

Proposal: Pacific Science Center/DUSEL/LIGO/Neptune Partnership for Outreach, Education, and Public Policy

I. BACKGROUND

The DUSEL-Cascades (Deep Underground Science and Engineering Laboratory) collaboration, in considering its goals in public outreach and education, recognized that these goals might be most effectively advanced through partnership with the Pacific Science Center (PSC) and with two other major NSF projects based in the Northwest, LIGO and Neptune. PSC provides

- A location accessible to several million Puget Sound residents;
- A demonstrated business plan and record in attracting visitors (750,000 to 1,000,000 per year on-site plus statewide outreach programs);
- Proximity to high-band-width data corridors;
- Affiliations with other major science centers in North America;
- The capacity to expand, including new floor space; and
- An established relationship with the NSF.

Collaboration leaders met with PSC President Bryce Seidl, who described PSC’s current strategic planning process and ambitious new goals – one of which was forming partnerships with university researchers to enable PSC to serve as the public’s “portal” to scientific discovery. We discussed how we could collaborate to further strengthen PSC’s strategic plan and our outreach program. We contacted the leaders of LIGO and Neptune, two other NSF projects based in the Northwest with complementary science goals, who then joined the effort, broadening the science scope.

II. THE PROPOSAL

The proposal focuses on three themes:

- Making frontier research and scientific discovery more accessible to the public, with the goal of increasing scientific literacy and public support of science.
- Addressing a challenge facing our K-12 schools, as well as society generally: effective education of young people in science, mathematics, and technology.
- Programs related to the interface of science and public policy: helping community and government leaders, science communities, the media, and the general public understand and address society’s grand challenges in health, energy, climate, and the environment.

These themes and their important intersections are illustrated in Fig. 1.

The “Portal” to DUSEL, LIGO, and Neptune: The projects’ researchers would work with PSC to create one or more rooms and appropriate tools dedicated to explaining scientific discovery under the sea (Neptune), within the Earth (DUSEL), and in the cosmos (LIGO). This space might include visual displays of real-time data streaming from detectors and instruments of DUSEL/LIGO/Neptune, descriptions of the science and the facilities, “caves” and other virtual

