

# LIGO Education and Outreach

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LIGO Livingston Observatory



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# Overview

- LIGO Lab Outreach

- » Mission
- » LIGO Science Education Center (Livingston, LA)
  - Student Field Trips
  - Teacher Professional Development
  - Public Tours and Open Houses
  - Docents
  - Educational Research
- » LIGO Exploration Center (Hanford, WA)

- LIGO Science Collaboration Outreach

- » Education and Public Outreach



# Mission and Structure

Leverage the scale, technology and science backdrop of the Observatories to create rich visitor experiences:



- » Student field trips integrate hands-on standards-based activities with explorations of LIGO science and technology.
- » Teacher professional development programs emphasize science inquiry along with key LIGO science concepts.
- » Programs for the general public address a variety of interests and ages.
- » Outreach programs are built on partnerships.

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**LIGO**

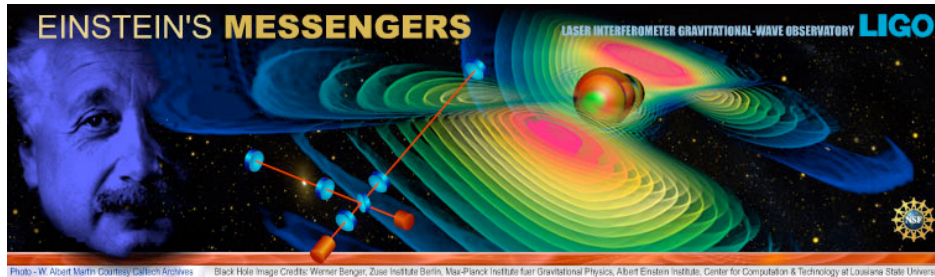
# LIGO Science Education Center (SEC)

- First class outreach program compliments LIGO as an NSF major facility
- Built on a partnership with the Exploratorium, SUBR, LaSIP and La GEAR UP
- Informal learning environment housing 50 hands-on exhibits focusing on LIGO science, all but ~10 made by the Exploratorium
- Exposes students, teachers and the public to LIGO concepts and scientists while being a platform for educational research



# Student Field Trips

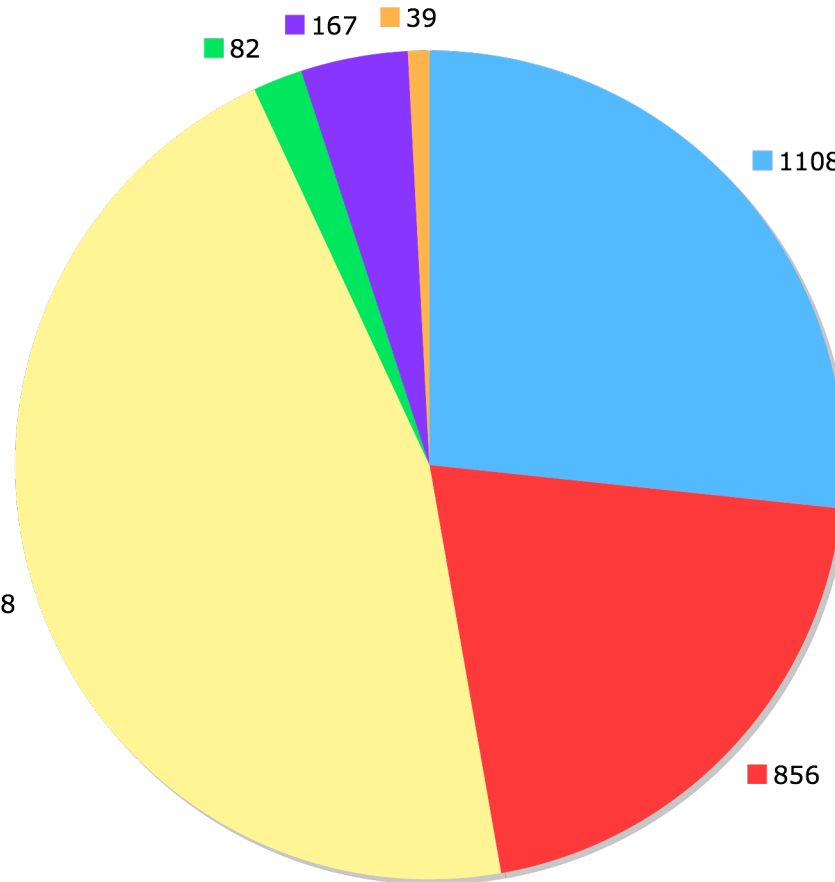
- Teachers prepare students for their visit by showing them the “Einstein’s Messengers” documentary in class.



