LIGO Lab Education & Public Outreach






Fred Raab,

LIGO Hanford Observatory, 23-Jul-09

Outline:

- Why we became what we are
- LIGO Livingston Observatory programs
  - » Reminder of ongoing resources/activities
  - » Changes and new ventures
- LIGO Hanford Observatory programs
  - » Reminder of ongoing resources/activities
  - » Changes and new ventures

Observatories are special opportunities for local and regional education

- Technical requirement to situate sophisticated science in rural areas, which happen to have large under-served populations (~45% of K-12 visitors)
- An emphasis with founding leadership, but a number of technical hurdles needed to be overcome
- Under the initial LIGO operations the core of a very successful program has been built
- Have capitalized on local targets of opportunity, so observatories have common goals and collaborate well, but have focused early development in complementary ways

LIGO outreach programs at Observatories connect the public to LIGO science

LIGO outreach uses the excitement, grandeur and intimacy of the Observatory sites to promote science interest and science literacy among all ages. Every visitor meets the people who make the science. (“Nerds in their natural environment.”)

LIGO's education efforts are focused by our Local Educator Networks

- Bring public out to "touch and see" science in the making
- Help schools with teacher training, internships and school tours
- Help us integrate science research into science teaching
- Help the public to value the richness of science

What a science education center means to rural America

- Most children in Louisiana have never met a scientist or an adult who holds a high-tech job.
- Many have never seen a place of business other than a store or (perhaps) a chemical or agricultural plant.
- In our control room, they meet an operator, a staff scientist or engineer, and perhaps visiting scientists, who tell them about LIGO and how one becomes a scientist.
- The kids step right up to the control room desks and computers and there are almost never any behavior issues; the kids ***know*** that this is the real deal, and they pay attention.
- Seeing an impressive science facility in their back yard, they can begin to think of science and engineering as part of their future, something that their neighbors do.
- We tell them to study math and science, and we hope that the programs and exhibits also nudge them in that direction.

Major local outreach components include field trips, on-site public events, off-site activities and teacher professional development programs

Outreach activities engage the ethnically diverse populations that surround the Observatories

Reminder of resources and activities at LIGO Livingston Observatory

- LIGO Science Education Center
- Major Partners

Livingston Science Education Center

- Flagship facility for LIGO EPO
- 9000 ft^2 adjacent to auditorium
- 5000 ft^2 of exhibit hall space with more than 40 exhibits
- Exhibit and classroom activities
- Programs for
  - **K-12 visits**
  - **Teacher Professional Development**
  - **Public/family outreach**
- Winner of AIA New Orleans 2007 Design Award

LIGO Science Education Center illustrates the power of partnerships

LIGO Science Education Center

Exploratorium Exhibits & Training

Docents in Training from Southern University Education Program

LA GEAR UP provides access to low performing schools

Professional development at LSEC

- Strengthen content knowledge and inquiry skills for in-service teachers as well as raising new generation of pre-service teachers
- Exploratorium provides not only exhibits, but training through Center for Informal Learning and Schools in use of exhibits either at a science center or in school
  - » LSEC exhibits (“full-meal deal”) have corresponding “snacks”, costing <$20 that teachers can use in school instruction
  - » “Snacks” are very important to LA teachers, who typically have very poor classroom resources for science instruction
  - » Trained our education staff as trainers
- Leveraged through partner Math & Science Partnerships (MSPs)

Educational Research

- Work thus far focuses on students' attitudes toward science, the people who do science, its utility, its process and personal interest.
- Results show a marked increase in students' personal interest in science and their views of science and scientists.
- This and similar work is done in cooperation with a Tulane psychology faculty member, Dr. Lisa Szechter, and has resulted in:
  - » 1 MS thesis
  - » 1 BS honors thesis
  - » Several scholarly papers and presentations

LLO Data for 2008 calendar year

- 4448 students were reached by the SEC
- 676 Teacher Professional Development days
- More than 600 public visitors

Challenges, Opportunities & Changes at LIGO Livingston Observatory

- Staff turnover
  - » Planned steady-state staffing is 3.5 FTE
  - » Had two resignations last year (lead + ass't educator)
  - » Kudos to Kathy Holt and Amber Stuver for keeping program going
  - » Have now filled lead position and offer out for ass't educator
- New operations proposal pending
  - » Supplies continued operating funds for partners and development of roving exhibits
  - » No funding coming to LIGO; Baton Rouge Area Foundation will be institution with J. Giaime as PI
  - » LIGO will supply labor for PI, educators and administration through Lab ops funding
  - » NSF review panel visited in Feb09 and commented positively

