HEP Status at NSF

Presentation for Fermilab Users' Meeting
June 3, 2009

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Topics

- Keith Dienes (U. of Arizona) becomes PM for Theory - Oct. 1, 2009
- PHY 2009 Committee of Visitors Comments
- PHY Strategy
- EPP/PNA Portfolio
- Budget Overview
- EPP Grants Program - Statistics and Funding
- PHY Planning in FY09 and Beyond
- Expanded Initiatives
- Summary

Comments from Committee of Visitors 2009 Report

- "The subpanels are unanimous in concluding that the process of reviewing proposals submitted to the physics division is excellent".
- "The summary reviews by the program officers are judged to be outstanding in terms of analyzing the proposals and providing the basis for the ultimate funding decisions".
- "We especially commend EPP for pro-active efforts to build cooperative relationships within NSF that broaden support for high energy physics through partnerships to support large-scale computing, innovative educational programs and interdisciplinary research".

NSF PHY Strategy

- Short term – Complete programs at FNAL, BaBar, CESR; begin LHC exploration of TeV scale; complete plans for neutrino, astrophysics/cosmology, rare processes program; R&D for DUSEL and all promising energy-frontier accelerator concepts; strengthen university program & theory
- **Intermediate term – Exploit discovery potential of LHC; utilize potential of DUSEL; support neutrino, astrophysics/cosmology, rare process approaches to major discoveries; prioritize/select best-value lepton & hadron accelerator concepts; strengthen university experiment program & theory**
- Long term – Prepare to participate in the next energy-frontier collider, from the platform of a broad discovery program.

EPP + PNA Portfolio

- University Program
  - EPP Accelerator based physics
    - Hadron Colliders: CDF, DØ, CMS, ATLAS, LHCb, TOTEM
    - Electron Positron Colliders: CLEO-c, BaBar, BES-III,…
    - Neutrinos: MINOS, NOvA, MINERvA, MiniBooNE, MicroBooNE
  - Particle and Nuclear Astrophysics
    - Dark Matter: CDMS, COUPP, XENON10, DRIFT-II, WARP, LUX
    - UltraHigh Energy Universe: HiRes/TA, Pierre Auger, VERITAS, MILAGRO
    - Neutrinos: Double Chooz, Super-K, Borexino, CUORE, Daya Bay, EXO,MAJORANA, IceCube
    - Other
  - Theory
  - Computational physics
- LHC Experiments: Maintenance and Operations, Tier 2 Centers, Student support program
- DUSEL and DUSEL R&D
- CESR/CESR-TA
- Accelerator and Detector R&D
  - ILC Accelerator and Detector R&D
  - MICE
  - Advanced Technologies; developing partnership with PHY Plasma program
- Other Partnerships & Broader Impacts
- Work with HEPAP sub-groups

Partnerships

- Cyberscience
  - Tier 2c – with OCI
  - UltraLight – with OCI
  - OSG – with OCI OASCR and DOE (http://www.opensciencegrid.org)
  - CDI – with NSF (http://www.nsf.gov/crssprgm/cdi/)
- Education with research
  - QuarkNet – with OMA, EHR and DOE/HEP
  - CHEPREO-Diversity with OMA, OCI, EHR, OISE
  - I2U2 – with OMA, EHR, PHY
  - Mariachi – OCI funded
  - CyberBridges – OCI funded
  - PIRE (UK,KSU,UNL,UIC, UPRM) – with OISE
  - ILC Outreach – with OISE

FY08 EPP/PNA/THY Demographic

	EPP	PNA	THY
1.Senior Personnel (Women)	113(22)	122(18)	278(21)
2. Postdocs	71	41	85
3. Other Professionals	28	12	0
4. Graduate Students	98	78	162
5. Undergrad Students	26	63	10
6. Secretarial - Clerical	10	4	5
7. Other Personnel	7	7	1