- During their visit, perform a hands-on classroom activity, tour the facility (including the control room) and Q&A with a scientist and explore the exhibit hall.
  - » Programs are designed to address specific LA Grade Level Expectations (GLEs) and the LA Comprehensive Curriculum.
- After the visit, teachers evaluate the educational value of the visit and suggest improvements.



# Student Visits by Educational Level January 2008 - January 2009

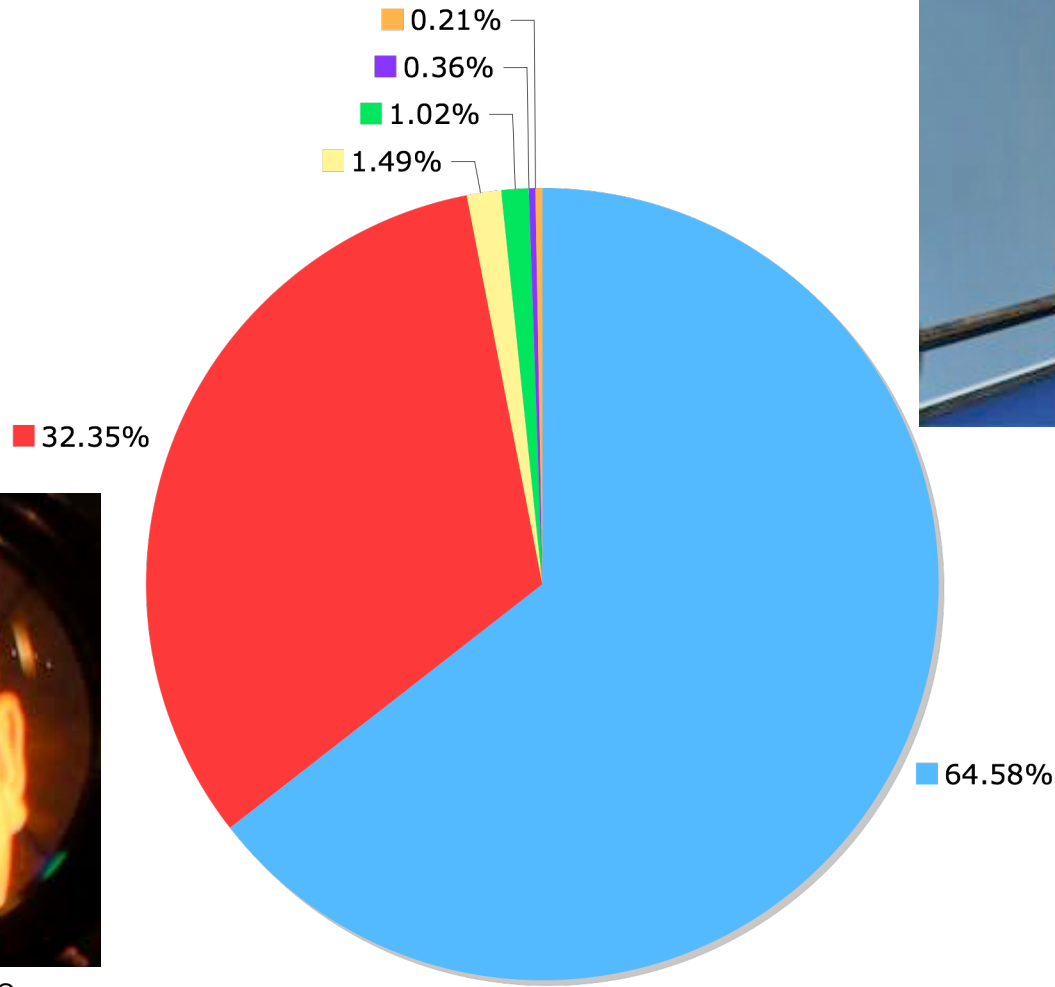


- High School
- Middle School
- Elementary School
- College
- Home School
- Youth Groups





# Demographics of Students Visiting the SEC January 2008 - January 2009



- Caucasian
- African-American