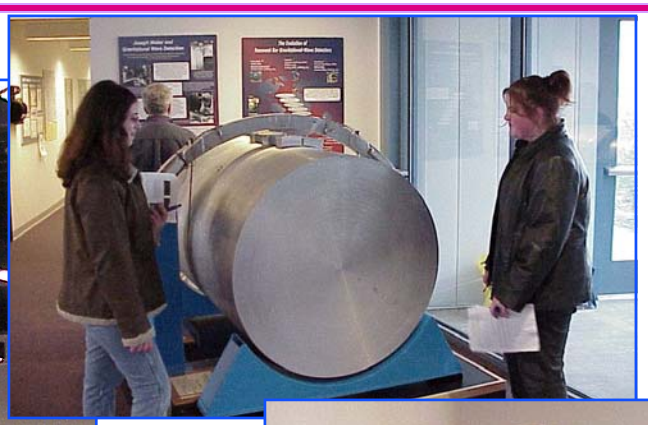
Reminder of resources and activities at LIGO Hanford Observatory

- Major Partners
- Ongoing programs

LIGO Hanford programs also rely on partnerships to fuel growth

LHO outreach received state and local awards in 2007 & 2009

Inquiry-friendly exhibits illustrate breadth of "LIGO science", tied to state standards



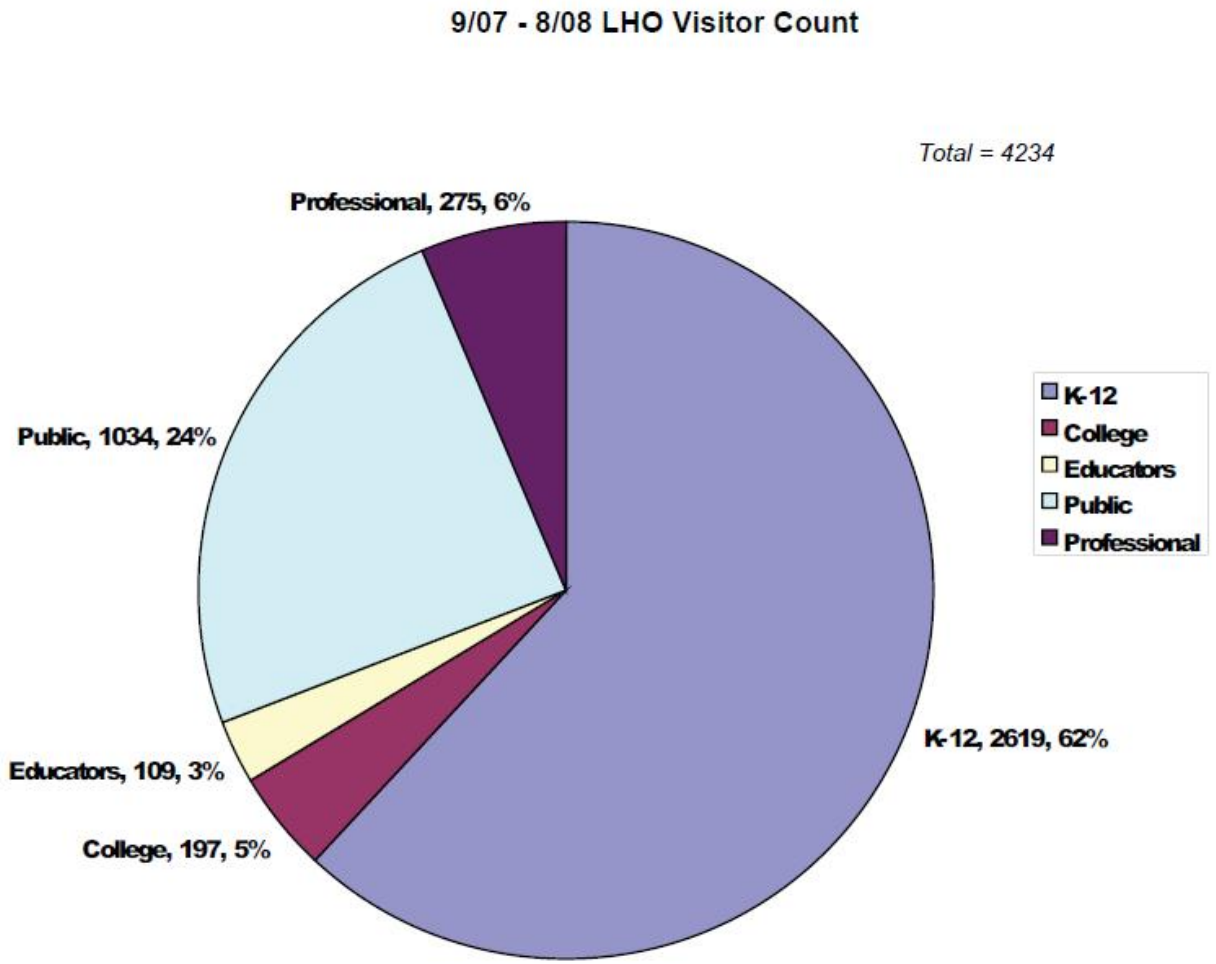
Professional development: WSU-TC T&L 571, *The Nature of Scientific Inquiry*

