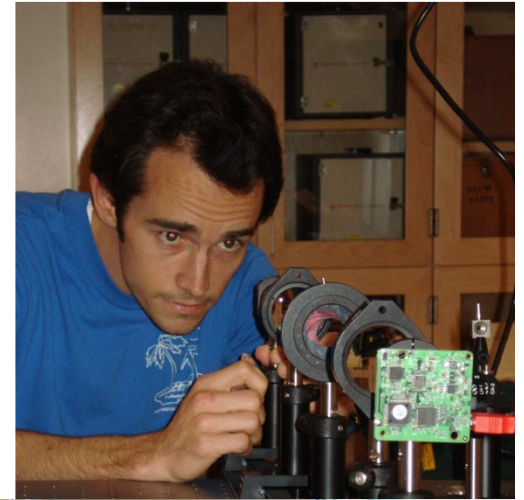
Prof. Lynn Cominsky  
Sonoma State University  
Director, Education & Public Outreach

LIGO-G1100149-v1



# Sonoma State University

- Part of the California State University System
- Physics & Astronomy Department graduates about 10 students each year
- We are the “liberal arts & sciences” campus within the CSU system
- About 8000 Full Time Equivalent Students
- I am the chair of the department, as well as directing the Education & Public Outreach group



# A bit more about me...

- High energy astrophysics research since 1975, beginning with work on the Uhuru satellite before I went to graduate school at MIT
- Author on over 100 papers in refereed journals
- Discovered pulsations from 4U0115+63 – first transient shown to be in a binary system
- Discovered eclipses from MXB1659-29 – first x-ray burst source shown to be in a binary system
- Discovered x-ray emission from PSR 1259-63 – first radio pulsar shown to be in an x-ray binary
- Scientific co-investigator on *Swift*, *Fermi* and *NuSTAR*

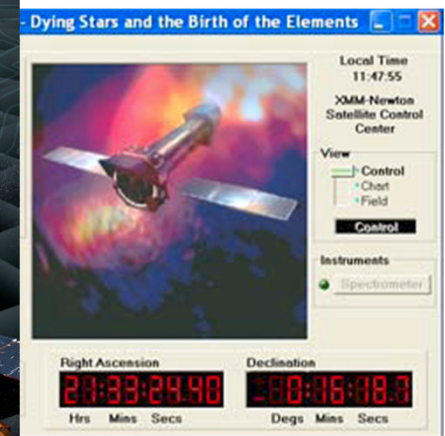
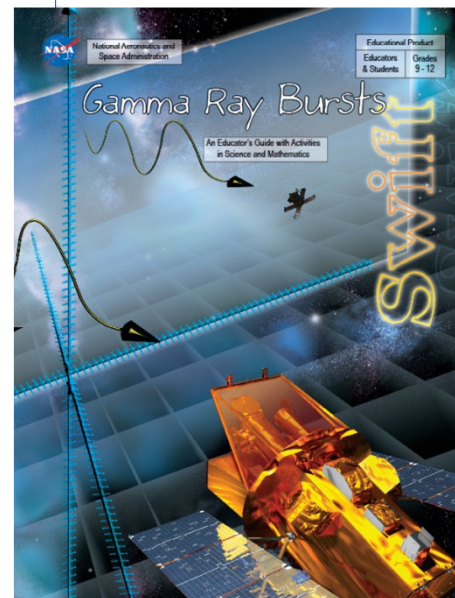
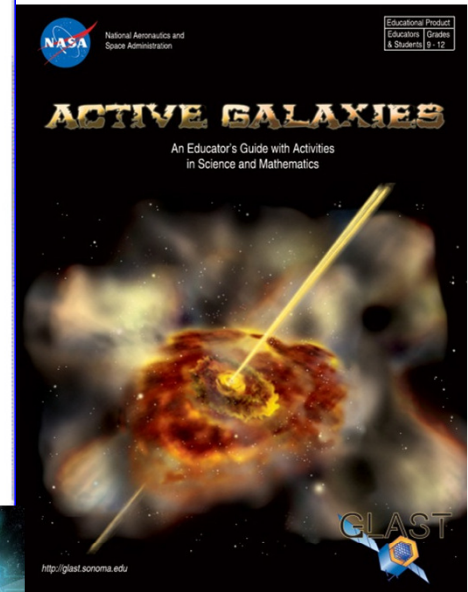
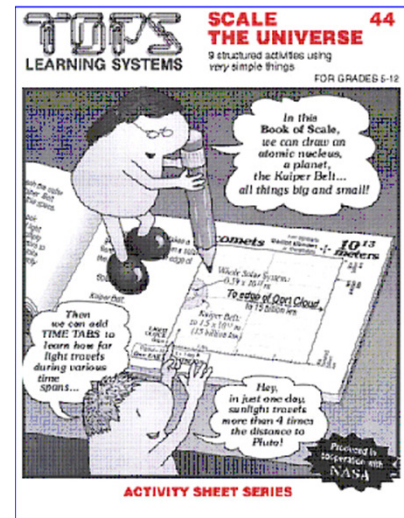
# Education & Public Outreach

- Founded in 1999 – goal is to use excitement of astrophysics to inspire and engage students, as well as increasing literacy of general public
- We lead the E/PO programs for the *Fermi*, *Swift*, *XMM-Newton* and *NuSTAR* missions
- We are also developing an online course in Cosmology at a general education level
- Over \$10M in funding from NASA to date