- Asian
- Hispanic
- Pacific Islander
- Other



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# Teacher Professional Development

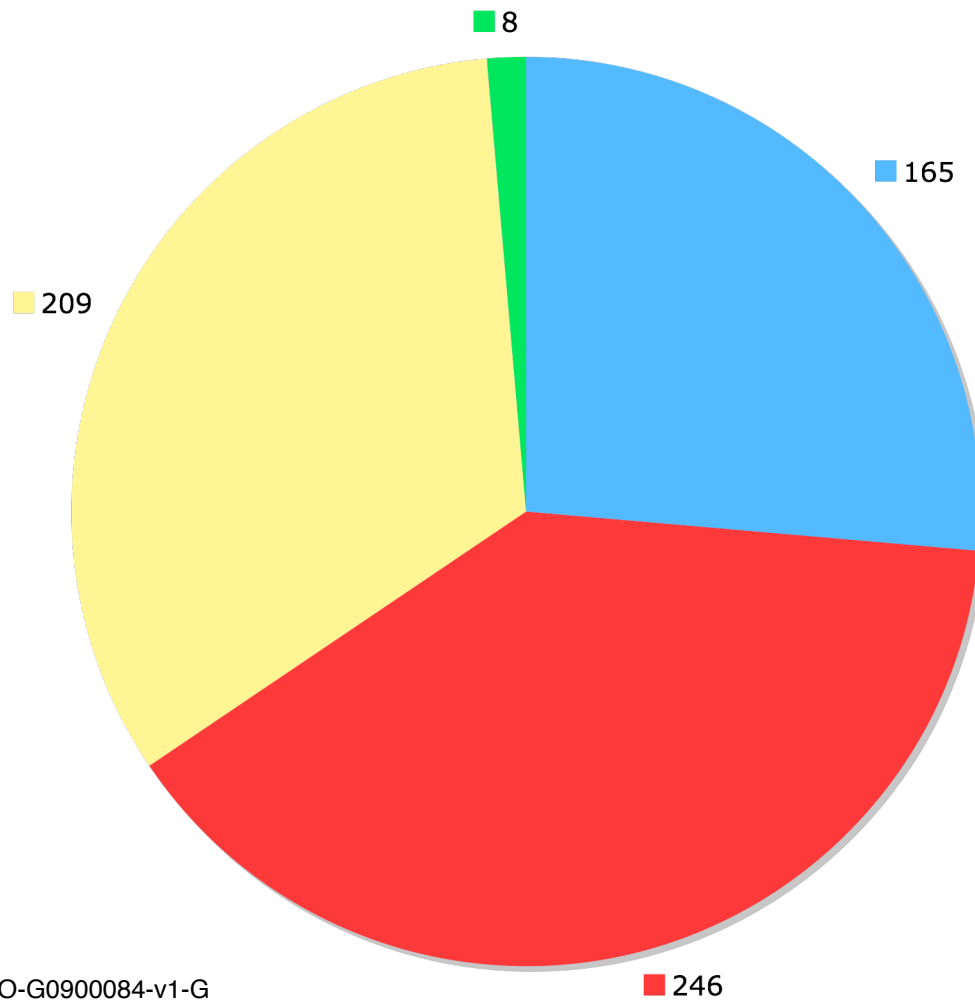
- Professional development (PD) immerses teachers in inquiry based teaching methods of LIGO concepts.
  - » Teachers come to the SEC with PD programs run by universities or local school districts.
- A typical program includes viewing “Einstein’s Messengers,” facility tour and Q&A with a scientist, hands-on activities dealing with LIGO science, and discussion on how to use these activities in the classroom using ‘snacks.’
  - » Programs target specific GLEs and the Comprehensive Curriculum.







