LIGO

LIGO Livingston Observatory

Mark Coles

Observatory Head

LIGO Livingston Observatory

California Institute of Technology

LIGO Program and Mission of the LIGO Laboratory

- *observe gravitational wave sources;*
- develop advanced detectors that approach and exploit the facility limits on interferometer performance;
- operate the LIGO facilities to support the national and international scientific community;
- support scientific education and public outreach related to gravitational wave astronomy.

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LIGO Plans

schedule

1996	Construction Underway (mostly civil)
1997	Facility Construction (vacuum system)
1998	Interferometer Construction (complete facilities)
1999	Construction Complete (interferometers in vacuum)
2000	Detector Installation (commissioning subsystems)
2001	**Commission Interferometers** (first coincidences)
2002	Sensitivity studies (initiate LIGO I Science Run)
2003+	LIGO I data run (one year integrated data at $h \sim 10^{-21}$)
2006+	Begin ‘advanced’ LIGO installation

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LLO Status

- Construction complete
- All equipment installed
- Systems integration and test nearly complete
- Engineering studies continue through 2001
- Scientific data taking for 3-4 years begins in 2002
- Major upgrade planned for 2006
  - » 1000X increase in astrophysics event rate
  - » Advanced R&D and design engineering to be undertaken in parallel with scientific data taking

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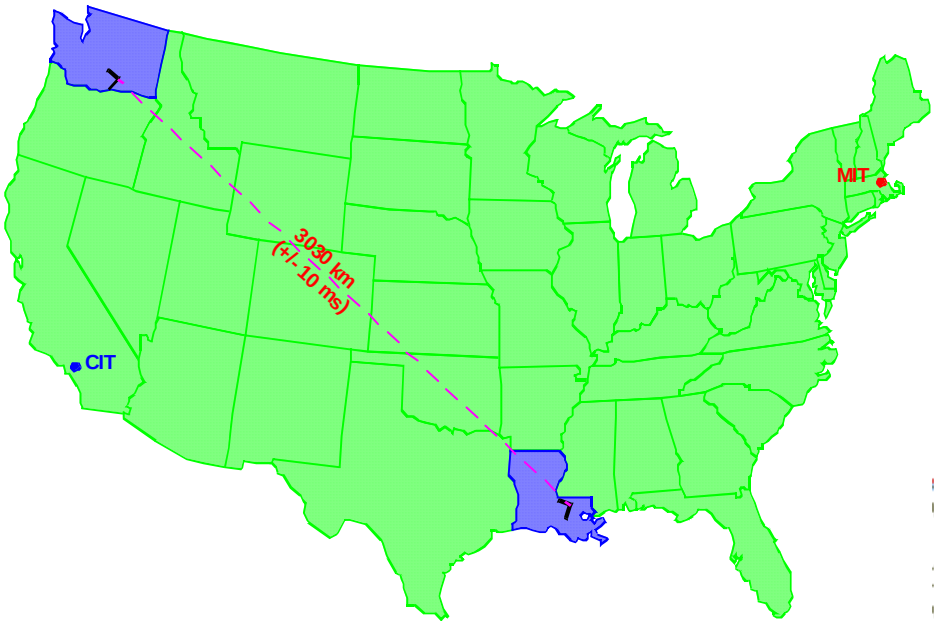
LIGO Locations



Approximately 2 million people with 90 minute drive

5 miles north of I-12 - major EW interstate – part of I-10 transcontinental route from Florida to California

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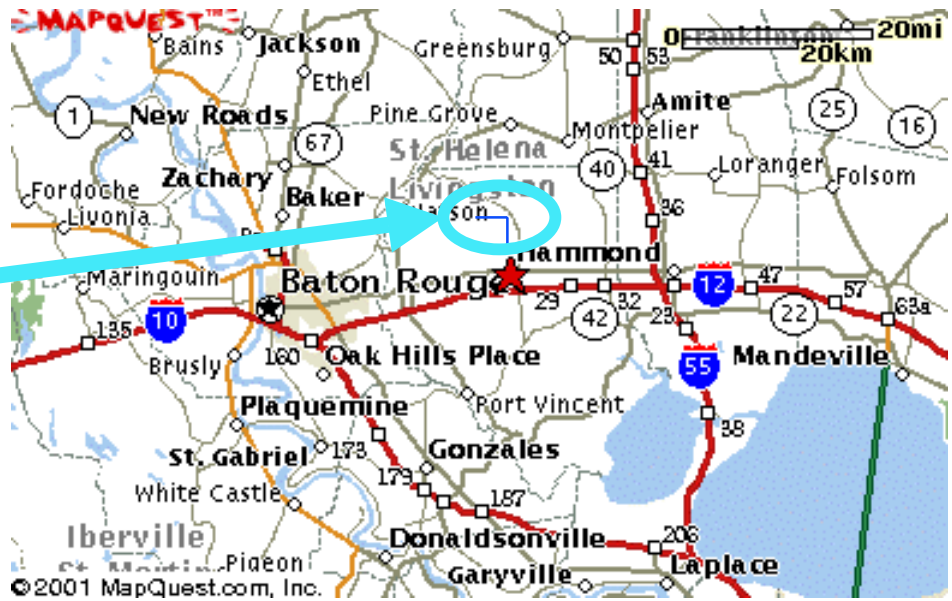

