



The View from NSF

Aspen 2003 GWADW

Beverly K. Berger

- **Gravitational Physics Program**
- **Budget for FY 2003**
- **Education**
- **International Activities**
- **Interagency Cooperation**

Barry Barish has been nominated to the National Science Board, the governing board of the NSF. Awaits Senate confirmation.



Gravitational Physics Program

- **Research related to gravitational waves**
- **Experiments to test gravitational theories**
- **Experiments to test particle physics and string theory via equivalence principle violations and deviations from $1/r^2$**
- **Theoretical research in classical and quantum gravity**

Beverly Berger, Program Director, Gravitational Physics
Tom Lucatorto, Program Director, LIGO
Joe Dehmer, Division Director, Physics



Gravitational Wave Research



LIGO



Gravitational Wave Research



LIGO Scientific Collaboration



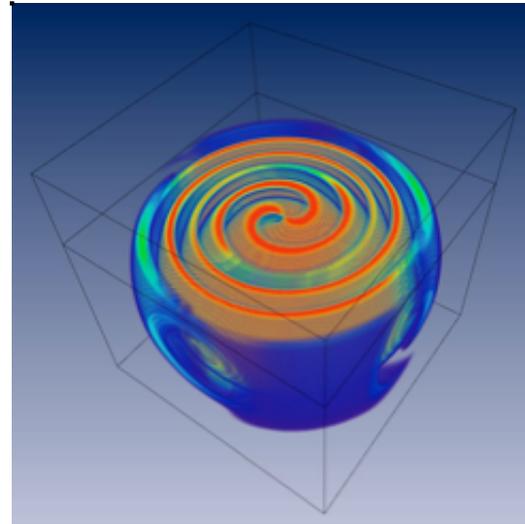
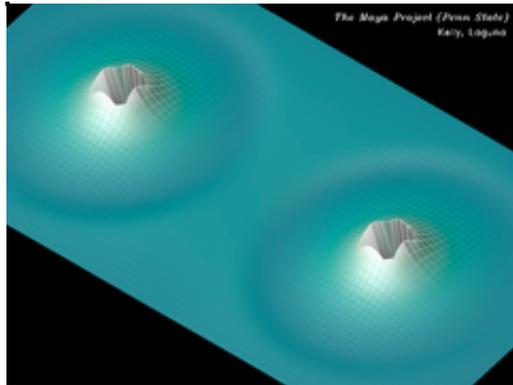
Gravitational Wave Research



ALLEGRO



Gravitational Wave Research



Source Simulations



Gravitational Wave Research



Center for Gravitational Wave Physics



Budget FY 2002

(\$M)

	NSF	MPS	PHY	Gravity
FY2001	4416	850.8	187.5	32.5
FY2002	4789	922.0	195.9	38.6
□	8.4%	8.4%	4.5%	19%

- The PHY increase was more than offset to meet needs of NSF-wide and PHY initiatives and PHY facilities.
- Gravity Program fared much better than most PHY Programs.
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Gravity in Detail for FY 2002

	PHY GP	LIGO Lab	LSC + Other (Core PI)
FY2001	\$32.5M	\$21.8M	\$10.69M
FY2002	38.6	28.0	10.57
□	\$6.1M	\$6.2M	\$- 0.12M

Other NSF programs funded:

Center for Gravitational Wave Physics (PFC)
Two GW source simulation projects (ITR)
Grid research for LIGO data (ITR)



FY 2003 - Status

	NSF	R&RA	MPS	PHY
FY2002	4789	3599	922	195.9
Presidential Request	5036 (5%)	3783 (5%)	942 (2%)	191.3 (-2%)
Senate (Omnibus)	5200 (8%)	4029 (12%)	1043 (13%)	—

- The Omnibus bill is now in conference.
- Latest news at <http://www.nsf.gov/od/lpa/congress/start.htm>.
- HR 4664 is now the law.
- FY2004 President's Request for PHY is | | + 10%.



HR 4664

- Does not provide funds for NSF; Does provide the authority to obligate funds for specified NSF activities.
- Authorizes increases to NSF of between 13% and 15% for each of next 5 fiscal years.
- Policy objectives include balancing the Nation's research portfolio (among which are cited the physical sciences, geoscience, and engineering), establishing and maintaining cooperative international relationships, and increasing overall workforce skills.
- Requires the creation of a prioritized list of Major Research Equipment and Facilities Construction (MREFC) projects to be updated each time the NSB approves a new project to be funded by the MREFC account.