# Days of PD at the SEC by Educational Level January 2008 - January 2009



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- High School
- Middle School
- Elementary School
- Other



# Public Tours and Open Houses

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- LIGO welcomes public visitors through reserved tours and open houses.
- These tours showcase the frontier science going on in their ‘backyard’ and the potential it has to see and understand the universe in a new way.
- A typical tour includes a viewing of “Einstein’s Messengers,” a facility tour and Q&A with a scientist, and time to explore the exhibit hall.
- Between Jan. 2008 - Jan. 2009, the SEC has hosted upwards of 600 public visitors.

## Docents



- In cooperation with Southern University - Baton Rouge, undergraduate students in STEM and education majors are trained and serve as docents explaining exhibits to visitors.
- Docents are trained on the SUBR campus in their local “Inquiry Laboratory” (complete with 6 exhibits) as well as on-site at the SEC.
- Docents represent a step in the pathway to being a scientist and serve as role models to students from underrepresented groups in the STEM fields.
- 2 cohorts of docents have completed training (cohort 1: 14, cohort 2: 16) and 15 students have begun training in cohort 3.





# Educational Research

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- 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



# SEC Next Phase

- Create a ‘continuum of engagement’ with students and teachers (in large and small school systems and school systems of varying performance) through repeated encounters.
- Use these repeated encounters perform in-depth studies into effective teaching and learning methods.
- These longitudinal studies benefit all parties: students, teachers, researchers and the public.



# Outreach at the LIGO Hanford Observatory (LHO)

- 15 exhibits (3 made by the Exploratorium) located throughout the facility (auditorium, foyers, multi-purpose room and outdoors)
- Between Sept. 2007 - August 2008, over 4000 people visited LHO for outreach activities and staff made 75 off-site visits to bring LIGO science to almost 6000 people.
  - » Reach out to the local Hispanic and Native American communities
- Activities included summer day camps for students, teacher graduate courses, (bilingual) open houses and star parties



# Proposed LIGO Exploration Center (LExC)

- LIGO seeks to replicate the success of the SEC with a comparable outreach facility at LHO.
- Will capitalize on the knowledge base that exists from the development of the SEC
- Plans to utilize the time window created by AdvLIGO construction for the LExC facility construction





# LExC Partnerships

- Exploratorium
  - » Provide training and exhibits
- Columbia Basin College
  - » Provide docent candidates from underrepresented groups
- Educational Service District 123
  - » Facilitate student fields trips, teacher PD and public outreach
- WA Mathematics, Engineering and Science Achievement (MESA)
  - » Facilitate student and family use of the center
- WSU Tri-Cities
  - » Collaborate with PD and facilitate student and family usage of center