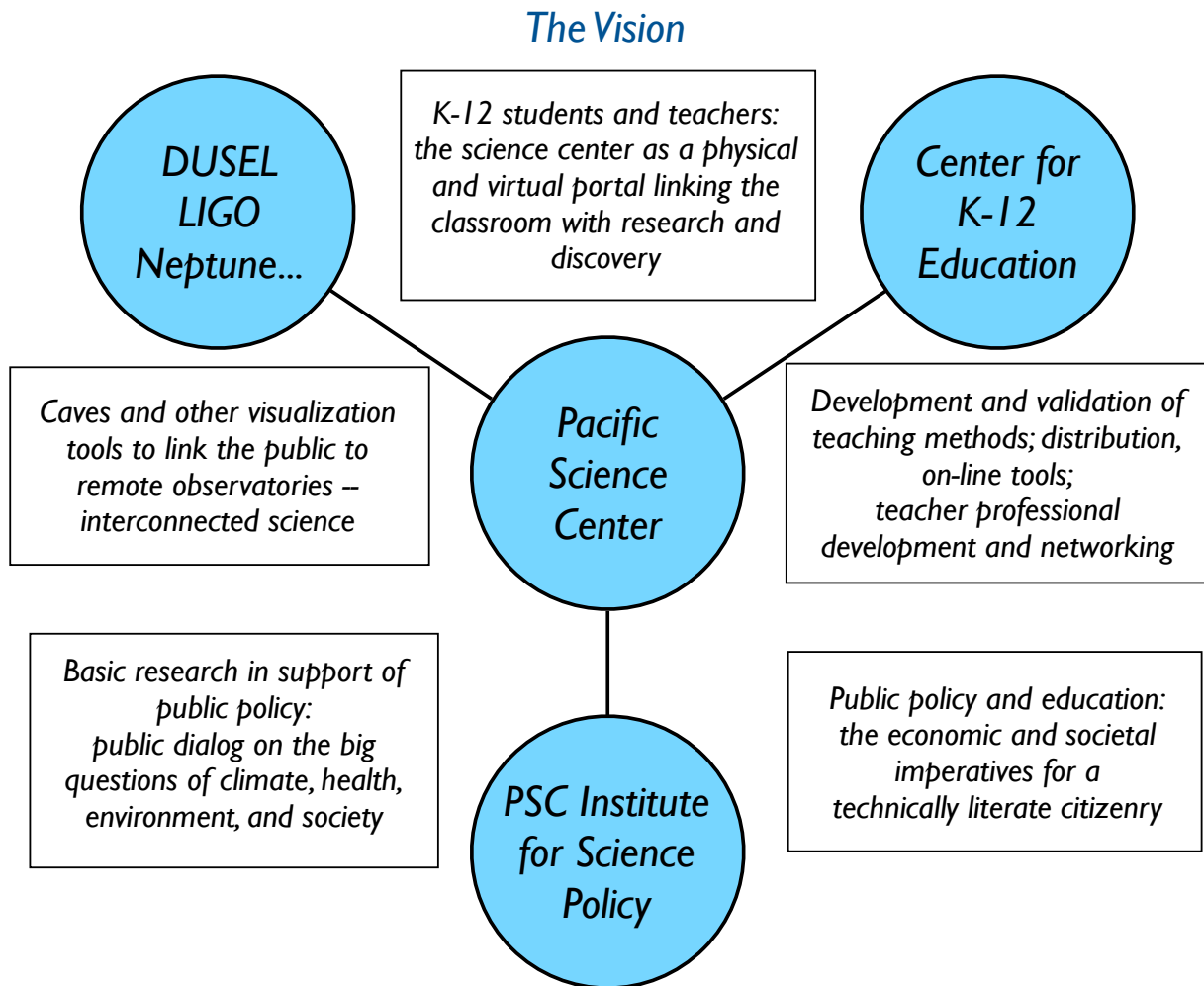


FIG. 1: An effort to capture the conceptual basis for the present proposal, which seeks to improve public awareness and support of science and technology; to improve learning of science and mathematics and help K-12 teachers gain confidence and advance professionally; and to provide a forum for discussion of science and engineering and their relevance to major public policy issues.

projections relevant to the science (the big bang, supernova explosions, spaced warped by passing gravity waves, creatures living in the extreme environments found deep undersea, etc.). A primary objective of the displays would be first to present the key science, math, and engineering concepts underlying DUSEL, LIGO, and Neptune research. In addition, the displays would emphasize the interconnectedness of science e.g., how LIGO and DUSEL will detect, by different means, the effects of distant supernovae, or how Neptune ocean science and DUSEL geoscience are both tied to the Northwest's unique geophysical setting and both concerned about the extreme life forms found deep undersea or deep within the earth. Data links to these observatories could allow the public to participate in scientific discovery in real time, right from the floor of the Pacific Science Center.

Science is an ongoing process, involving neighbors as well as the international community. The displays could also invite the public to visit DUSEL, LIGO, and Neptune, as these projects also would have some visitor opportunities at their sites. The displays would be engaging and tell interesting stories about discoveries now in progress.

The Center for K-12 Education: There is national concern that K-12 students are not being adequately prepared to compete in science, mathematics, and technology. In Washington State the improvement of math and science education is one of the Governor’s key initiatives. We envision the creation of a new center at PSC dedicated to professional development for educators working with our youth – school teachers, after-school providers, parents, and volunteers. This would include the design and validation of new teaching tools and the distribution of such tools. The Center’s researchers will identify student misconceptions and evaluate teaching methods designed to correct the misconceptions. We envision efforts, similar to those of the Physics Education Group (PEG) at the University of Washington, to introduce educators to inquiry-based methods and to help them form support networks. The Center could serve as the state’s “think tank” for K-12 science/math education. It could establish programs for certifying master science educators and, through university partnerships, provide credit for courses completed. It would explore internet-based learning tools that might have the potential to compete for attention in a game-oriented culture.

PSC, in collaboration with Battelle, already runs the nation’s largest K-12 Science Education Reform program, LASER – Leadership and Assistance for Science Education Reform. The network of school districts, ESDs, teachers, and state education officials provides a particularly strong platform upon which PSC can build K-12 education programs.

