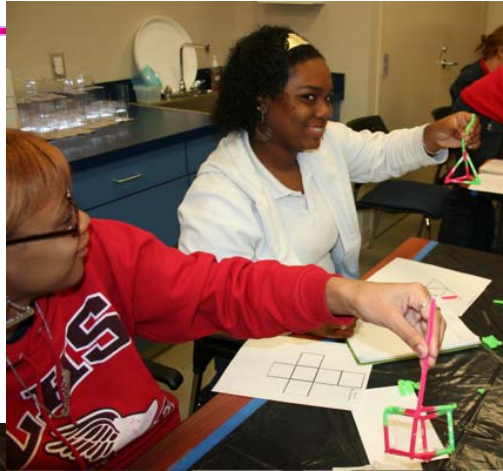


Education & Outreach



Fred Raab,
LIGO Hanford Observatory, 25-Jun-09

Education and Outreach Outline: *Investing in the Future*

- Mission
- Audiences
- World-wide efforts
- But what about doing better...

Education = what's left after forgetting everything
you learned in school

Outreach = inviting those outside your world to come
inside, visit and maybe stay a while

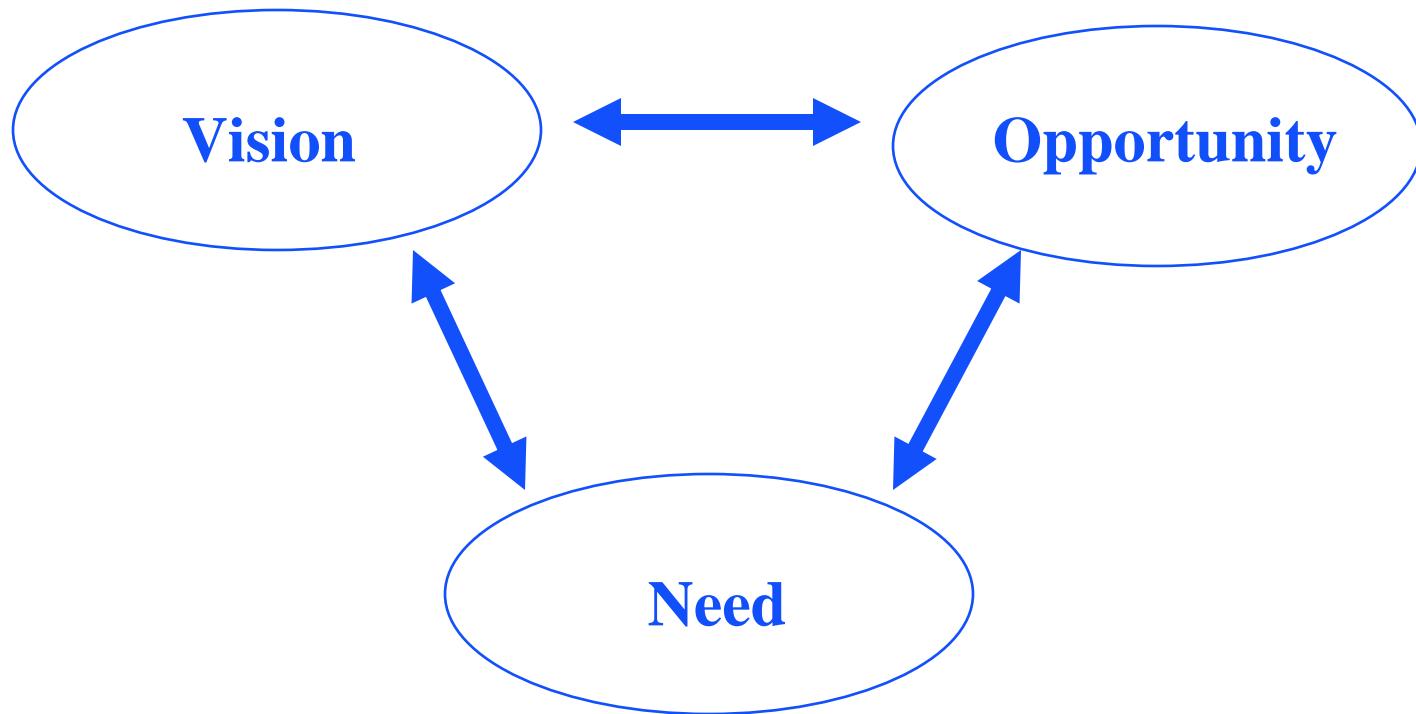
Mission

- providing opportunities for lifelong learning (E)
- promoting and developing science literacy (E)
- Inviting public involvement with emerging science (O)
- building relationships with educational and community development organizations that will advance mutual interests (O)

Audiences

- general public
- children and their teachers
- aspiring future scientists and engineers
- science policy makers

Three fundamental elements of an E&O strategy



What do people want? 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

Following the sun, there are exceptional
science educational facilities in the GW
community

Western Australia: a visit to the Gravity Discovery Center



Inside the Cosmology Center

- Informal education
- Exhibits on gravity, cosmology, astronomy, physics and art
- Nature walk
- Approx. 20,000 annual visitors

Focuses on the big questions of Life and the Universe, and the extraordinary biodiversity of Wallingup Plain

Italy: a class may visit the large interferometer on a Saturday or (shown here) construct a smaller 100 Euro device.





