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LIGO Exploration Center – Bringing LIGO Education & Outreach at Hanford into a New Era

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Outline

- The need for a LIGO Hanford science center
- A population portrait of our region
- LHO outreach programs and partners
- Capturing remarkable outreach opportunities through increased capacity
- The growth potential provided by additional capacity

Why Build LExC?

- LIGO represents a tremendous resource – a place where the public observes science research taking place in real time, interacts with professional scientists and engineers, experiences the scale and precision of gravitational wave detectors and engages in Q&A over issues such as the nature of space, time, matter, gravity, black holes and things yet undiscovered. We know that interactive exhibits heighten the impact of a LIGO visit by providing compelling, enjoyable hands-on experiences centered on the science concepts that are foundational to LIGO's research. LExC will transform this dimension of the Observatory's outreach, taking it to a level that will significantly heighten visitor experiences in all of the categories of outreach activity in which LHO engages.

Why Build LExC?

- LHO rests in the midst of a large diverse population that is underserved in informal science opportunities.
- Several sectors of the region's population are very underrepresented in STEM majors and professions. LIGO and our partners seek to move these numbers; LExC will help this happen.
- Partnerships are in place that will drive the center's use and programming from the outset.
- The LLO SEC model and experience provides an anchor for our thinking about the design and use of a comparable Hanford facility.
- Under current conditions LHO will soon saturate it's outreach growth capacity. LExC will key our ability to extract greater value from the excitement of LIGO's science mission by offering higher-impact experiences to larger numbers of the public.

Portrait: ~700,000 residents of southeastern Washington must drive to science centers in Seattle or Portland

- 2010 estimate: 700,000 WA residents within a 2-hour drive of LHO, 540,000 in the closest four counties, 40% minority (primarily Hispanic/Latino), several Native American groups
- Significant economic diversity, ranging from farm labor to PNNL/Hanford science and engineering
- Several population centers; many small rural communities and school districts

- Roughly 120,000 K-12 students within the 8-county area; several thousand teachers who are responsible for science instruction
- Columbia Basin College: Hispanic-serving Institution
- WSU Tri-Cities: 27% of new 2009 students are from minority* groups

Programs and Partners: Principal Outreach Activities

- Audience: Preschool through senior adult
- Public tours
- Special public events, including family-friendly and bilingual offerings
- School field trips, including standards-based student experiences and supplemental Web resources
- Extended student experiences (day camps, dual-venue programs)
- Teacher professional development
- Off-site: Classroom visits, community and school events, career fairs, conferences
- National-level outreach occurs through NSF-funded I2U2 and einsteinsmessengers.org
- LSC EPO leverages Collaboration resources for national outreach; LIGO Lab outreach retains a strategic voice in these efforts

Partnership-driven Outreach Activities Cut Across the Region's Diversity

- Institutional partnerships are essential in nearly every type of LHO outreach endeavor.
- LIGO highly leverages the expertise of our partners to avoid paying the cost of learning how to replicate their capabilities. In turn, LHO provides to them our unique potential and assets in joint activities that advance shared goals.
- LIGO has accumulated significant understanding of partnerships through LSEC; this knowledge base will be a key asset in the development of LExC.

The LexC Partners have built a history with LIGO, positioning the Center for growth in 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

The LIGO SEC Backdrop

- Our estimates of the effects of LExC on LHO outreach that appear on the following slides are informed by what has occurred at LLO SEC. The communities that the Observatories serve are different, yielding differences in the outreach programs at the two sites. However certain common denominators, particularly in the K-12 sector and teacher professional development, create pathways for transferring what LIGO has learned in LA to WA.