Need for Scientific Education and Public Outreach

- Louisiana ranks last in the US in per capita research activity
- Louisiana scores on Iowa Tests of Basic Skills exceeded only Washington, DC and the US Virgin Islands
- Only 5% of New Orleans first graders will enter college

Regionally, K-12 education needs help!

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Vision

- We can make a difference by partnering with other institutions to promote science education.
- Each institution should do what they can do best
  - » LIGO
    - – scientific facilities and research environment
    - – Educational outreach activities to the community
  - » Local institutions:
    - Connections to formal education
    - Teacher pre-service and in-service

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Observatory Facilities and Staff

- Approximately 25 scientists and engineers resident at each LIGO site (30+ during full 24x7 operation)
- Joint faculty appointments with U of Florida, SLU
- 5-10 scientific visitors from Caltech and MIT and other universities resident for periods of weeks up to one year
- Regular visitors from local universities

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Facilities…

- Summer program for undergraduates
  - » This year about 20 students worked at Livingston during the summer
- Summer teacher program
  - » Pilot program at LLO last summer
- Laboratories and shops to conduct supporting research and development
- 2x-T1 internet (to be upgraded to OC3)
- 156 seat auditorium
- 16 inch telescope with web access (provided by Louisiana)

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Collaborating Institutions

- Approximately 30 institutions world-wide are part of the LIGO science collaboration.
- This brings regular visits by some of the world's top scientists and universities to an area that has had little access to first rate research programs and facilities
- LIGO encourages the participation of additional institutions in the science collaboration, particularly those in the regions close to each of the LIGO sites.
- Presently participating Louisiana institutions:
  - LSU
  - Southern Univ. of Baton Rouge *(a unique opportunity!)*
  - Louisiana Tech Univ.
  - Southeastern Louisiana Univ.
  - Loyola University
- Others welcome!

Educational Outreach

- Field trips by community and professional groups at both sites
- More than 3,000 visitors in last year at LLO (mostly school classes), 750 on one day during public open house
- Teacher open houses in summer and winter, more than 100 middle and high school science teachers in Livingston Parish have toured LIGO as part of teacher in-service
- LLO has hosted participants in Southern University's Timbuktu Academy and SEMIT programs

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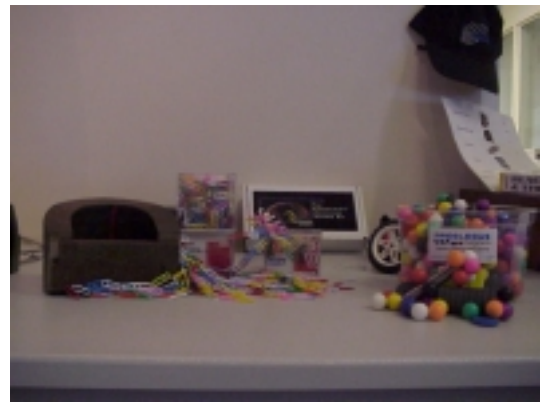
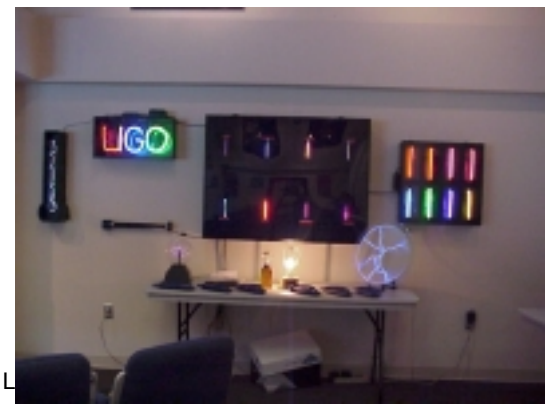
Hands-on exhibits for visitors