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



Outreach activities engage the ethnically and economically diverse populations surrounding the LIGO Observatories; a market traditionally underserved by science education.



LIGO Science Education Center illustrates the power of partnerships

**LIGO Science
Education Center
in Louisiana**



**Exploratorium
Exhibits & Training**



**Docents in Training from Southern
University Education Program**

**LA GEAR UP provides access to
low performing schools**

Coming (we hope!) to LIGO Hanford Observatory after S6?



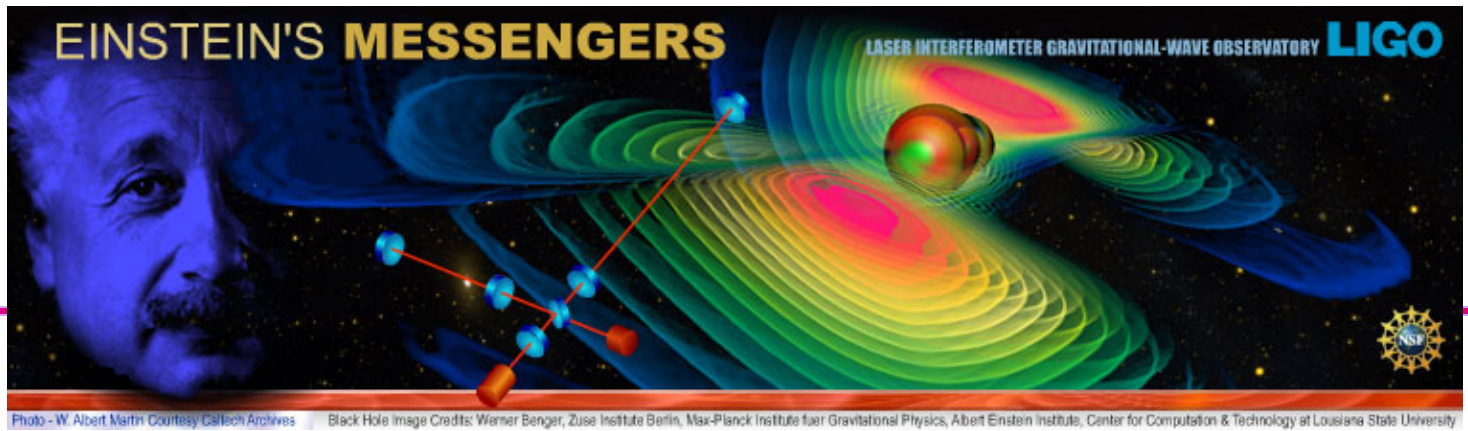
Taking it to the streets...

(courtesy LSC EPO working group)



LSC road show debuts at Washington Square Park, New York for the 2nd Annual World Science Festival 14-Jun-09