Going beyond "hands-on" to "minds-on" teaching

Emphasizing the Nature of Scientific Inquiry

- WSU graduate course (T&L 571) for in-service teachers
- Intensive and immersive “summer academy” (a.k.a. “boot camp”) for science inquiry
  - » 2 weeks full day at LIGO Hanford + significant readings and papers
  - » Development of individual instruction improvement plans
- Started up using solely NSF funds; now leveraged by Math Science Partnership award to ESD123
  - » Award from WA State Office of Superintendent of Public Instruction, using US Dept. of Education funds provides strong coupling to public K-12
  - » Instructors from LIGO, WSU and Columbia Basin College with assistance from corps of master teachers we develop
  - » Focused on districts with high ratios of “at risk” students
  - » Focus on teachers in grade bands 4-8
  - » Summer academy + 4 academic-year follow-up workshops + 2 classroom observations and coaching
  - » Professional evaluation firm + continued academic research

Hanford Observatory outreach attendance



Additional off-site activities served 5936 in the same time period.

Challenges, Opportunities & Changes at LIGO Hanford Observatory

- Under-staffed
  - » One educator, serving an audience of more than 10,000, plus PR and national-scale support (e.g., I2U2 and Einstein's Messengers), is totally saturated
  - » Facilities are becoming a limiting factor (capacity + efficiency)
  - » Growth rate has been steady at 15-20%/yr for many years
  - » Local service area (700,000 residents, all under-served by science education facilities and 40% "minority") affords opportunity for continued growth for many years
- Mitigating challenges and moving forward
  - » Search ongoing for assistant educator
  - » Worked through LSC Excom to get LSC_EPO started
  - » Proposal pending to construct LIGO Exploration Center (LExC)
  - » Diversity initiatives

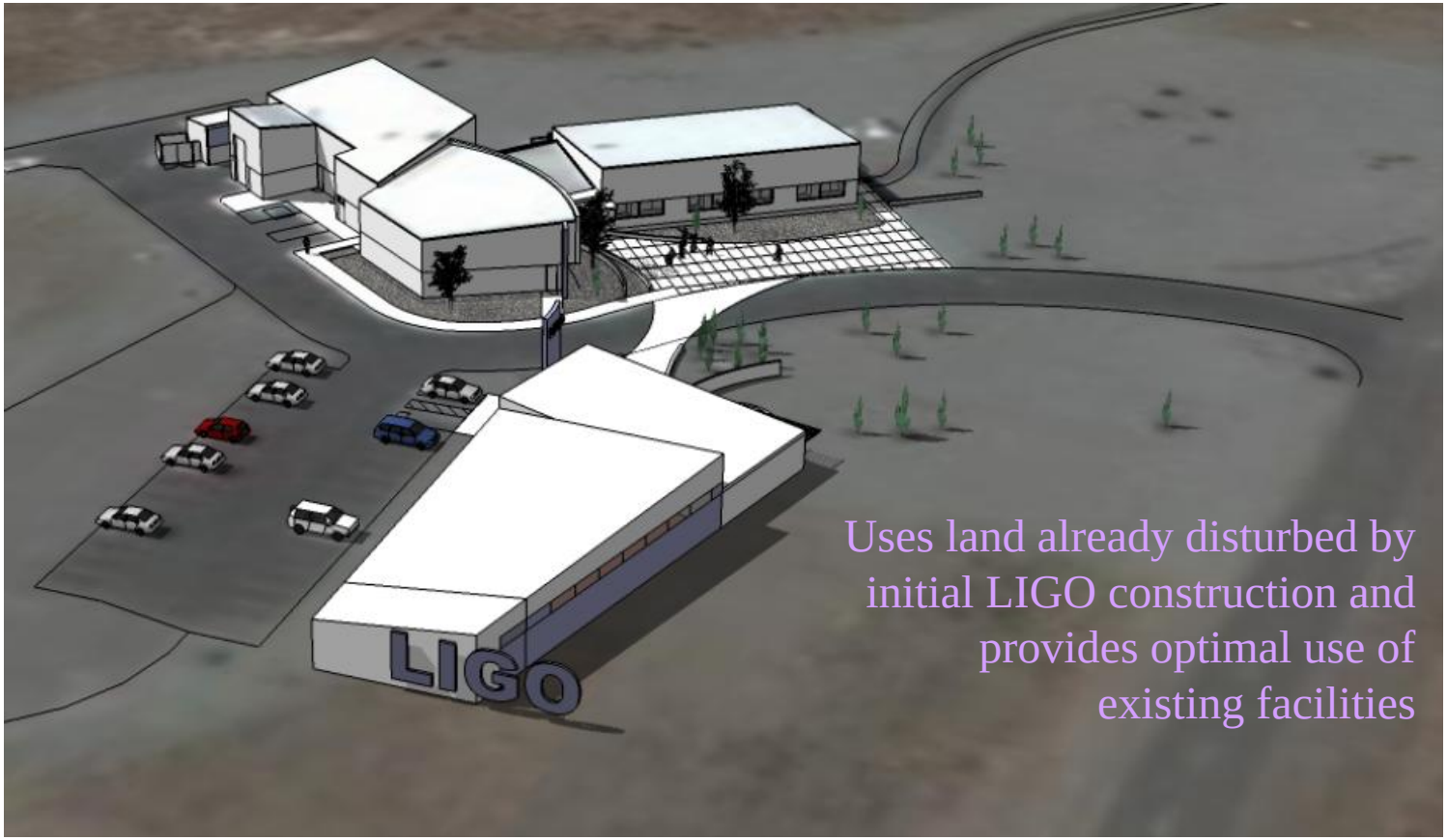
LIGO Scientific Collaboration EPO Working Group