NSF Budget - $M

	FY 2008 Actual	FY 2009 Omnibus	FY 2009 ARRA	FY 2010 Request	Change over FY 2009	
Research & Related Activities	**$4,853.24**	**$5,183.10**	**$2,500.00**	**$5,733.24**	**$550.14**	**10.6%**
Education & Human Resources	766.26	845.26	100.00	857.76	12.50	1.5%
MREFC	**166.85**	**152.01**	**400.00**	**117.29**	**-34.72**	**-22.8%**
Agency Operations & Award Management	282.04	294.00	0.00	318.37	24.37	8.3%
National Science Board	3.82	4.03	0.00	4.34	0.31	7.7%
Office of Inspector General	11.83	12.00	2.00	14.00	2.00	16.7%
Total, National Science Foundation	**$6,084.04**	**$6,490.40**	**$3,002.00**	**$7,045.00**	**554.60**	**8.5%**
			Change from FY 2008:		+961M,	+15.8%

R&RA Budget - $M

	FY 2008 Actual	FY 2009 Omnibus	FY 2009 ARRA	FY 2010 Request	Change over FY 2009	
Biological Sciences	$613.42	$653.81	$260.00	$733.00	$79.19	12.1%
Computer and Information Sci & Eng	535.26	573.74	235.00	633.00	59.26	10.3%
Engineering *(less SBIR/STTR)*	531.23	564.94	215.00	632.00	67.06	11.9%
SBIR/STTR	109.07	119.21	50.00	132.52	13.31	11.2%
Geosciences	757.87	807.13	347.00	909.00	101.87	12.6%
Math & Physical Sciences	**1,171.13**	**1,255.96**	**490.00**	**1,380.00**	**124.04**	**9.9%**
Social, Behavior, & Economic Sciences	215.18	229.80	85.00	257.00	27.20	11.8%
Office of Cyberinfrastructure	185.15	199.28	80.00	219.00	19.72	9.9%
Office of International Sci & Eng	47.77	44.03	14.00	49.00	4.97	11.3%
Office of Polar Programs	447.13	470.67	174.00	516.00	45.33	9.6%
Integrative Activities	238.56	263.03	550.00	271.12	8.09	3.1%
U.S. Arctic Research Commission	1.47	1.50		1.60	0.10	6.7%
Research & Related Activities	**$4,853.24**	**$5,183.10**	**$2,500.00**	**$5,733.24**	**$550.14**	**10.6%**

MPS Budget - $M

	FY 2008 Actual	FY 2009 Current Plan	FY 2009 ARRA	FY 2010 Request	Change over FY 2009 Current Plan	
Astronomical Sciences	$217.90	$228.62	$85.80	$250.81	$22.19	9.7%
Chemistry	194.62	211.35	103.00	238.60	27.25	12.9%
Materials Research	262.55	282.13	106.90	308.97	26.84	9.5%
Mathematical Sciences	211.75	226.18	98.00	246.41	20.23	8.9%
Physics	251.64	274.47	96.30	296.08	21.61	7.9%
Office of Multidisciplinary Activities	32.67	33.21	-	39.13	5.92	17.8%
Total, MPS	**$1,171.13**	**$1,255.96**	**$490.00**	**$1,380.00**	**$124.04**	**9.9%**

MPS MREFC Projects - $M

	FY 2008 Actual	FY 2009 Omnibus	FY 2009 ARRA	FY 2010 Request
AdvLIGO	$32.75	$51.43	-	$46.30
ALMA	102.07	82.25	-	42.76
ATST	-	7.00	146.00	10.00
IceCube	18.74	11.33	-	0.95

AdvLIGO - Advanced Laser Interferometer Gravitational-Wave Observatory

Third year of a seven-year project that began in April 2008. Major initial activities include the placing of long lead-time orders and the preparation of the sites for the upgrade.

ALMA - Atamaca Large Millimeter Array

Milestones for FY 2010 are expected to include

- Acceptance of the first European antennas
- Acceptance of the eighth through fourteenth North American antennas
- Transport of several antennas to the final, high-altitude site in Chile
- Start of commissioning

ATST - Advanced Technology Solar Telescope

It is anticipated that the federal environmental and cultural compliance activities will be completed in FY 2009 and construction will begin in early FY 2010. $146.0 million of ARRA MREFC funding will initiate construction.

