



Report from NSF Particle Physics

HEPAP Meeting

March 14, 2014

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Elementary Particle Physics

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Particle Astrophysics

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Particle Theory, Astrophysics/Cosmology Theory

Program Directors, Physics Division, NSF



Program of Activities for FY14

- Organizational Updates
- Base Programs – EPP, PA, THY
 - Review of Budgetary History FY08-FY13
 - Review of Proposal Actions for FY13
- New in FY14 - Accelerator Research
- Major Research Instrumentation (MRI) Program
- Mid-Scale Instrumentation Fund
- Physics Frontier Center (PFC) Competition
- Direct Detection of Dark Matter (DDDM)
- Broader Impacts
- Particle Physics Program Staffing
- Closing Comments

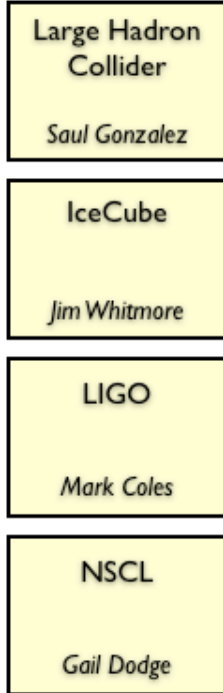


Division of Physics

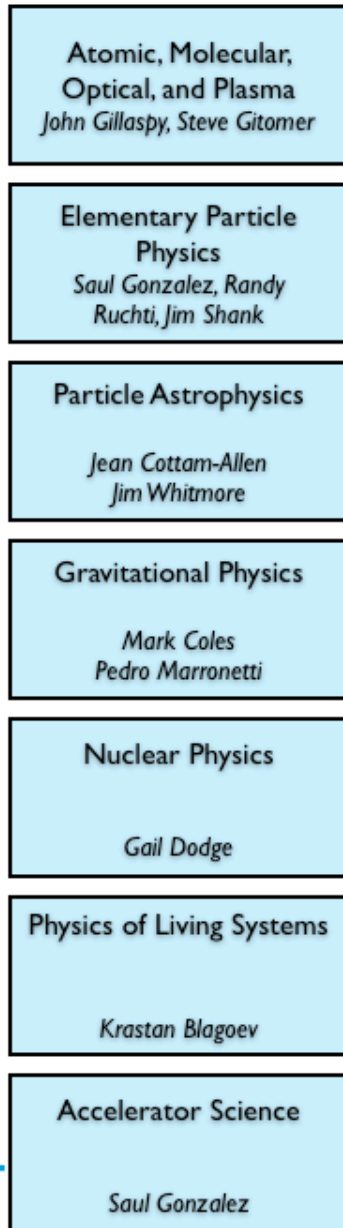
Denise Caldwell
Director

Brad Keister
Deputy Director

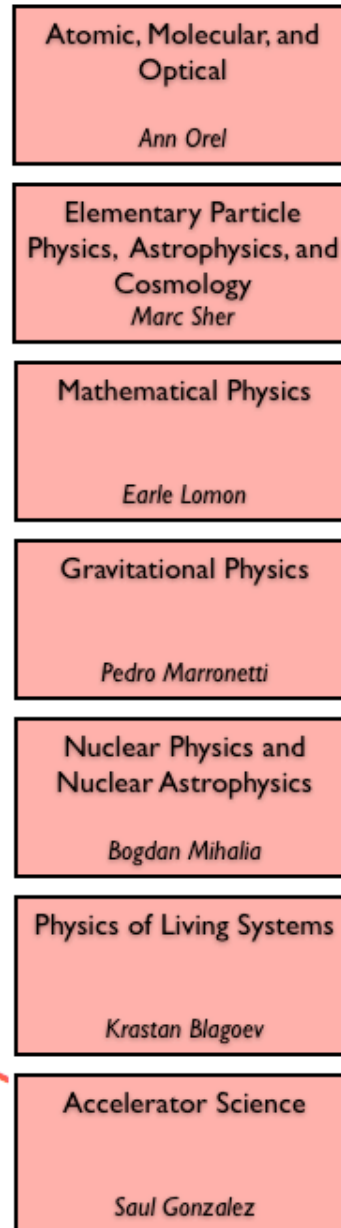
Facilities



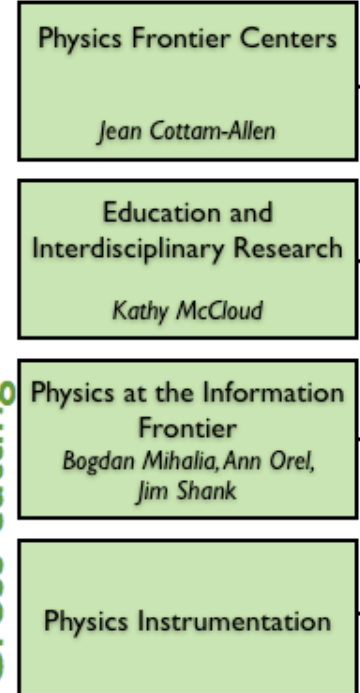
Experiment



Theory



Cross-cutting



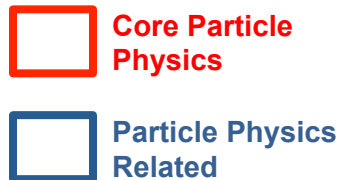
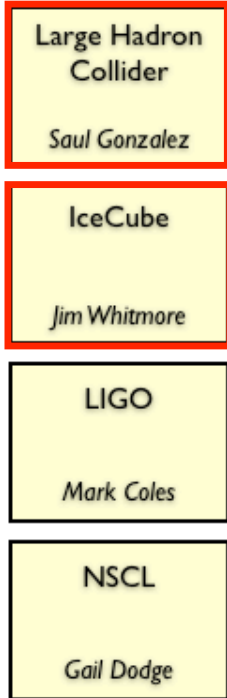


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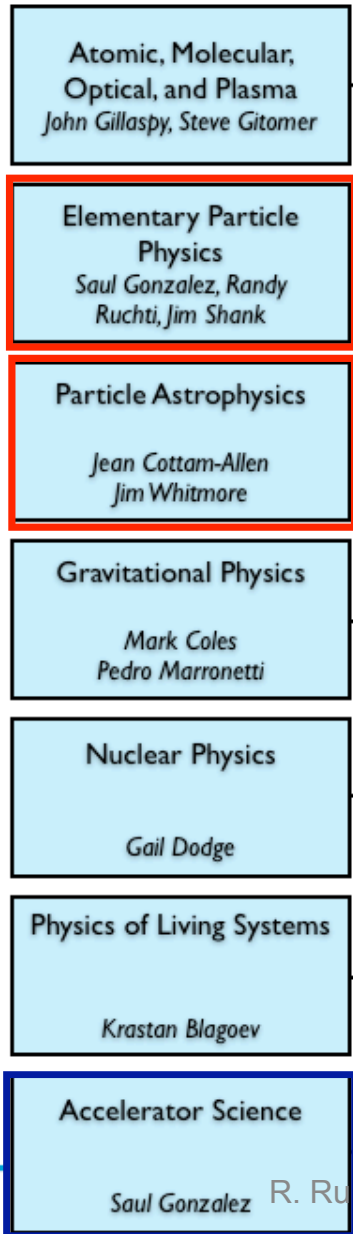
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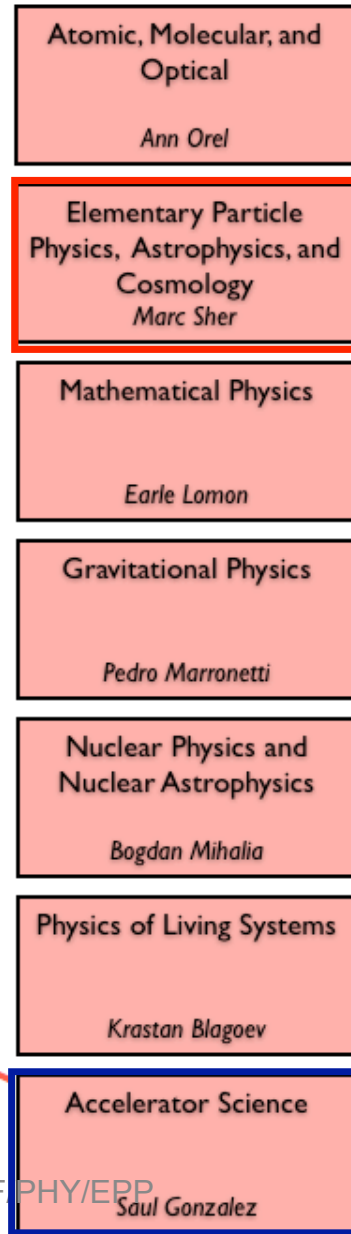
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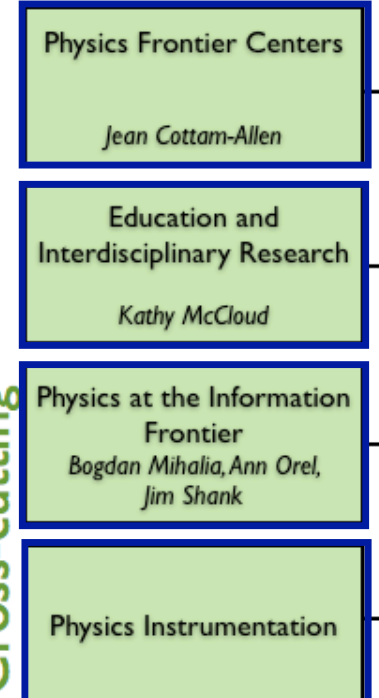
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Particle Physics – Recent Budgetary History

