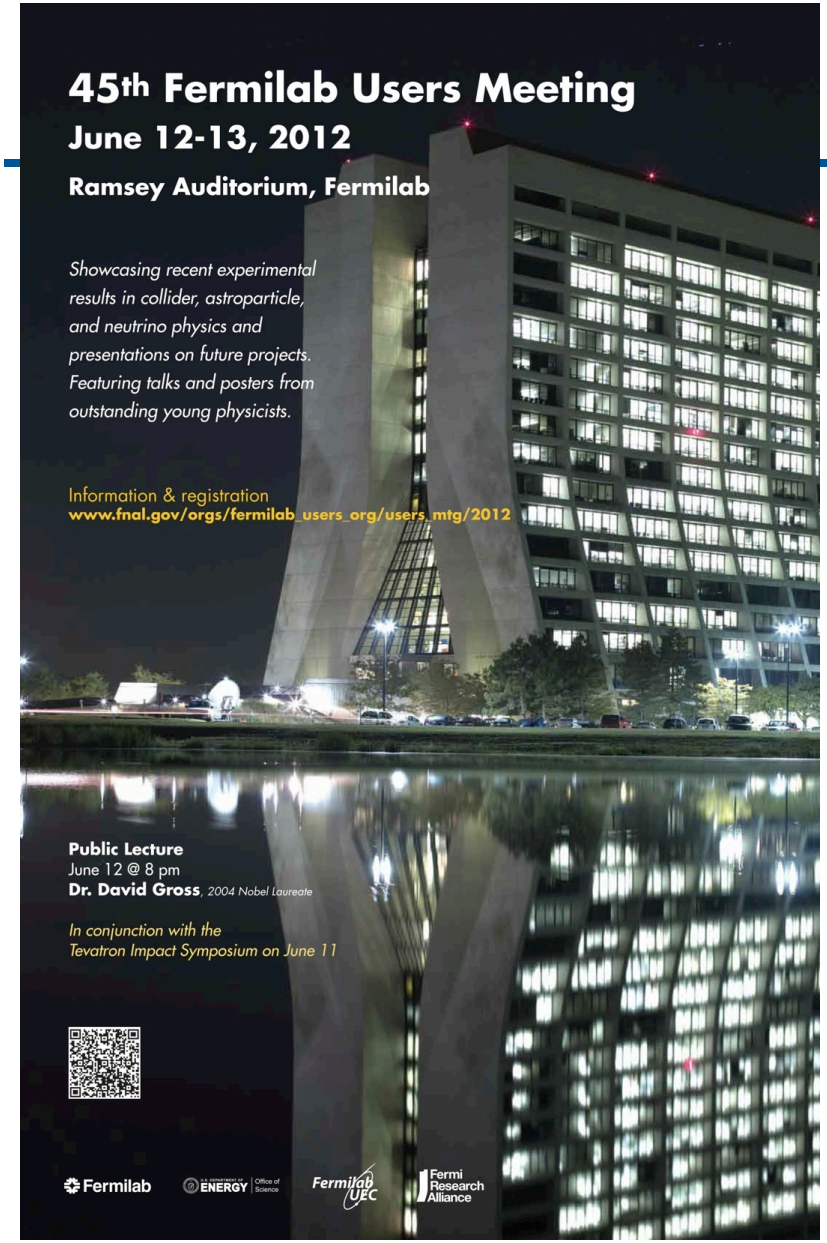
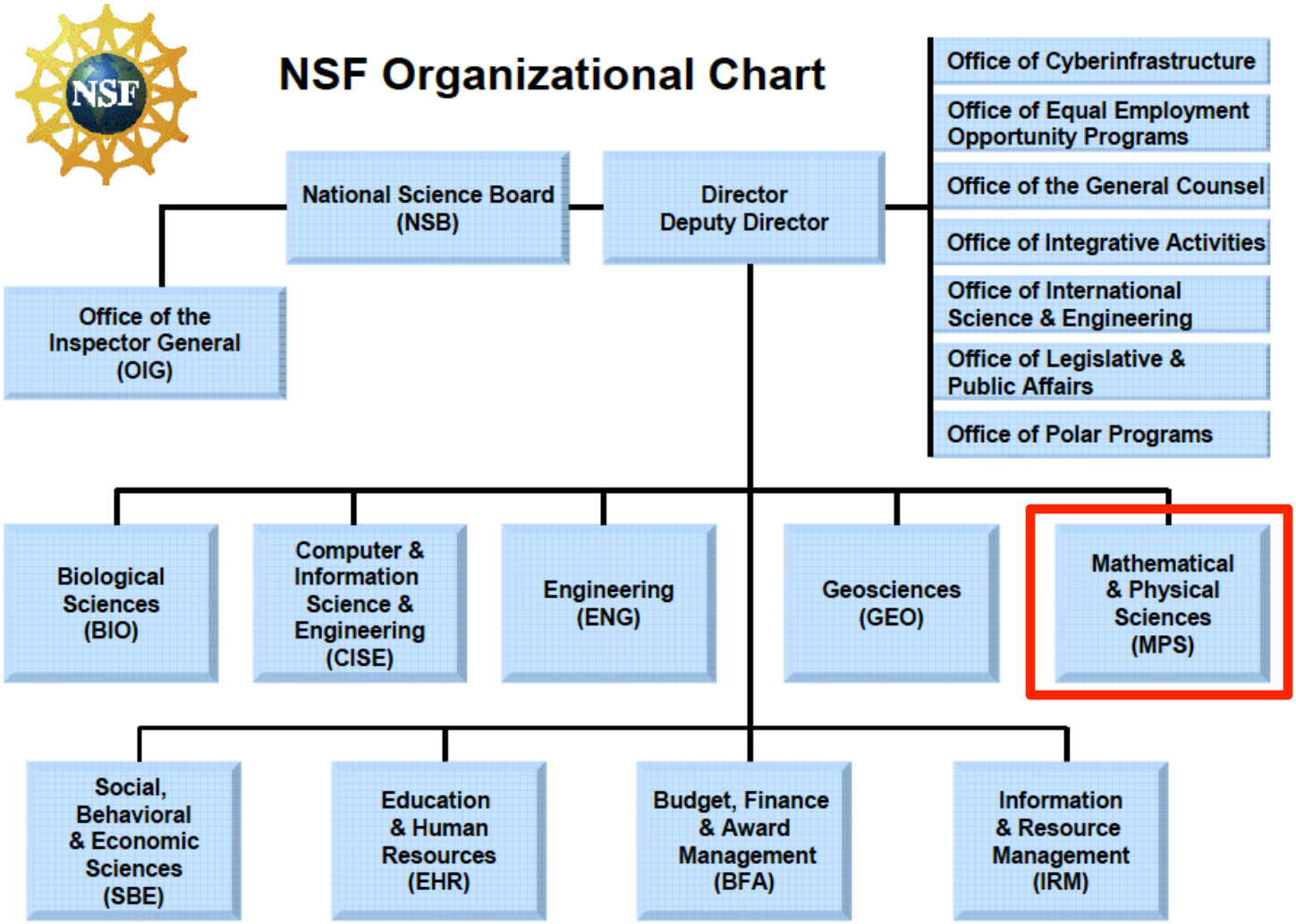