IceCube - IceCube Neutrino Observatory

Preliminary data acquisition with partial array underway; two seasons remain to completion on time and within budget

EPP/PNA/THY Funding - $M

	FY05	FY06	FY07	FY08	FY09 ARRA	FY09 Omnibus
Base (plus FY09 ARRA)						
EPP	18.19	19.03	18.91	20.45	13.99	19.50
PNA+IceCube Ops	14.69	15.85	16.33	17.33	15.31	15.93
CESR	16.62	14.62	14.71	13.71	1.30	
LHC OPS	10.51	13.65	18.00	18.00		18.00
Accel + ILC Det R&D	0.78	1.55	2.16	4.00		
(RSVP)/DUSEL, R&D	(2.65)	(0.99)	6.00	6.96		4.00
DUSEL Planning						22.00
EPP+Astro/Cosmo Theory	10.05	10.82	11.82	11.68	6.80	11.99
Total Base	73.50	76.24	87.94	92.13		
EPP Allied Funding						
MRI	0.75	1.66	1.05	1.44		
PFC	5.56	5.77	5.93	6.26		
OCI/CISE	5.65	3.63	1.61	1.30		
PIF/OMA/ESIE/OISE	0.55	3.72	4.45	4.41		
Total Allied	12.51	14.78	13.05	13.41		
Overall Total	**86.01**	**91.02**	**100.99**	**105.54**		
MREFC						
IceCube	47.62	49.85	28.65	22.38		11.33

FY08 - FY09 EPP/PNA/THY Proposal Data

	EPP		PNA		THY[c]	Comments
	FY08	**FY09**	**FY08**	**FY09**	**FY08**	
CAREER						
Submitted	13	8	9	10	13	
Funded	1	3	1	3	3	
RESEARCH PROPOSALS						
Submitted (Renewals)	25(15)	28(12)	45(16)	45(23)	57(21)	THY: 46 Individual[a] 11 Group[b]
Funded	16(14)	20(11)	21(15)	TBD	24(17)	
Total Grants (# Universities)	57(37)		61(40)		142(72)	

[a] Cosmology 17; Strings 12; Phenom 9; Astrophysics 3; Lattice QCD 2; General 3

[b] Phenom 11; Strings 11; Cosmology 2; General 1

[c] FY09 data in preparation

EPP/PNA FY09 Funding Process

- In FY09 proposals with first year requests totaling more than $8.5M (EPP) and $14.2M (PNA) were received. The FY09 EPP program budget would have allowed funding less than half this amount and PNA less than a third
- The addition of American Recovery and Reinvestment Act (ARRA) funds and the allocation following from the FY09 Omnibus Bill have allowed for reasonable funding of proposals satisfying the review criteria and has enabled EPP/PNA to consider limited funding for supplemental proposals.
- Under guidelines set by the National Science Foundation the EPP/PNA ARRA funds are used only for standard grants that had undergone the merit review process and were to be recommended for an award. In addition, proposals funded with ARRA funds cannot be awarded supplemental funds during the duration of the grant. We attempt to take that into account when making awards with ARRA funds.

EPP/PNA FY09 Funding Process - Cont.

- Within NSF "standard grant" means that all the funds are awarded immediately regardless of the duration of the grant.
- Based on the first year requests one sees that the three year requests would total over $25M (EPP) and $42M (PNA) so, even eliminating the proposals not slated for an award, not all the requests could be addressed using ARRA funds. Some proposals had to be funded from the operating budgets.
- With the ARRA funds and once the final determination is made for the amount needed to fund the remaining active research proposals, EPP/PNA will be able to consider limited supplemental funding actions. Some supplemental awards will address prior commitments. Then priority consideration will be given to those grants that were made in FY08 and were reviewed as meriting funding that could not be realized but had to accept a significant decrease compared to their FY07 funding. Priorities established by the PIs at that time will be addressed first. Following that, EPP/PNA will consider other supplements.