Capturing Opportunities -- Field Trips

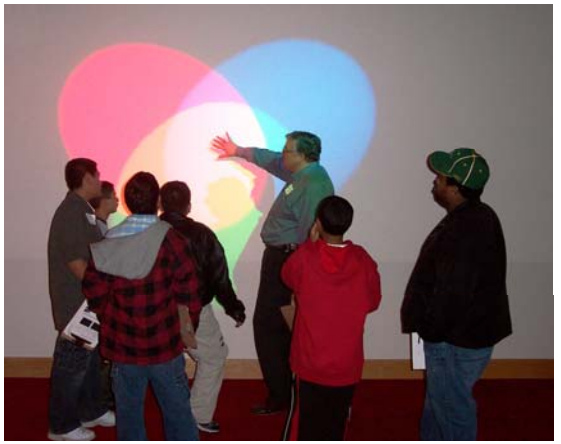
- Increasing the number and quality of exhibits will provide deeper and stronger conceptual understandings and offer many more connections to LIGO science for all ages of students.
- The LExC exhibit set will cover a broader range of LIGO physics themes and will present a number of opportunities to explore each theme. Opportunities for teacher follow-up back at school will increase significantly.
- We will serve more students in a safer and more manageable way by consolidating the exhibits in one location adjacent to a classroom and to the LHO auditorium.

Public Tours

- The exhibit hall will transform our current tour structure by creating a family-friendly focal point for drop-in visitor experiences.
- Group tours will include LExC time as part of the program, increasing interest and deepening the connections to LIGO science for visitors.
- LExC will increase the site's ability to attract tour groups and other tourist-based activities. The tourist population will continue to grow as the Reach Interpretive Center and B Reactor become tourist destinations.

Special Events

- LExC will provide a dedicated exhibit space during special events, leaving the staff free to use the auditorium, lobby and multi-use room for concurrent activities.
- Classroom space will support the development of targeted programming, for instance in the area of early childhood learning in science and math, or in special interest classes for adult learners.
- LExC will provide space for “works in progress” that are currently unsupportable – student-developed exhibits, etc. – that can serve as points of focus for special activities.



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Teacher Professional Development

- Experience at the Exploratorium and SEC highlights the value of placing PD participants in a classroom that is next to the exhibit floor.
- Many of the students served by the SEC come from classrooms whose teachers have participated in SEC professional development. We have seen the power of this ‘learning cascade’ in our MSP program at Hanford; LExC will cause this dynamic to grow.
- The magnitude of LExC will elevate our ability challenge teachers to reflect on their teaching of science and raise the quality of student experiences in their classrooms.
- The array of exhibits will provide an immersion experience in physics concepts that will improve many teachers’ understandings and confidence related to physical science, complimenting LHO’s current practice of immersion in science inquiry.

Extended Student Experiences

- LExC will support opportunities for longer, deeper inquiry-based experiences in physics, astronomy and engineering by offering improved space, more exhibits and better infrastructure.
- Outreach programming will be more effectively served through dedicated LExC space than through the sharing of mixed-use space such as the corner station multi-use area.
- The LExC classroom will provide the storage space for materials that will support efficient, high-quality programs of both short-term and extended experiences.

Growth potential -- An estimate of 7,000 visitors per year at opening

- 80 field trips per year, 50 students per visit
- 8 extended activities per year, 25 students per activity
- 3000 general public visitors through drop-in visits, scheduled tours and public activities
- 200 teachers per year in short-duration and extended workshops/courses

In the Advanced LIGO era, the upper bound could be very large; 15,000 will be 2% of the 8-county population

- 90 field trips, 80 students per trip
- 100 drop-in visitors per week
- Special events/activities and scheduled tours, 2000 visitors
- Teacher PD, 400 teachers
- Extended activities, other activities, 400 visitors
- LExC will position LHO to host these numbers of visitors as we continue to focus on substantive visitor interactions that deliver high impacts.
- LIGO will plan for the addition of outreach FTE that will support our projected growth into the AdLIGO era. Undergraduate interns and a team of community volunteers will work along side permanent staff.

Our Aim: The High School Graduation Exit Interview

- My family went to LIGO numerous times. We talked to scientists, did science, learned science and enjoyed all of it.
- I was challenged by my science classes at school. My teachers provided work that made me grow and increased my interest. I saw connections between what we did at school and what real scientists do.
- LIGO is part of a world in which I can see myself working some day.