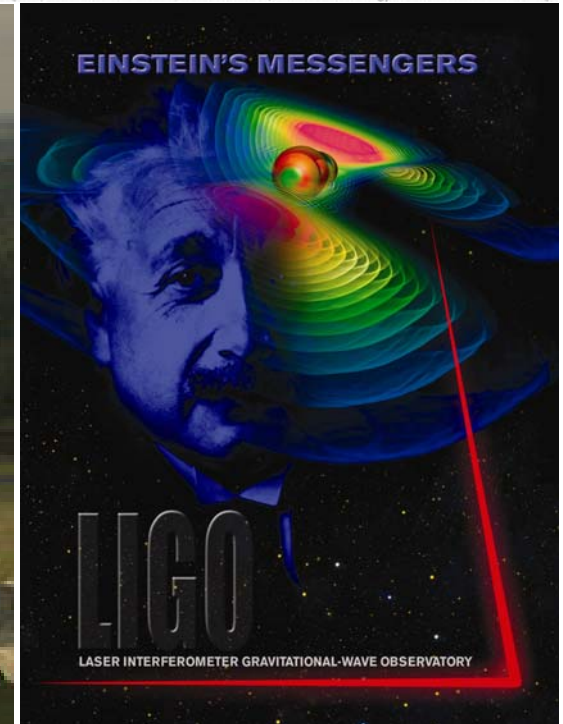
Gravity in cyberspace



NSF's 20-min video on LIGO & search for gravitational waves

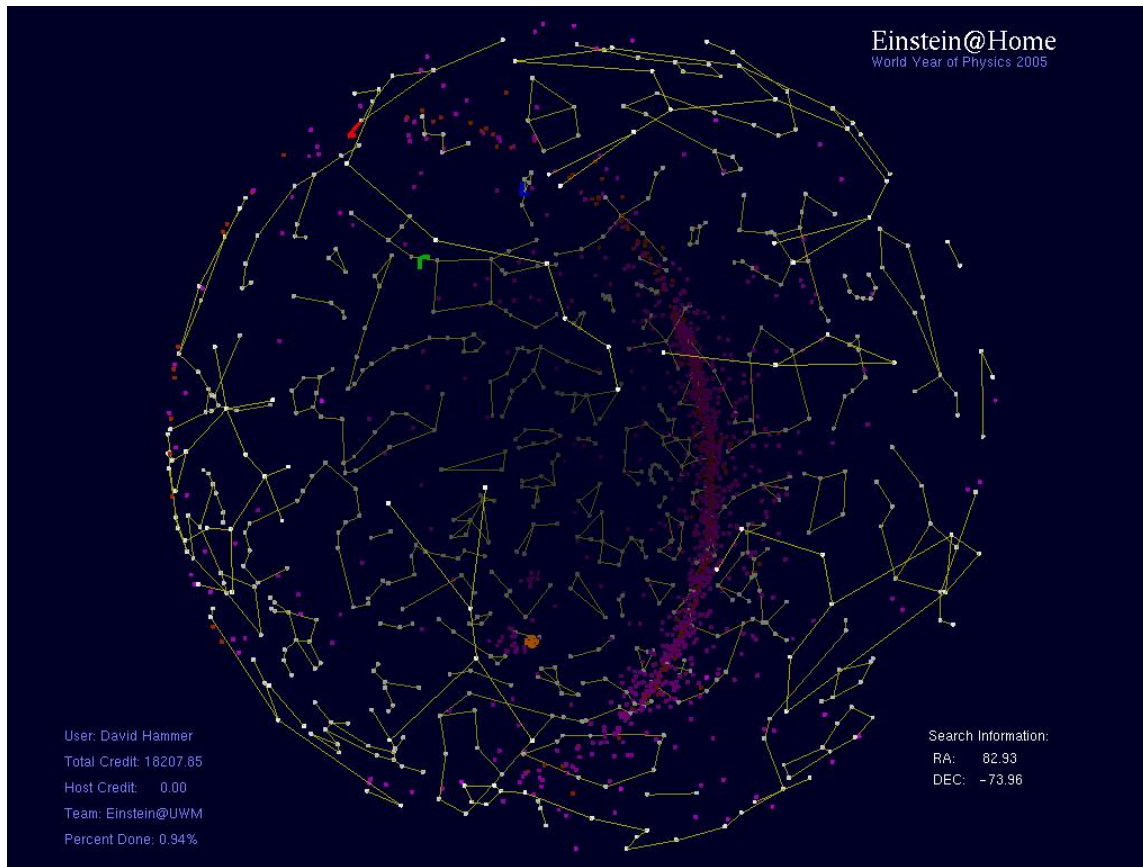


Einstein's Messengers:
NSF watch online site



Einstein's Messengers:
Teacher support web site

Einstein@Home



- Distributed computing project
- Public contribute their unused computing cycles to analyze LIGO data
- 75,000 active host computers with combined 210 TFlop computing power

scienceface.org *Kip Thorne*
"The warped side of the universe"

MP4 Videofile
.mp4
Size: 355.93 MB

Quicktime
.mov
Size: 59.11 MB

YouTube



Home Who is Kip Thorne? Where we met Resources About scienceface.org

The purpose of ScienceFace is to make front-line science accessible to non-scientists, by filming top scientists in conversation with a young interviewer.

Celebrating International Year of Astronomy online...



2-5 April
INTERNATIONAL YEAR OF ASTRONOMY 2009
CORNERSTONE PROJECT

Home



CELESTRON
Proud Global Sponsor
International Year of Astronomy 2009
100 Hours of Astronomy



100 HA
MERCHANDISE SHOP
2-5 APRIL 2009

Main Menu

Home

100 Hours of Astronomy - A retrospective

Photo Galleries	Blogs	Around the World in 80 Telescopes	24-hour Global Star Party	100 Hours of Remote Astronomy
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100 Hours of Astronomy, 2-5 April brought over 100 countries together in a planet-wide celebration of astronomy. The world visited 80 professional observatories around the world during a 24-hour live online tour, and more than a million people had their first close-up views of the Moon, Saturn, the Sun and other objects of interest through telescopes. A Cornerstone Project of the International Year of Astronomy brought the Universe to all the world's citizens to discover for themselves.