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Pilot teacher program at LLO in 2001:

Wilson Doucette and John Thacker

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Educational Partnerships

- Pilot program in place at Northwestern State Univ. to develop web-based curriculum materials related to LIGO
- Strong relationship with Southern University to promote community and K-12 outreach in African-American community (a tremendous opportunity!)
- Southeastern Louisiana University – the largest teacher training program in La, is only 17 miles away (joint faculty appointment already in place)

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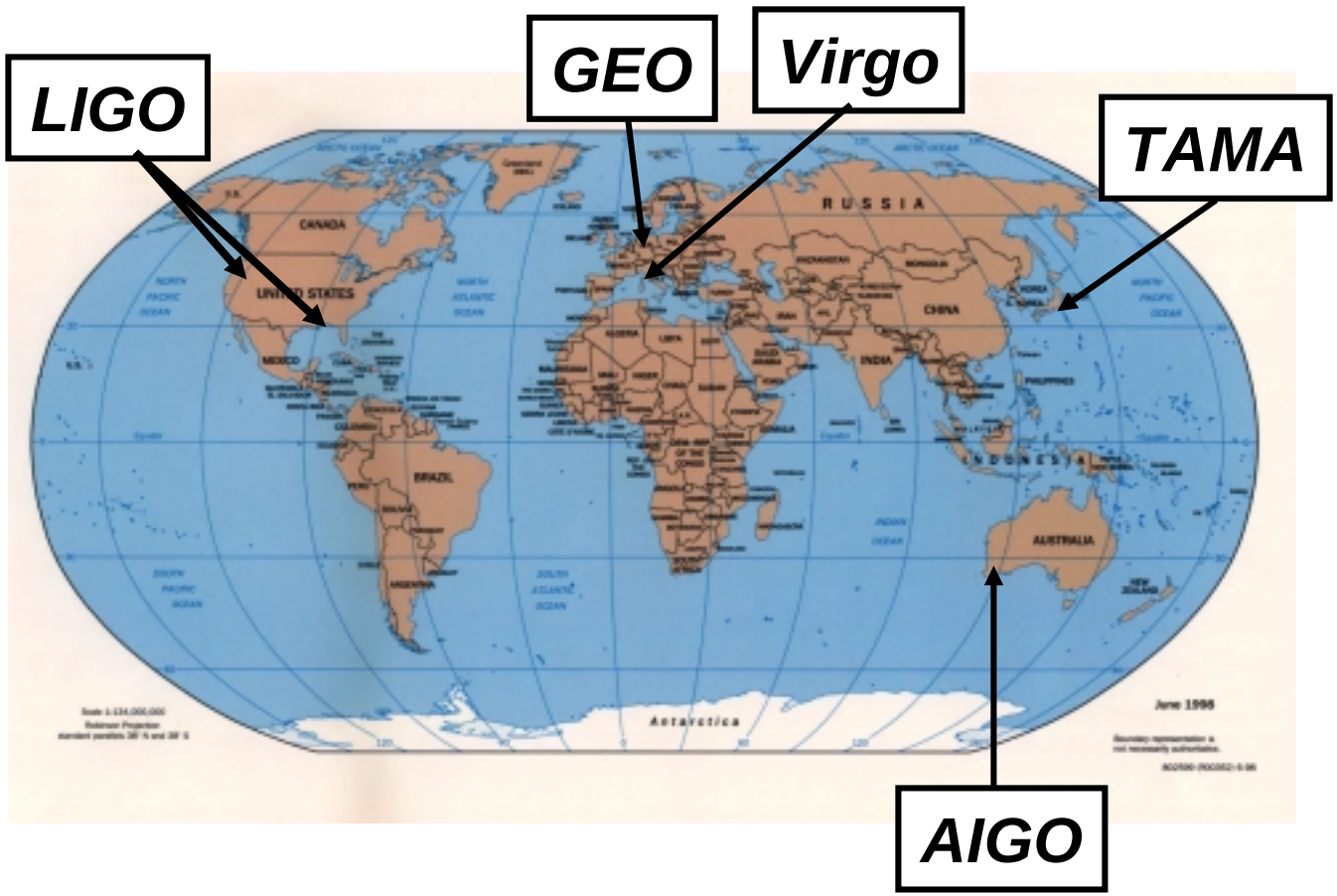
International Education Collaboration Example: Western Australia and Italy



