



# *LIGO Hanford Observatory*

## *Education and Outreach*



### *Annual Summary* *September 2005 - August 2006*



# LIGO Hanford Observatory Outreach Mission

*LIGO Hanford Observatory seeks to impact the development of the Tri-Cities and the surrounding region by providing opportunities for lifelong learning, by promoting and developing science literacy and by building relationships with educational and community development organizations that will advance mutual interests.*

## A Local Educator Network Guides LHO Outreach

*LIGO Hanford Observatory receives advice on public outreach from our Local Educator Network (LEN). The fifteen members of the LEN and their affiliations are listed below. The LEN meets each October to review LIGO's outreach progress and to offer guidance for the focus of future outreach efforts.*

Royace Aikin  
Science Education Programs  
PNNL  
Richland, WA

George Garlick  
President  
Garlick Enterprises  
Richland, WA

Mary Moore  
Teacher, 3rd grade  
Jason Lee Elementary School  
Richland, WA

Terry Andre  
Education Coordinator  
CREHST  
Richland, WA

Roy Gephart  
Scientist  
PNNL  
Richland, WA

Judy Morrison  
Faculty, Education, Teaching & Learning  
WSU Tri-Cities  
Richland, WA

Warren Buck  
Professor, Arts and Sciences  
University of Washington  
Bothell, WA

Trisha Kirk Herron  
Economic Development  
City of Richland  
Richland, WA

Tim Olson  
Faculty, Computer Sci. & Engineering  
Salish-Kootenai College  
Pablo, MO

Rebecca Chitkowski  
Science Teacher  
Gladstone High School  
Gladstone, OR

Janae Landis  
Director  
Yakima Valley/Tri-Cities MESA  
Richland, WA

Keith Plewman  
Teacher, 6th grade  
McLoughlin Middle School  
Pasco, WA

Rod Coler  
Physician  
Kennewick, WA

Marisela Mendoza  
Recruitment/Retention  
Columbia Basin College  
Pasco, WA

Brock Wells  
Science Teacher  
Robert Olds Junior High School  
Connell, WA

# *A Sample of Public Activities*

## *Astronomy Day 2006*

LHO continued the tradition of celebrating Astronomy Day by collaborating with the Tri-City Astronomy Club (TCAC), the Association for the Advancement of Science Teaching through Astronomy (AASTA) and AASTA's Rattlesnake Mountain Observatory (RMO), Columbia Basin College and the College's Moore Observatory, and the CREHST Museum to offer free public Astronomy Day programs at LHO and at the Moore Observatory on May 6. The highlight of this year's program was the transmission of live images from the 31-inch telescope at RMO into the LHO auditorium and, via the Internet, into the Moore Observatory. On behalf of all of the collaborators, TCAC received an Honorable Mention for the Sky and Telescope 2006 Astronomy Day Award.



## *LHO Open House*

LIGO offered a premier showing of the National Science Foundation's *Einstein's Messengers* movie at a public open house on February 12. 350 community members came to watch the movie, to tour LIGO and to enjoy hands-on experiences with over twenty science exhibits and activities. Students from the Department of Teaching and Learning at Washington State University Tri-Cities assisted with the activities.



# Una tarde de Astronomía



On April 22 LIGO joined Washington State University GEAR UP and Yakima Valley Tri-Cities MESA to offer an “Afternoon of Astronomy” to the Hispanic and Latino families served by GEAR UP and MESA in the communities of Pasco and Prescott. All of the event’s activities were conducted in both Spanish and English, including a Spanish voice over of Einstein’s Messengers. Students from WSU Tri-Cities assisted by staffing LHO’s exhibits and hands-on activities. Members of the Tri-City Astronomy Club provided views through solar telescopes. Bus transportation to LIGO was provided by GEAR UP and MESA.



## School Field Trips

Over 900 middle school and high school students from 24 schools visited LHO during the school year. With help from the “LIGO Explorer,” the Observatory’s field trip activity packet, students used LHO’s twelve hands-on exhibits and activities to explore the physics of waves, light and gravity along with basics of astronomy. The LIGO Explorer correlates the science content of the exhibits and activities to Washington State science standards. Many of the groups watched Einstein’s Messengers in LIGO’s auditorium. LHO staff members shared LIGO science along with insights about educational and career pathways. Students observed the interferometer arms and the control room as part of their walking tours. Most field trips originated within 70 miles of the Observatory. Many were from predominantly Hispanic and Latino schools served by GEAR UP and MESA programs.