**LIGO**



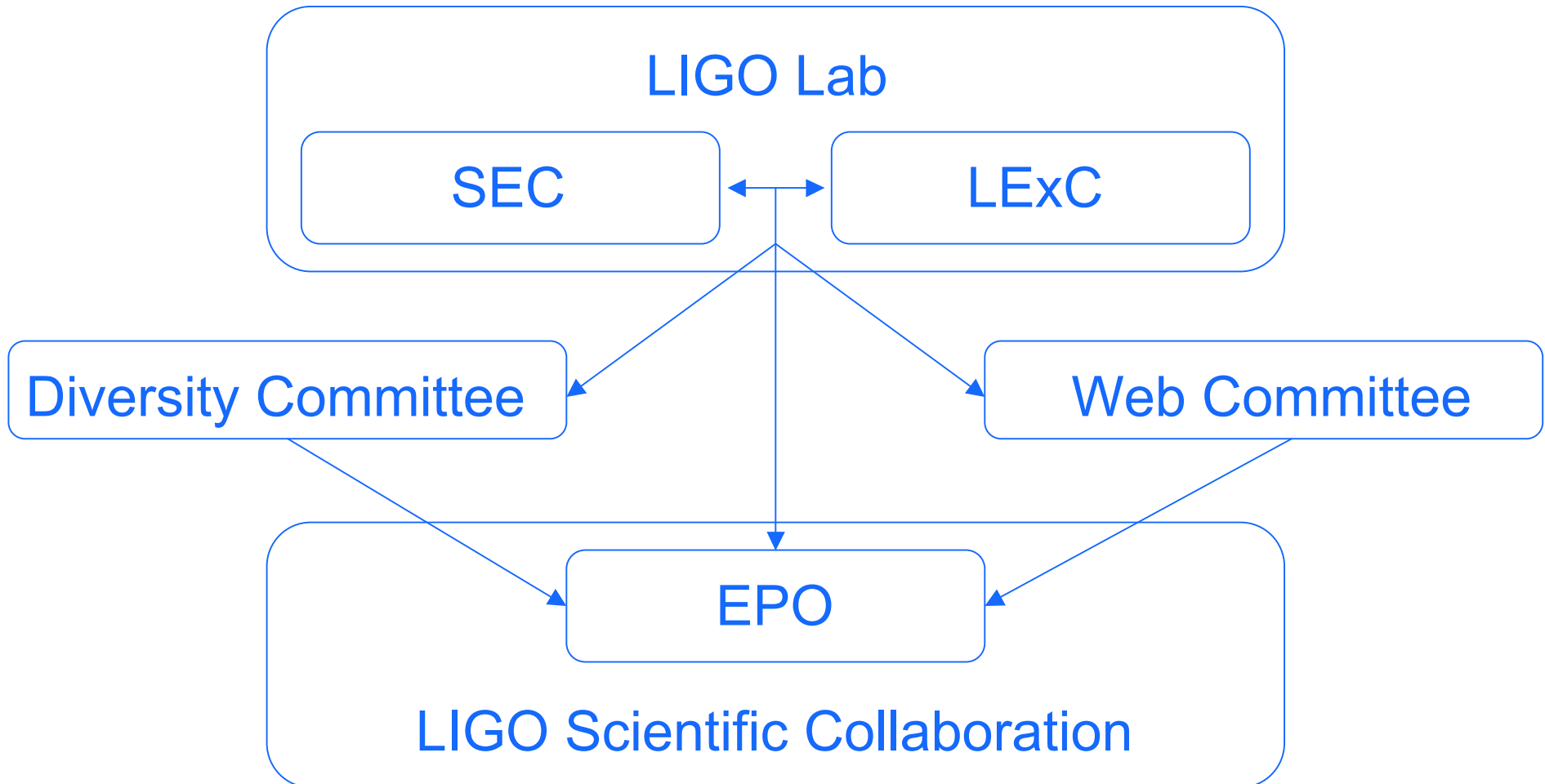
# LIGO Science Collaboration: Education and Public Outreach

- Group within the LSC that encourages and contributes outreach efforts off-site
- Includes activities at/near member institutions, presentations at professional meetings and national efforts
  - » World Science Festival 2009 (WSF)
  - » International Year of Astronomy (IYA09)
- The EPO also works in partnership with the LIGO Diversity Committee to recruit talent from underrepresented groups and the LIGO Web Committee to better disseminate LIGO science on the internet.





# Outreach Collaborations Within LIGO



# Summary

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- LIGO has successfully undertaken extensive outreach efforts within the Lab itself and throughout its collaboration.



- The SEC as created a national model for how universities, research labs, state and local educational agencies, and informal learning centers can work together to motivate student and teacher learning, and to support inquiry-based teaching and learning practices.