Broad band networks utilized for cultural interactions

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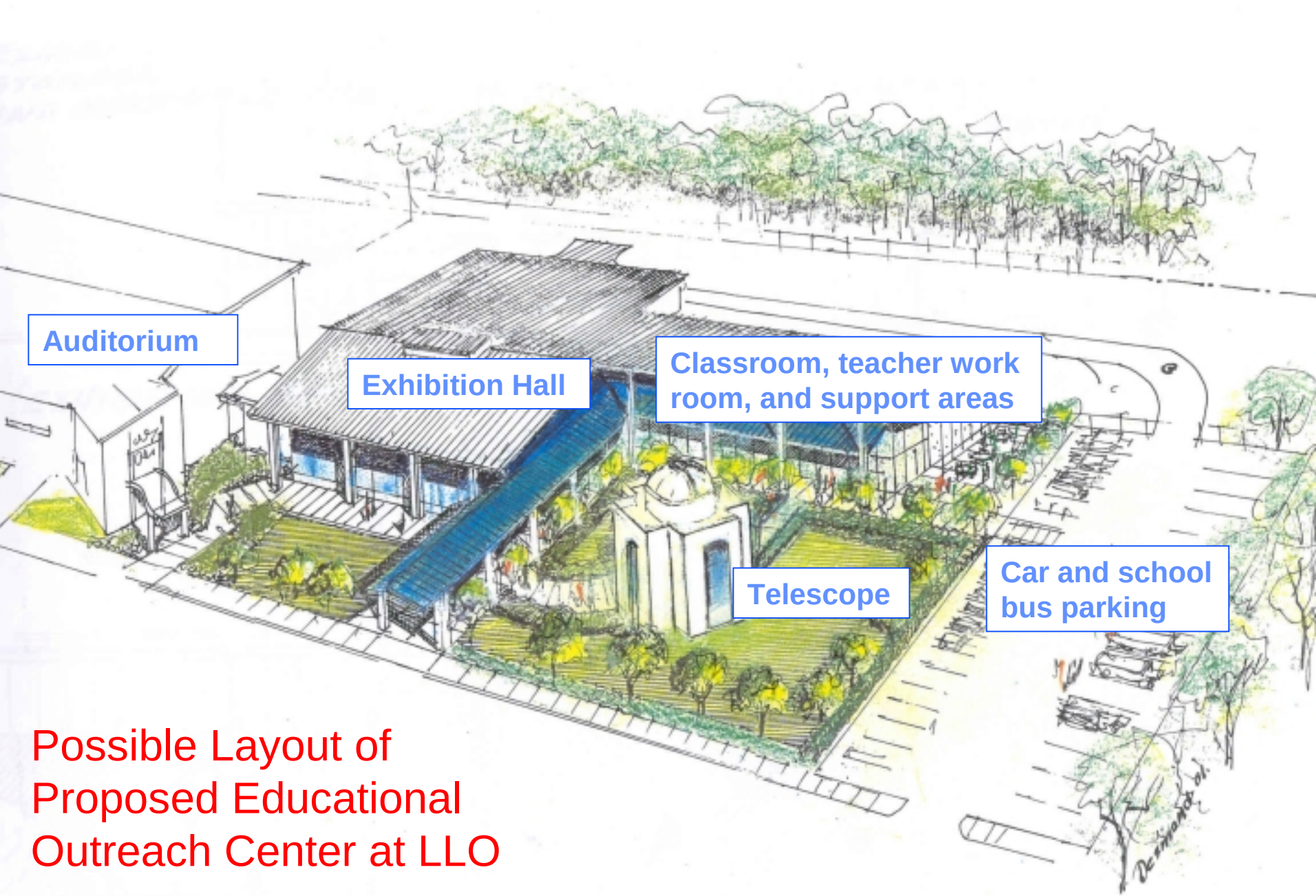
Outreach Center

- Want to establish an outreach center at LIGO Livingston Observatory along the lines of centers at Arecibo, Lowell Observatory, MacDonald Observatory.
- Center mission:
  - » Host site visitors with hands-on exhibits and science classes (similar to NSF-funded Arecibo and Lowell Observatory centers).
  - » Teacher in-service training and support for classroom enrichment (also like Arecibo and Lowell Centers).
  - » Host a modest school-to-work program for vocational training.
- We would like to partner with other education organizations to help create, operate, and utilize the proposed center.



Possible Layout of Proposed Educational Outreach Center at LLO

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Summary

- LIGO is committed to strengthening science education at the K-12 and university levels and wants to partner with universities, local school systems, and regional science centers to do this