# *Teacher Training and Education Resource Development*

## *A Graduate Course for Teachers: The Nature of Scientific Inquiry*

*LIGO again hosted a two-week WSU Tri-Cities graduate course designed to sharpen teachers' understandings of science inquiry and to improve their inquiry instruction skills. Fourteen teachers participated in the course with WSU TC Professor Judy Morrison. LHO Head Fred Raab and EOC Dale Ingram assisted with course planning and instruction. A number of LHO staff members participated in course activities such as staff interviews and job shadows.*



## *Interactions in Understanding the Universe (I2U2)*

*LIGO is one of several partners in the NSF-sponsored I2U2 program which seeks to make data sets from large research projects available to students and teachers. New software, the LIGO Data Analysis Tool, allows participants to plot data from LIGO environmental channels through a Web interface. Five teachers received training at an August LHO workshop. These teachers will pilot the software with students during the current school year.*



# Internships

LHO hosted five undergraduates for 10-week summer research internships through Caltech's SURF program. Former Columbia Basin College student Victoria Smith (right), currently enrolled at the DigiPen Institute in Seattle, undertook a 10-week work experience in the Observatory's electronics lab. Teacher John Kerr of Pasco High School (below) used a summer internship to build support materials for the I2U2 program. Teacher Keith Plewman of McLoughlin Middle School (Pasco) developed new resources and improved existing resources on the "Teachers Corner" Web page of the LHO Web site.



## Participation in NSF-funded Activities

PHY 0355454: LIGO Livingston SEC and Outreach Partnership. LHO Head and EOC participate in the oversight of the grant's activities

ESI 0610053: WSU and YVTC MESA, *Making Science Accessible to Latino Parents*. LHO wrote a support letter for this proposal and will participate in some of the grant's activities

PHY 0636265: Fermilab, *Interactions in Understanding the Universe*. LIGO is a partner in the effort to make data sets from large projects available for analysis at schools

ESI 0087571: University of Washington, *Family Science*. LHO will assist in coordination of regional science resources for providers of after-school child care

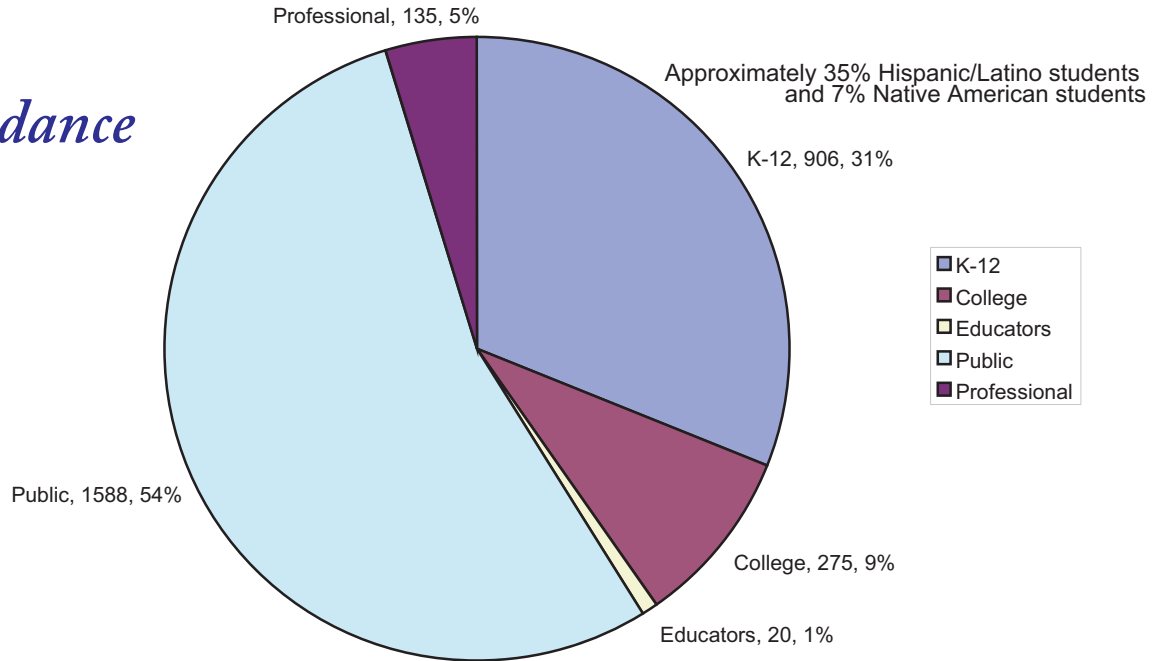
Supplement to LIGO Operations: Development of teacher resource materials for *Einstein's Messengers*