Around the World in 80 Telescopes
Watch online 3-4 April

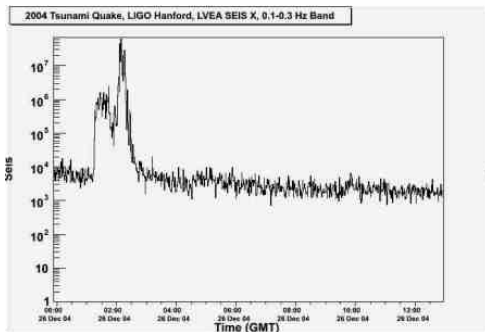


live video powered by
Ustream TV



Cosmic

Getting into the game...



I2U2 (Fermilab): LIGO eLabs provide access to environmental data for students and teachers via the Web and the Grid

BLACK HOLE HUNTER

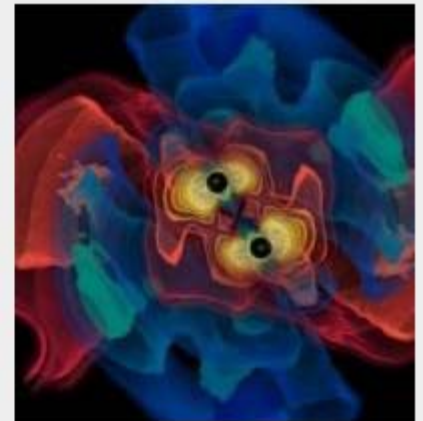
Welcome to Black Hole Hunter. The game that lets **YOU** search for gravitational waves.

Please select a difficulty level:

- 1 ☒ Beginner
- 2 ☐ Intermediate
- 3 ☐ Advanced

PLAY

As your gravitational wave hunting improves, higher levels may become available to you!



Gaming is a potentially powerful educational tool; Black Hole Hunter is an early entry into this arena.

Developing better science teachers

- Most of the world learns science in elementary and secondary schools (K-12 in US), not colleges and universities
- The quality of science instruction at early grade levels today will strongly influence economic progress, rationality of policy decisions, support for scientific research and the pool of science talent in the future
- The success or failure of one grade 5 teacher will be imprinted on many hundreds of students
- We tend to focus on science education battles in high schools and colleges, but (at least in the US) we are losing the war by 8th grade
- For broad change, we need more focus toward deeply impacting science teaching for young learners

Teacher Professional Development within LIGO

- Foci are the “Nature of Science” and “Inquiry-Based Learning”
- Although science is built with facts like a home may be built with bricks, a pile of bricks is not a home and a pile of facts is not science
- Unfortunately, “content junkies” rule too much of science education in US
- We emphasize using the same learning strategies scientists use (“Nature of Science”) to teach science and focusing learning tactics on exploring questions, instead of collecting lots of answers (“Inquiry-Based Learning”)



Training the next generation of scientists

- Beyond the formal higher education programs:
 - » Summer undergraduate research opportunities (national and international programs, e.g, REU, RET)
 - » International visitor programs (e.g., IREU, LIGO Visitor Program)
 - » Summer schools (e.g., Center for Gravitational Wave Astronomy at UTB)
 - » AstroWatch program at LIGO: 19 graduate students from US and European LSC institutions took up residence at LIGO Hanford to learn GW detector operation and monitoring, while providing an essential service to the LIGO Scientific Collaboration

But what about doing better?

- More (quantitatively) would be better; but does not need a radical re-thinking of how we do business
- Promoting greater diversity in our community would be better; qualitatively different and probably needs substantial changes in how we do business
- Amaldi-1 audience, more than a decade ago, did not look substantially different than today's audience
- What should we be doing now, so that the audience will look substantially different at Amaldi-15



Are we reaching out far enough?

- Why don't we have more women, Hispanics, Blacks and Native Americans in the US GW community?
- Internationally, why don't we have more African and South American institutions and colleagues here?
- Is this field, which so reveres the accomplishments of Stephen Hawking, sufficiently open to people who are physically challenged?
- Are we doing well enough to encourage first generation to college students?

Reaching out to the future...



National Technical Institute for the Deaf Dance Company in “a collaborative exploration with dance movement and the astrophysical universe.”

Corey Gray at the American Indian Science & Engineering Society meeting.