PHY Planning FY09 and Beyond-1

- **Continue to support university groups participating in a compelling experimental program at Fermilab and the LHC while being responsive to the exciting programs in non-accelerator based physics**

- **Strengthen University Experiment Program and Theory**

- **Continue a successful history of partnerships with DOE/OHEP and DOE/NP**
  - **LHC: LHC Operations**
  - **Pierre Auger, CDMS, Veritas, CUORE,…**
  - **QuarkNet**
  - **CESR-TA, SRF**
  - **OSG with OCI OASCR**
  - **FRIB (Facility for Rare Isotope Beams)**

PHY Planning FY09 and Beyond-2

- **Stewardship with DOE**
  - High Energy/Intensity Accelerator
  - DUSEL-Phase 1
  - LHC Detector Upgrades
  - Expanded Accelerator R&D; pilot plasma physics program
  - Detector R&D (ILC, SLHC, generic)

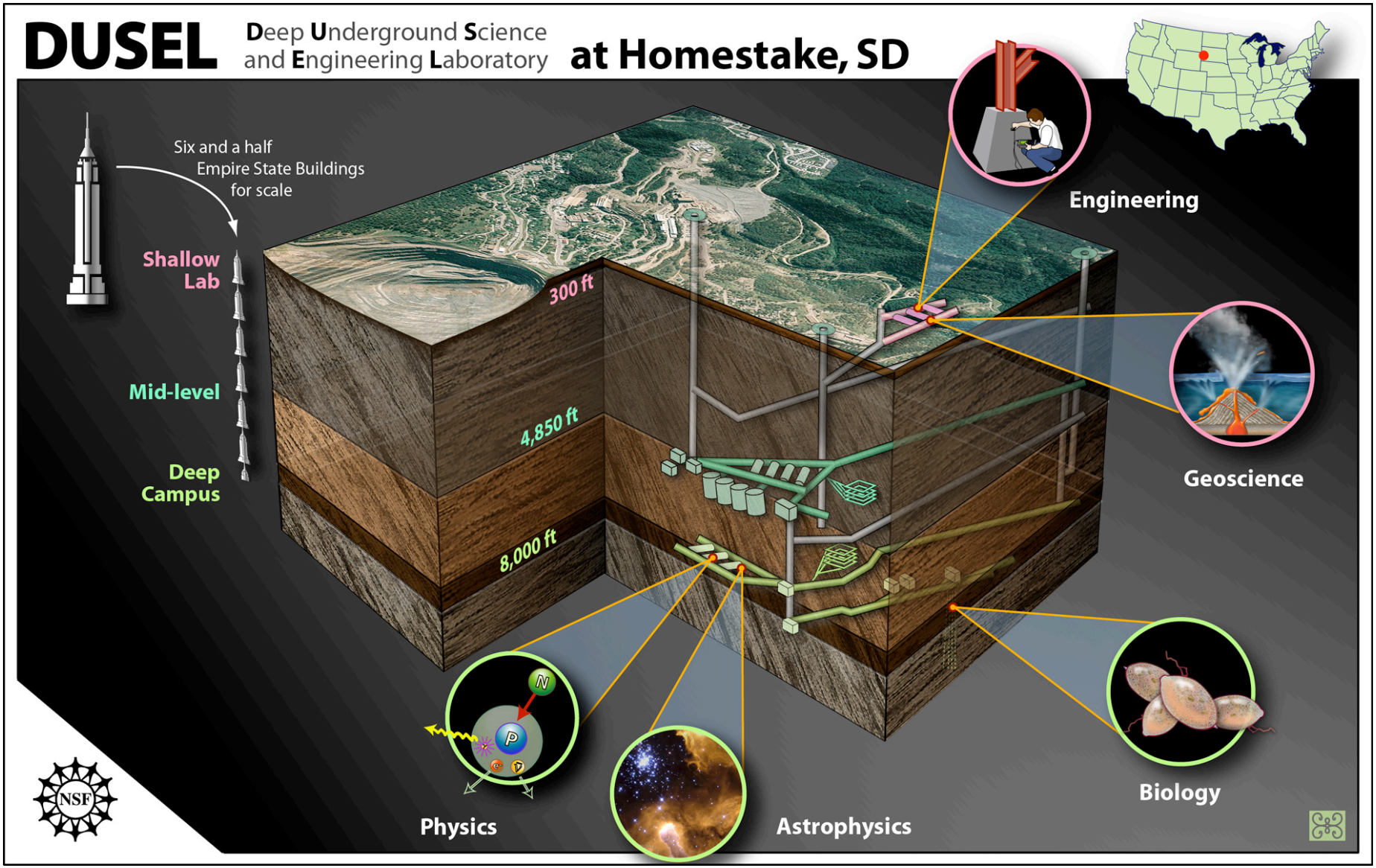
- **New Solicitations within ARRA**
  - MRI-R^2 (Major Research Instrumentation)
  - ARI-R^2 (Academic Research Infrastructure)