# Outreach Data

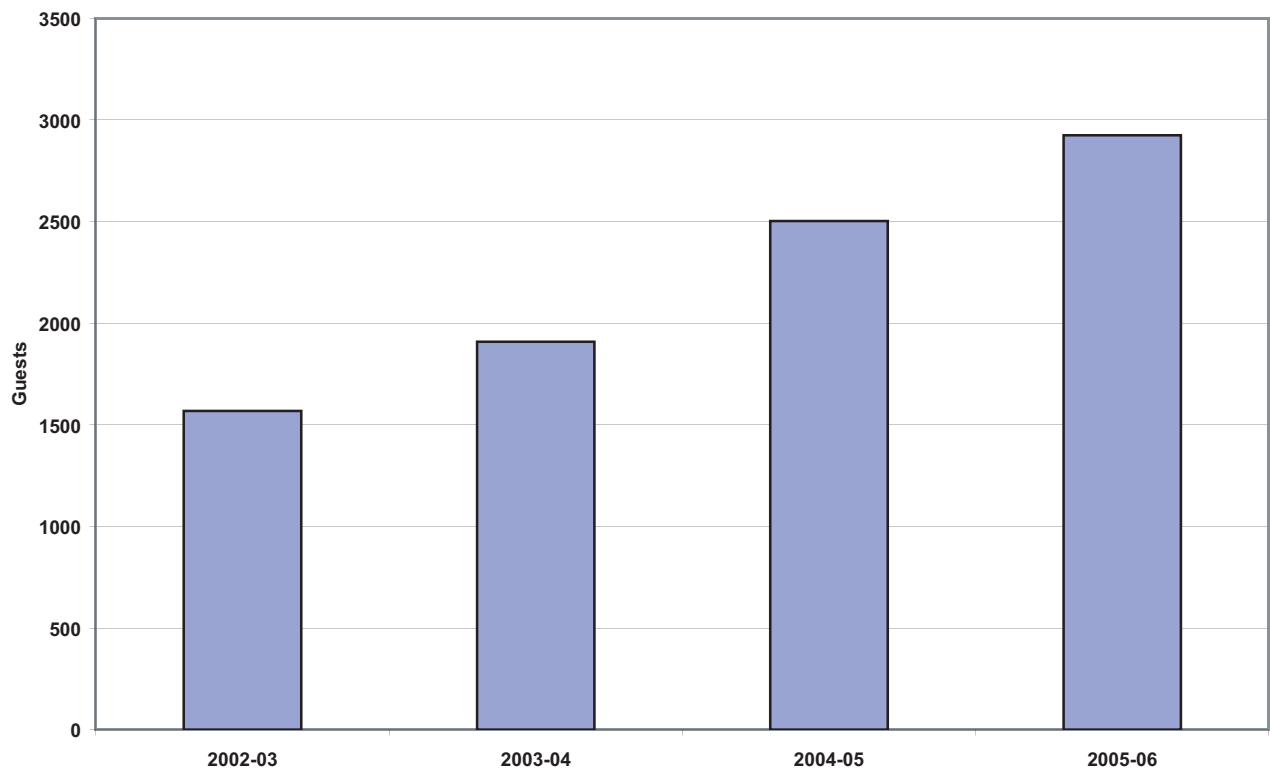
2005-06 LHO Visitor Count

Total = 2924

## Attendance

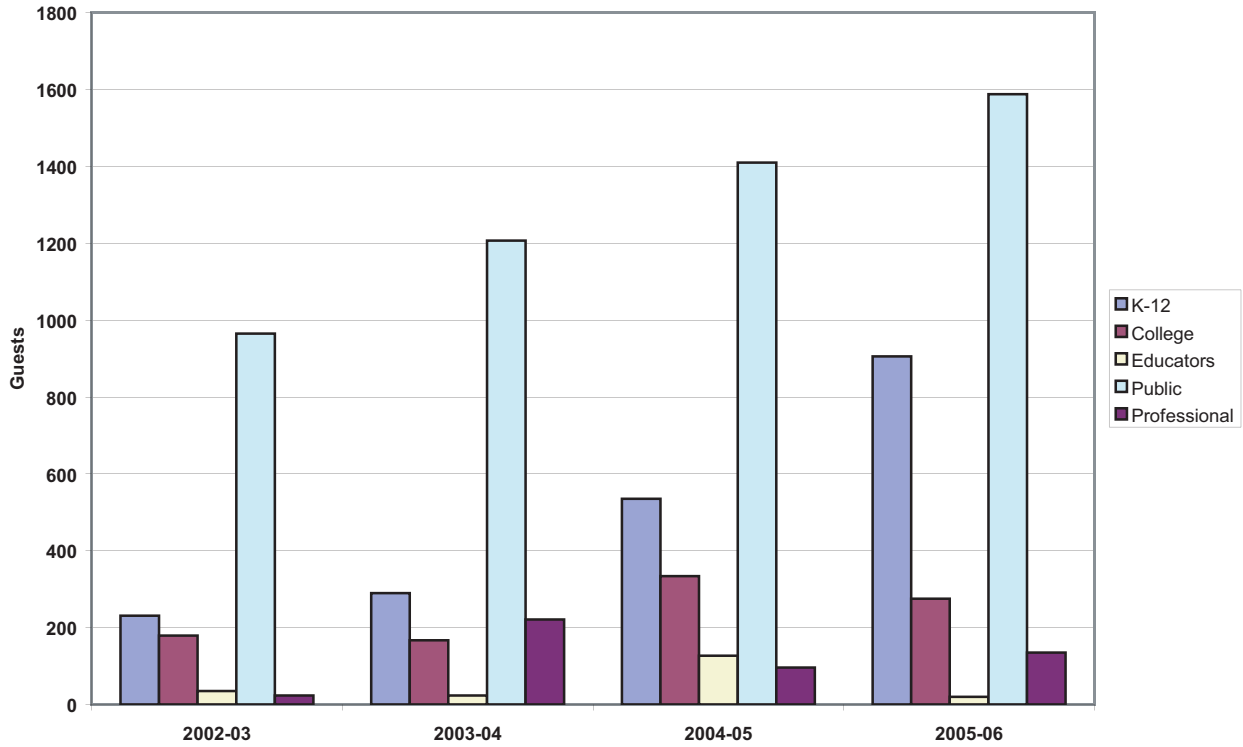


LHO Annual On-site Outreach Attendance, 2002-06



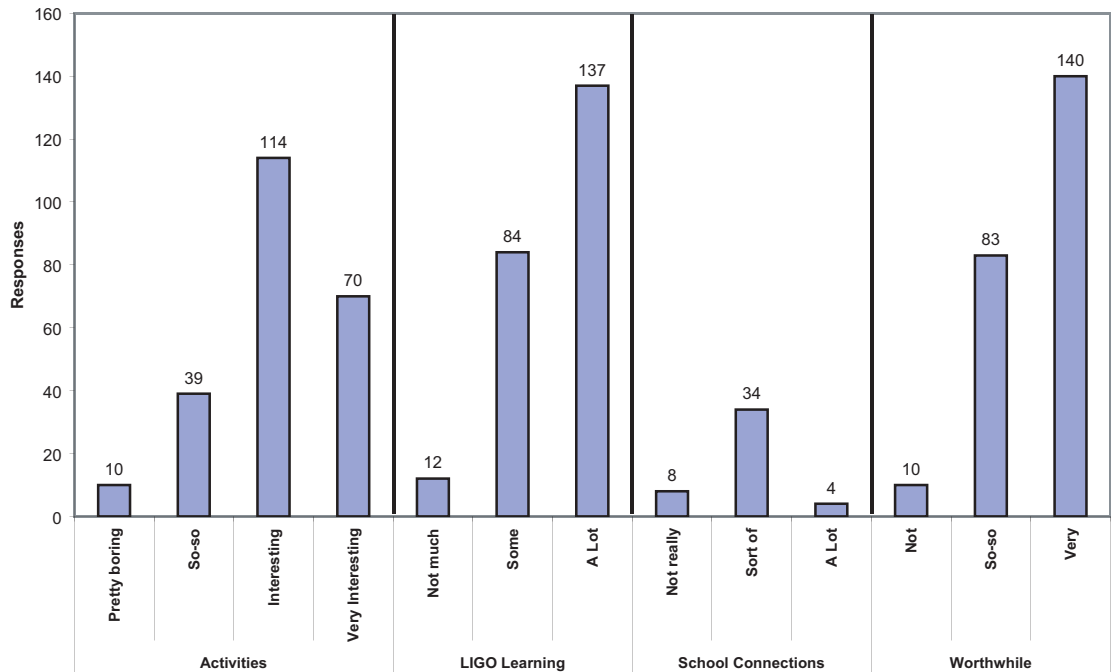
# Attendance

LHO On-site Outreach Attendance Categories, 2002 - 2006



# Student Survey Data

LHO School Visit Survey Results, 2005-06



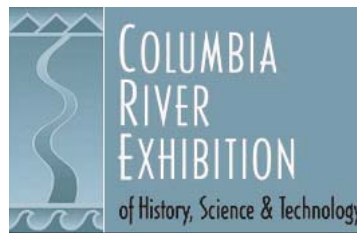
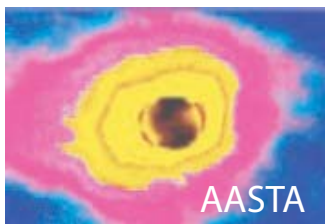
**Full text of the survey questions**