- In addition to LIGO Lab, individual LSC groups have many independent EPO efforts on appropriate scales
- Several exemplary efforts, for example
  - » University of Texas, Brownesville annual summer school programs in GW detector science and “physics carmival” activities
  - » Penn State development of radio programs on gravitational wave science – both English and Spanish language versions
  - » Southern University work with Timbuktu Academy and LSEC
- LSC has recently formed an EPO working group to coordinate these varied outreach efforts and to build the LIGO national and international education and outreach efforts (see Marco Cavaglia’s PAC talk)

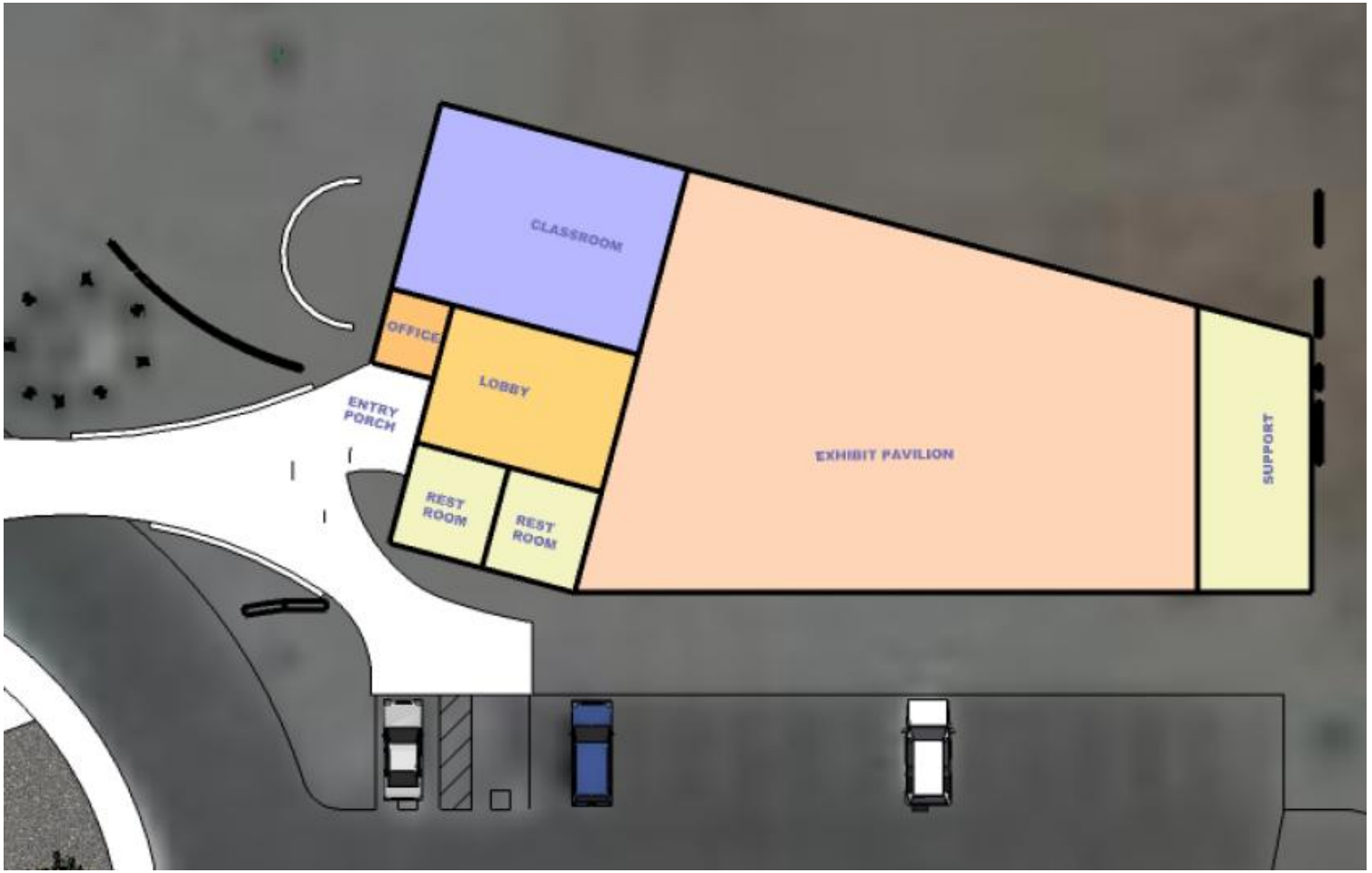
The LexC Partners will help LIGO expand program quality and numbers served