(in M\$)	FY 2008 Actuals	FY 2009 Actuals	FY 2009 ARRA	FY 2010 Actuals	FY 2011 Actuals	FY 2012 Actuals	FY 2013 Actuals
EPP Research	20.5	18.8	14.0	25.8	25.0	24.7	21.8
LHC Ops	18.0	18.0		18.0	18.0	18.0	18.0
CESR	13.7	8.5	1.3				
Accel/Instrumentation	4.0	2.2		3.0	4.1	11.9	4.5
Particle Astrophysics	15.8	15.9	15.3	17.9	9.7	11.5	12.0
IceCube Ops	1.5	2.2		2.2	3.5	3.5	3.5
DUSEL Planning	2.0	22.0		28.9	10.2		
Underground R&D	5.0	4.0	5.6	4.6	6.0	11.0	3.9
Underground Physics					8.4	6.3	6.8
THY (EPP/Astro/Cosmo)	11.7	12.0	6.8	13.2	14.1	13.6	12.1
Physics Frontier Centers	6.3	5.9		5.9	6.0	6.0	6.0
Total Particle Physics	98.5	109.5	43.0	119.5	105.0	106.5	88.5
Total Physics Division	285.0	275.5	102.1	307.8	280.3	277.4	247.4
% of Physics Division	34.6%	39.7%	42.1%	38.8%	37.5%	38.4%	35.8%
Allied Funding	7.2	4.9	0.5	12.7	12.3	24.7	20.8
Effective Total	105.7	114.4	43.5	132.2	117.3	131.2	109.3

FY13 Base Program Proposal Action Summary



PROGRAM	PROPOSALS	AWARDED	%	CAREER	AWARDED	%
EPP	36	19	52.8%	10	0	0.0%
PA	64	20	31.3%	9	2	22.2%
THY	38	17	44.7%	11	1	9.1%
Total	138	56	40.6%	30	3	10.0%

Particle Physics Related Base Programs – FY14



- Target dates for proposals this past fall:
 - EPP and PA – October 30, 2013
 - Accelerator Science (AS) – November 29, 2013
 - THY – December 5, 2013
- Merit Review process is underway:
 - Ad hoc/email reviews
 - Panel reviews
 - Site reviews as needed
- Decision process on funding actions:
 - Program budget guidance soon
 - Funding actions will follow as the merit review processes are completed.



New in FY 2014: Accelerator Science

The acceleration and control of charged particle beams are essential tools for discovery science within the Physics Division: from high to low energy beams, high intensity sources for secondary or tertiary beams (e.g., neutrinos), nuclear physics, nuclear astrophysics.

- We are starting an accelerator science program with the goal of enabling fundamental discoveries and train students and postdocs across disciplinary boundaries
 - Program Description *PD 13-7243: “Accelerator Science”*
 - http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504937
 - Program Contact: Saul Gonzalez
- Broader impacts are significant: industrial applications, medical applications, homeland security, light sources
- Program will focus on transformational developments that are likely to come from curiosity-driven research with strong interdisciplinary link.
- Program will evolve with the community as new challenges are identified

Merit review process currently underway. A total of 60 proposals have been received requesting ~ \$70M in funding.



Major Research Instrumentation (MRI)

- The Major Research Instrumentation Program (MRI) serves to increase access to shared scientific and engineering instruments for research and research training in our Nation's institutions of higher education, and not-for-profit museums, science centers and scientific/engineering research organizations.
- This program especially seeks to improve the quality and expand the scope of research and research training in science and engineering, by supporting proposals for shared instrumentation that fosters the integration of research and education in research-intensive learning environments. Two types.
 - Track (1) acquisition of a research instrument
 - Track (2) development of a research instrument.
- Solicitation 13-517
- Program Contact: Kathleen McCloud or EPP/PA program directors

MRI Program – Impact in Particle Physics



- MRI Support has been significant to the various programs from FY08 – FY13, totaling \$26.3M
 - EPP related: \$14.5M
 - PA related: \$9.4M
 - Accelerator Science: \$2.4M

Mid-Scale Instrumentation and Particle Physics



One of the most critical needs of research projects funded through the Physics Division is that of having cutting-edge instrumentation that enables investigators to remain competitive in a rapidly-changing scientific environment.