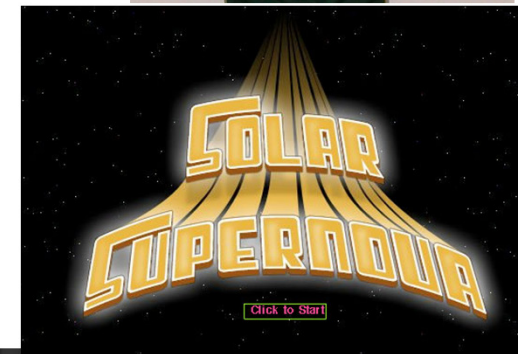
# Formal Education

- Active Galaxies
- Gamma-ray Bursts
- Supernovae
- Newton's Laws
- Invisible Universe: From Radio Waves to Gamma Rays
- 3 guides with TOPS – use science to teach math
- CLEA lab – Dying Stars and the Birth of the Elements

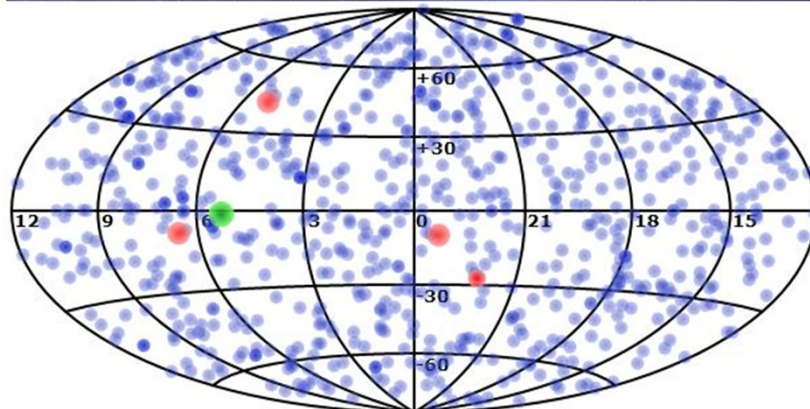


# Informal Education

- Model booklets – Fermi and Swift
- Space Mysteries – 5 interactive videogames that teach math and science
- Black Hole Rescue – with JPL’s Space Place
- Fermi LAT Simulator
- Epo’s Chronicles – weekly webcomic



- PBS NOVA “Monster of the Milky Way”
- “Black Holes: The Other Side of Infinity” planetarium show at the Denver Museum of Nature & Science and many other places
- GRB Skymap website – user friendly view of GRB sky



**Burst ID:** GRB 100122A  
**Burst date:** 2010/01/22  
**Burst time (UTC):** 14:47:37.31  
**Detecting mission:** Fermi

**Burst summary:**  
 "This burst had two pulses, the first a weak one, followed by a much stronger one beginning 21 seconds later and lasting 6.6 seconds. The spectrum is fit by a Band function with alpha = -0.98 +/- 0.05, beta = -2.31 +/- 0.03 and

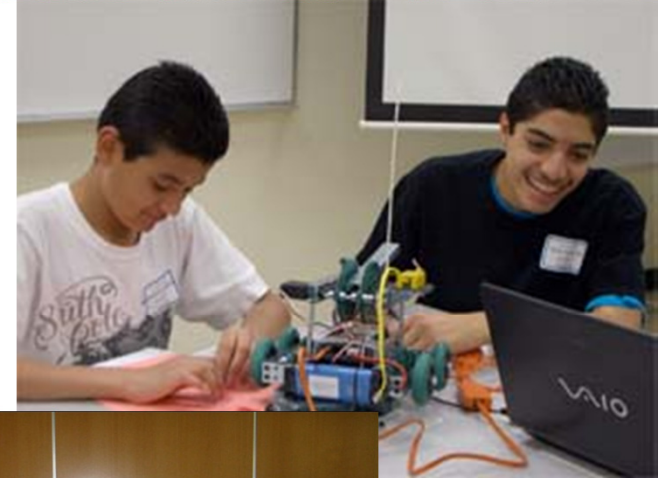
[Click the GRB to learn more...](#)

Burst ID	Date	Time	Mission
GRB 100224B	2010/02/24	02:40:55.48	Fermi
GRB 100223A	2010/02/23	02:38:09.31	Fermi
GRB 100131A	2010/01/31	17:30:57.67	Fermi
GRB 100122A	2010/01/22	14:47:37.31	Fermi

● Burst < 7 days old   ● Burst > 7 days old   ● Burst > 60 days old   ● Selected burst

# Working with students and teachers

- Educator Ambassadors – have trained over 50,000 teachers nation-wide
- After-school clubs at four local schools
- Authentic research experiences for HS and college students using the Global Telescope Network





# Formal Education for aLIGO era

- LLO and LHO both work with many teachers who request classroom-ready, standards-aligned materials.
- SSU E/PO has considerable experience developing educator's guides for middle and high school.
- We also have a teacher's network through which to distribute these materials nation-wide (at educator's conferences).
- Developing an aLIGO-inspired educator's guide would be our main work product for the next 3 years (once funded).
- We would also pilot some of the materials with the Educator Ambassadors at the training in Summer 2012 as part of the formative evaluation process through a 2-day "mini-workshop" on gravitation. The workshop materials will then be available online to other interested educators or professional development providers.
- I have discussed these ideas with NSF program officers and they are interested in reviewing a white paper and a proposal.

# Interested in more?

- Here are the links to my group's websites:
  - <http://epo.sonoma.edu> – main site
  - <http://fermi.sonoma.edu>
  - <http://swift.sonoma.edu>
  - <http://xmm.sonoma.edu>
  - <http://mystery.sonoma.edu>
  - <http://gtn.sonoma.edu>
  - <http://grb.sonoma.edu>