Expanded Initiatives -1

- Major Research Instrumentation Program - Recovery and Reinvestment (MRI-R^2)
- mid-scale instrumentation
- $200M Total; approx 400 $100K - $6M awards;
- Full Proposal Deadline Date: August 10, 2009
- http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5260

- Academic Research Infrastructure Program - Recovery and Reinvestment (ARI-R^2)
- $200M Total; 100 - 120 awards ranging from $250K to $10M
- Letter of Intent Deadline Date: July 1, 2009
- Full Proposal Deadline Date: August 24, 2009
- http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503380&org=NSF&sel_org=XCUT&from=fund

Expanded Initiatives - 2: DUSEL



NSF & DOE Collaboration on DUSEL

- NSF/DOE agreed to establish DUSEL Physics Joint Oversight Group (JOG) immediately after release of P5 report.
- Representation from NSF/PHY, DOE/OHEP, DOE/ONP.
- Builds on successful NSF & DOE collaboration on Large Hadron Collider (LHC) in HEP.
- Will jointly coordinate & oversee DUSEL experimental physics program.
- Meet ~ quarterly.
- Both agencies closely collaborating in defining and realizing the DUSEL physics program.

DUSEL Solicitation Process

- Initiated at Town Meeting at NSF, March 2004.
- Solicitation 1 (S1):
  - Define site-independent science scope and infrastructure needs; unify the community (awarded Jan 2005).
- Solicitation 2 (S2):
  - Develop conceptual designs for one or more sites (two awarded, Sep 2005).
- Solicitation 3 (S3):
  - Initiate facility design for an MREFC candidate (one awarded – Homestake, U.C. Berkeley).
  - $15M total over three years, starting in September 2007.
- Solicitation 4 (S4):
  - Initiate technical designs for candidates for the DUSEL suite of experiments.
  - $15M total over three years, beginning in FY09.
  - Proposals received January 9, 2009; reviewed this spring.
- Additional design funding of $22M in FY09

Community targets baseline review
(Preliminary Design Review, PDR) in December 2010.
Goal is FY13 construction start, if approved.

Deep Underground Science and Engineering Laboratory (DUSEL) – What and Why?

- DUSEL will support a set of potentially transformational physics experiments that require a deep underground location (free of cosmic rays) and the necessary infrastructure.
- The particle, nuclear, and astrophysics communities have selected DUSEL as central to their national programs.
- Although physics is the main cost driver, other communities remain actively engaged.

DUSEL Physics Experiments

- The aforementioned questions are addressed at DUSEL via a variety of experimental probes:
  - Direct Detection of Dark Matter
  - Neutrino-less Double-Beta Decay
  - Nuclear Astrophysics
    - Accelerator-based cross-section measurements
  - Solar Neutrinos
  - Long Baseline Experiment, Proton Decay, and Supernovae Remnants (Mega-Detector)

DUSEL MREFC funding would support the construction of forefront experiments in nuclear- and astro-physics, and in particle physics using the Fermilab accelerator as a high intensity neutrino source.

Summary

- We have a mandate to support University Groups; partnerships are important.
- ARRA and the FY09 Omnibus funding has extended our vista and allowed us to meet many critical needs of the HEP community.
- We take advice from the community seriously. P5 report basis for our future. PASAG in progress.
- We respond to proposals. Merit review is a cornerstone of our decision process.