- WSU TC:
  - Dept. of Teaching and Learning: Teacher PD, education research, LExC volunteers
  - WSU Early Outreach: School field trips, extended student activities, family outreach, teacher PD
- CBC: Docent/intern candidates
- YV/TC MESA: School field trips, extended activities, family outreach, teacher PD
- ESD123: School field trips, partners on teacher PD and family outreach
- Exploratorium: Exhibits and training

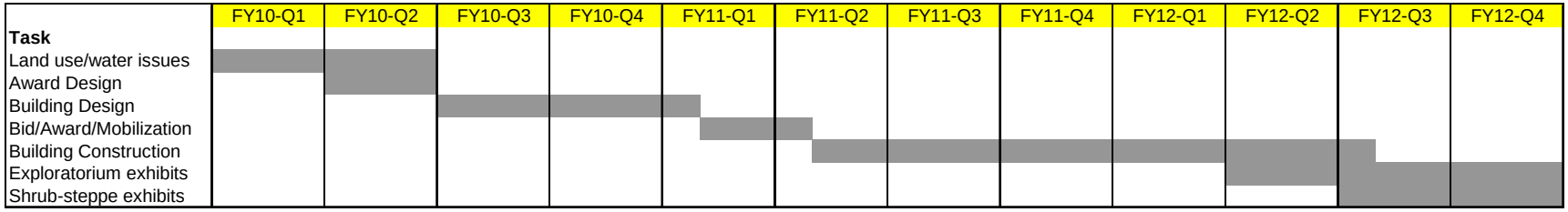
LExC will occupy a new building across from LHO LSB



LExC Floor Plan



LExC construction scheduled to “hide” inside AdLIGO installation



LIGO Lab values diversity as essential to the creative process of science.

- Diversity Officer and Diversity Committee in place and Lab Diversity Plan drafted.
- Tracking system to measure progress under development.
- Online staff poll on workplace issues under development.
- Procedure for routine postings of job searches to strategic online sites begun in collaboration with HR.
- Decision to modify Employee Performance Reviews to explicitly include diversity accomplishments starting in 2009.
- Decision to provide special support for travel that advances promotion of diversity.
- Annual exhibitions at annual meetings of NSBP/NSHP, SACNAS and AISES have raised LIGO awareness through hundreds of personal contacts among minority-rich institutions. Includes coordination with LSC_EPO.
- EPO programs will increase careers emphasis.

LIGO

Summary

- LIGO Observatories, located in rural areas with special needs and under-served/represented cultural and economic groups, are LAB EPO focus
- Strong partnerships bind LIGO Lab and stakeholders in Louisiana and Washington
- Productive programs are in place and growing, but concerns with staffing and facilities have needed attention
- A couple of NSF proposals are pending with big potential impacts for the future of LIGO Lab EPO
- LSC_EPO is now providing the focus and muscle for national and international EPO that has not been supportable through Lab efforts alone