The PSC Center for Science and Public Policy: Science can help guide policy makers in their attempts to address the grand-challenge problems facing society, such as health, energy, environmental protection, and global climate change. There are many important issues involving both the application and pursuit of science that intersect public policy. The PSC’s Center for Science and Public Policy will create a neutral forum where public policy issues related to scientific inquiry can be explored in the context of sound science and engineering. Goals include helping scientists understand the complexities of the public policymaker’s world, helping public policymakers better understand the potential and promise of pioneering science, and to better equip the public to make informed decisions about the major issues affecting our future.

PSC has recently acquired some new neighbors. The Bill and Melinda Gates Foundation headquarters for work on global health is under construction just two blocks from PSC. Paul Allen’s Vulcan Inc. is currently developing 60 acres of the PSC’s South Lake Union neighborhood as a biotechnology and research campus, and nearby is the Fred Hutchinson Cancer Research Institute, Seattle Biomedical Research Institute, Merck, Amgen, and other research organizations. These neighbors draw private and government policy makers to the PSC’s doorstep.

III. HOW DUSEL, LIGO, AND NEPTUNE MIGHT CONTRIBUTE

DUSEL, LIGO, and Neptune could help PSC realize its goals in these areas:

- This partnership would bring a community of researchers, and their universities, in close and frequent contact with those on the front lines of public outreach. The need for stronger ties between the nation’s science centers and the research community has been recognized previously. Such ties could help increase public scientific literacy and public support for science. The envisioned partnership would create new opportunities for young researchers to engage the public, both virtually and directly, helping them gain experience in communicating the importance of science, both in person and to virtual audiences.
- The DUSEL, LIGO, and Neptune collaborations include individuals experienced in creating

scientific displays for the public, including state-of-the-art visualization. For example, DUSEL collaborators Lucy Fortson and Evalyn Gates have long associations with the Adler Planetarium in Chicago. (Lucy is the Director of the Adler’s Astronomy Department.) Neptune and DUSEL collaborators Tom DeFanti and Jason Leigh of Electronic Visualization Laboratory (University of Illinois, Chicago) invented the Cave and other virtual reality tools that are impacting both research and public outreach. These talented individuals could collaborate with PSC staff to create an unprecedented virtual “portal” to DUSEL/LIGO/Neptune.

- The DUSEL collaboration includes PEG researchers Paul Heron, Lillian McDermott, and Peter Shaffer, the leading group studying the effectiveness of teaching methods in physics. Susan Pfiffner has done similar work in the geosciences. We envision DUSEL/LIGO/Neptune supporting an education group for the PSC’s Center for K-12 Education that would extend PEG’s work on education research, evaluation, and educator professional development into other science areas, with a focus on school-age youth and high-band-width internet-based tools.
- The kinds of connectivity important to DUSEL/LIGO/Neptune, e.g., iGRID HDTV broadcasts, have generally not yet migrated into science centers. We think such migration has extraordinary potential to engage young people in science through the attraction of high-end visualization.

IV. HOW THE PSC MIGHT CONTRIBUTE

PSC is the nucleus for the efforts described here:

As described previously, it is a nationally prominent science center with over 750,000 visitors annually, major outreach capabilities, an experienced operations staff, a successful business plan, and strong ties to the local community and to an international network of science centers.

It has existing space that could be used to house the envisioned “portal” to DUSEL/LIGO/Neptune.

It has the capacity to add significant floor space for the Education and Public Policy efforts.

It is an attractive investment opportunity for the NSF, the State of Washington (and its Washington Learns initiative), and private donors.

V. SCALABILITY

If successful, this partnership would provide a national model for coordinating the outreach efforts of major research projects and science centers. A series of coordinated regional efforts is envisioned, linked by the nation’s high-band-width communications corridors. The displays, educational tools, and validation efforts of one site could be shared with others and incorporated into a national data base. Fig. 2 shows two natural “beta site” PSC partners in a more extended network, the Adler Planetarium in Chicago and the R. H. Fleet Science Center in San Diego. PSC and the DUSEL, LIGO, and Neptune collaborations already have many ties to these two centers. All three science centers could take advantage of the high-band-width corridors that run between StarLight Chicago, Northwest GigaPop, and Calit2 and the San Diego Supercomputing Center. Beyond this, PSC has the relationships and standing to bring other prominent science centers and museums into