- The Physics Division has established a Mid-Scale Instrumentation Fund.
 - Dear Colleague Letter *NSF 13-118*: “Announcement of Instrumentation Fund to Provide Mid-Scale Instrumentation for FY2014 Awards in Physics Division”
 - http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13118
- This is not a separate program to which investigators can apply directly. PI’s should request funding for specialized equipment as part of a regular proposal to a disciplinary program in the Division. The Program Officer can then request funds be provided through the Mid-Scale Instrumentation Fund.

Mid-Scale Instrumentation and Particle Physics



- Resources from the Mid-Scale Instrumentation Fund can be used for off-the-shelf purchases or for construction of specialized equipment.
- Mid-Scale Instrumentation Fund resources are non-renewable and are intended to be one-time investments in the research project.
- Merit reviews proceed through the base programs or special reviews.

- **Prior year examples: formerly called the APPI Program**
 - Has provided significant instrumentation and development for PA experiments. \$25.9M over the period FY08 – FY13. Examples HAWC, XENON1T, SCDMS...

- **Current potential Mid-Scale possibilities:**
 - Large detector upgrades...

Physics Frontier Centers (PFC) - Competition



The PFC program supports university-based centers and institutes where the collective efforts of a larger group of individuals can enable transformational advances in the most promising research areas.

- The program is designed to foster major breakthroughs at the intellectual frontiers of physics by providing needed resources such as combinations of talents, skills, disciplines, and/or specialized infrastructure, not usually available to individual investigators or small groups, in an environment in which the collective efforts of the large group can be shown to be seminal to promoting significant progress in the science and the education of students.
- PFCs can be in any subfield of physics within the purview of the Division of Physics, including elementary particle physics, particle astrophysics, theory and accelerator science.
- The Physics Division issues a new solicitation every three years.
- **Solicitation NSF 13-559: “Physics Frontier Centers (PFC)”**
 - http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5305&org=PHY&from=home
 - Program Contact: Jean Cottam
 - Full Proposals for this round were due January 27, 2014
- We are currently reviewing submissions for FY14 awards. Selections are expected to be made in summer.

Direct Detection of Dark Matter Solicitation



The current generation of direct dark matter experiments should all achieve their projected sensitivities and complete operations within the next few years. The more sensitive, "second generation" direct detection experiments, will then be required to either search with increased sensitivity or to measure in detail the detected dark matter.

- These next generation experiments will be selected through a solicitation with funding beginning in FY 2014.
 - *Solicitation NSF 13-597: “Support for Construction of Direct Detection Dark Matter Experiments in Particle Astrophysics”*
 - http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504939&org=PHY&from=home
 - **Program Contacts: Jean Cottam and Jim Whitmore**
- NSF and DOE are closely coordinating the review, selection and funding of the awards and subsequent support for the experiments.
- The review is in process. We expect to make selections later in the spring.



Broader Impacts...

- NSF Merit Criterion #2 is important. In the area of Broader Impacts/ Informal Education:
- In theaters...
 - Documentary on the quest for the Higgs Boson entitled “Particle Fever” by David Kaplan and Mark Levinson, shown in Washington DC on March 12. Reviewed in the New York Times, March 4, 2014.
- Coming soon... and in preparation for planetarium presentation...
 - Show on Dark Matter entitled “Dark Secrets of the Big Bang” lead by Reinhard Schwienhorst, Kaushik De and Michael Barnett.



Particle Physics Program Staffing

- Incoming: New Program Director in EPP – Jim Shank from Boston University has joined NSF as an IPA in January 2014.
- Outgoing: Current Program Directors: M. Sher (THY) and R. Ruchti (EPP) both IPAs stand down at the end of FY14.
- Position Openings:
 - In EPP – Elementary Particle Physics (Experiment)
 - Position is available (IPA or Fed Temp)
 - <http://www.nsf.gov/pubs/2013/phy13002/phy13002.jsp?org=PHY>
 - DCL PHY 13-002
 - In THY – Particle & Astrophysics/Cosmology Theory
 - Position available (IPA or FED Temp or Permanent)
 - <http://go.usa.gov/KBPT>
 - Job Announcement Number: PHY-2014-0006



Closing Comments

- NSF is very appreciative of the Particle Physics Community's considerable efforts in the Snowmass 2013 Process which have led to important reports on the scientific opportunities in the field.
- NSF, with our DOE colleagues, is following P5 closely as it carries out its important work. We sincerely appreciate their efforts and look forward to the Report in May.
- While the funding climate is challenging, NSF is committed to advancing Particle Physics research across its many intellectual frontiers, with emphasis on university-based research efforts.