Education





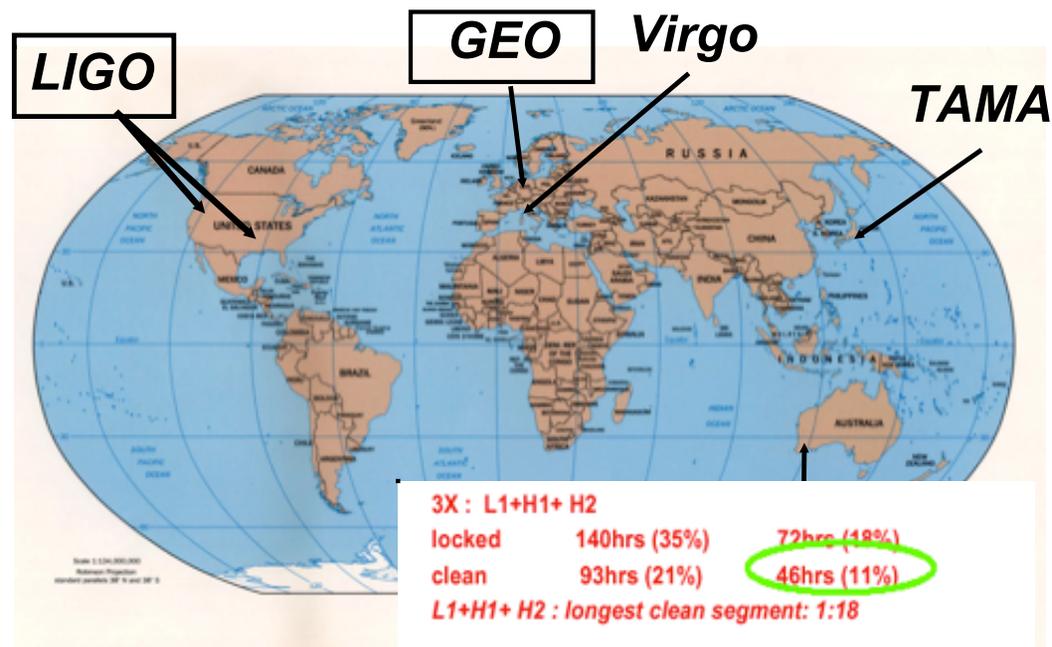
International Activities

Examples supported or bragged about by NSF:

- LIGO MOU's with other GW projects: GEO 600, TAMA, ACIGA, VIRGO
- Joint science runs with LIGO, GEO, TAMA
- International participation in LSC
- Probable international partnership in Advanced LIGO (PPARC)
- LIGO Visitors Program
- LIGO-VIRGO undergraduate exchange

LIGO Exercises International Array in E7 run

- LIGO engineering run Dec. 29, 2001 through Jan. 14, 2002 exercised both LIGO observatories (Hanford, WA and Livingston, LA)
- First test of international network was accomplished with 26 hours of stable running in coincidence with UK/German GEO 600 interferometer
- Data collected to study long distance noise correlations in analysis





NEW UPPER LIMIT ON GRAVITY WAVE EVENTS. The International Gravitational Event Collaboration (IGEC) involves a network of five cryogenic resonant cylinder gravity wave detectors: two in Italy and one each in Switzerland, the US, and Australia. The search for passing gravity waves is a delicate art; in the resonant cylinder approach, it means measuring strain displacements far smaller than the size of an atomic nucleus on the end faces of 3 meter long, 2000 kg metal cylinders. The IGEC team has now reported that in its first operational period, covering 1997 and 1998, no gravity waves were detected. From this they calculated an annual upper limit of four events with a mean Fourier component exceeding 10^{-20} Hz⁻¹ arriving at Earth. The IGEC typically used thresholds that correspond to the conversion of 0.04-0.11 solar masses to gravity waves in an astrophysical source such as a coalescing binary system of neutron stars or black holes at the Galactic center. The collaboration also demonstrated that a network of many detectors operating simultaneously can achieve a negligible false alarm rate. (Z. A. Allen *et al.*, *Phys. Rev. Lett.* **85**, 5046, 2000.)



NASA/NSF Cooperation on GW Source Simulation

- Task group report has been made available to both agencies (<http://astrogravs.gsfs.nasa.gov>).
- GW source simulations are regarded by both NASA and NSF as an important area for cooperation.
- Committee to advise NASA and NSF on collaboration made strong statements on need for increased support for GW source simulation
- Time scales and formats for actual cooperative programs are not yet known.
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From Quarks to the Cosmos (Turner Report)

Finding: “More than ever before, astronomical discoveries are driving the frontiers of physics, and more than ever before our knowledge of physics is driving understanding of the universe and its contents.”

Recommendation: “The agencies [DOE, NASA, NSF] proceed with an advanced technology program to develop instruments capable of detecting gravitational waves from the early universe.”

OSTP has formed a joint DOE (HENP, Fusion), NASA (Space Science), NSF(PHY, AST) working group to foster the recommended collaboration including ground-based and space-based GW wave detectors and GW source simulation.