The Potential to Scale: Our Natural “Beta Site” Partners

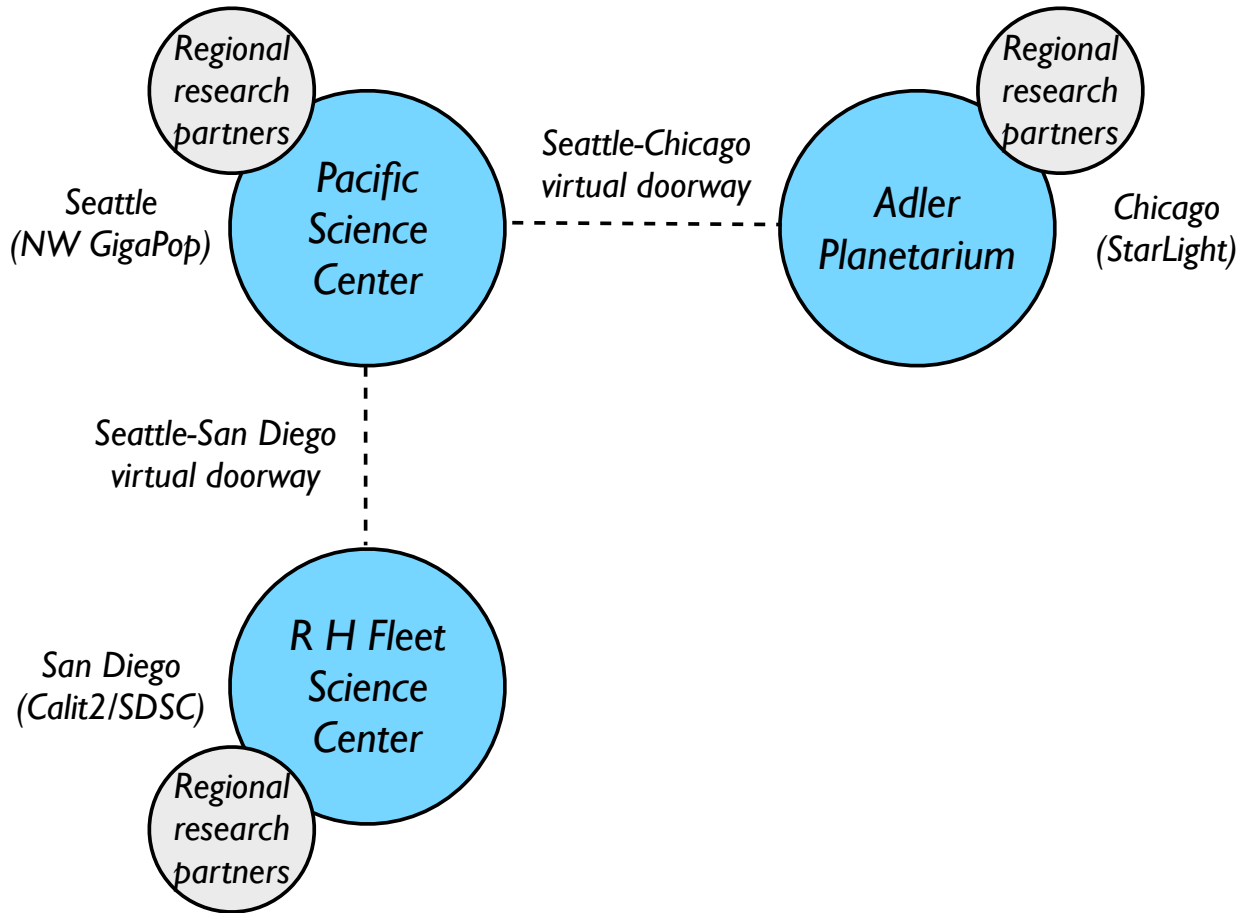


FIG. 2: A successful collaboration between PSC and major research projects of the National Science Foundation might become a model for similar efforts elsewhere, coordinated nationally. Existing PSC/DUSEL/LIGO/Neptune collaborations and the high-band-width corridors linking Chicago, Seattle, and Southern California make the Adler Planetarium and San Diego’s R. H. Fleet Science Center natural partners.

the partnership, creating national and international networks that would extend the reach of such broader-impact work.