1. How interesting were the activities that you did during the first part of the visit?
2. How much did you learn about what goes on here at LIGO?
3. Did you see any connections between the science that you learned about today and what you have worked on at school?
4. How worthwhile was the trip to LIGO for you?

**Off-site contacts: 1750 (public lectures, school visits, community speaking engagements, Idaho National Laboratory Science Expo)**



# Partners for Outreach Events in 2005-06



AASA is the Association for the Advancement of Science Teaching through Astronomy. AASA operates the Rattlesnake Mountain Observatory and seeks to make the RMO telescope available to schools over the Internet

Columbia Basin College in Pasco serves thousands of Mid-Columbia residents through a large variety of academic and professional programs. The new Moore Observatory on the CBC campus serves the public and CBC astronomy courses

CREHST, the Columbia River Exhibition of History, Science and Technology offers programs that explore the unique history of the Tri-Cities. CREHST will become part of the Reach Interpretive Center in 2008.

LitFest provides the Tri-Cities with an annual celebration of literature under the auspices of CBC and the Mid-Columbia Library Foundation. LIGO participated in LitFest 2006.

MESA is Mathematics, Engineering and Science Achievement. Yakima Valley/Tri-Cities MESA encourages students to consider and prepare for futures in STEM-related fields by providing academic enrichment and support

NSF, the National Science Foundation, provides the financial support for LIGO's science and outreach missions. NSF is the primary funder of basic research in the U.S. in the physical and mathematical sciences.

The Tri-City Astronomy Club, TCAC, brings hands-on astronomy to the public and to schools through regularly scheduled programs and special events such as Astronomy Day

GEAR UP is Gaining Early Awareness and Readiness for Undergraduate Programs. Washington State University GEAR UP serves students to the north and east of the Tri-Cities, including Kennewick and Pasco

Washington State University Tri-Cities is currently transitioning from satellite status to a full four-year campus.

LHO also works with Pacific Northwest National Laboratory on issues related to science and public outreach

# *Recognition*

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*NSF's Einstein's Messengers DVD, an account of LIGO's search for gravitational waves, received a CINE Golden Eagle award and a Telly award for science documentary filmmaking*

*Science writer Trudy Bell received the 2006 David N. Schramm award for high energy astrophysics science journalism by the High Energy Astrophysics Division of the American Astronomical Society*

*LIGO articles also appeared in the New York Times and Los Angeles Times*

*The Astronomy Day program offered by the Tri-City Astronomy Club, LHO and other collaborators received an Honorable Mention for the Sky and Telescope Astronomy Day award (see p 3)*

## *A Look Ahead . . .*

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*Over the past year LHO improved its connections to local and regional organizations in K-12 education, higher education, Hispanic/Latino outreach and Native American outreach. The Observatory will continue to strengthen these relationships to increase the volume and quality of our outreach contacts with students and families. LHO will continue to work with WSU Tri-Cities, now transitioning to degree-granting status, and Columbia Basin College to explore innovative strategies for involving students and teachers in LIGO science, particularly those from underrepresented groups. More contacts with teachers and school administrators will improve the Observatory's visibility within local and regional schools.*

*The Observatory will continue to provide informal opportunities for families. Ample evidence points to public interest in astronomy in our area. In partnership with TCAC, CBC and AASTA, LIGO will help capitalize on the potential of the Rattlesnake Mountain Observatory. We will continue to use hands-on optical astronomy to compliment our focus on gravitational waves.*

*LHO holds memberships in the Tri-Cities Development Council (TRIDEC) and the Tri-Cities Visitor and Convention Bureau. Participation in TRIDEC will help the Observatory continue its integration into the higher education and economic development sectors of the community. The Visitor and Convention Bureau will continue to support LIGO's efforts to gain increased visibility in the tourism industry.*

*Support materials for Einstein's Messengers and the LIGO's continuing I2U2 involvement will add national outreach components to the 2006-2007 program.*