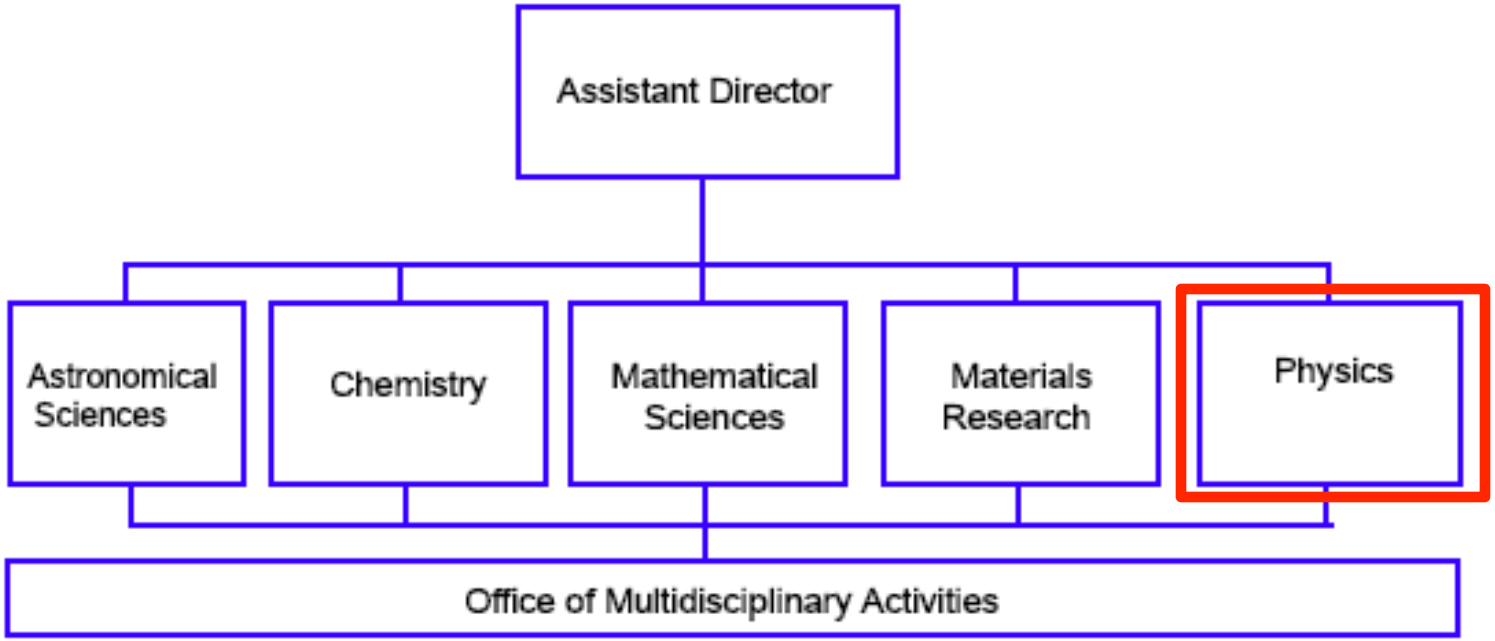


Report from the National Science Foundation

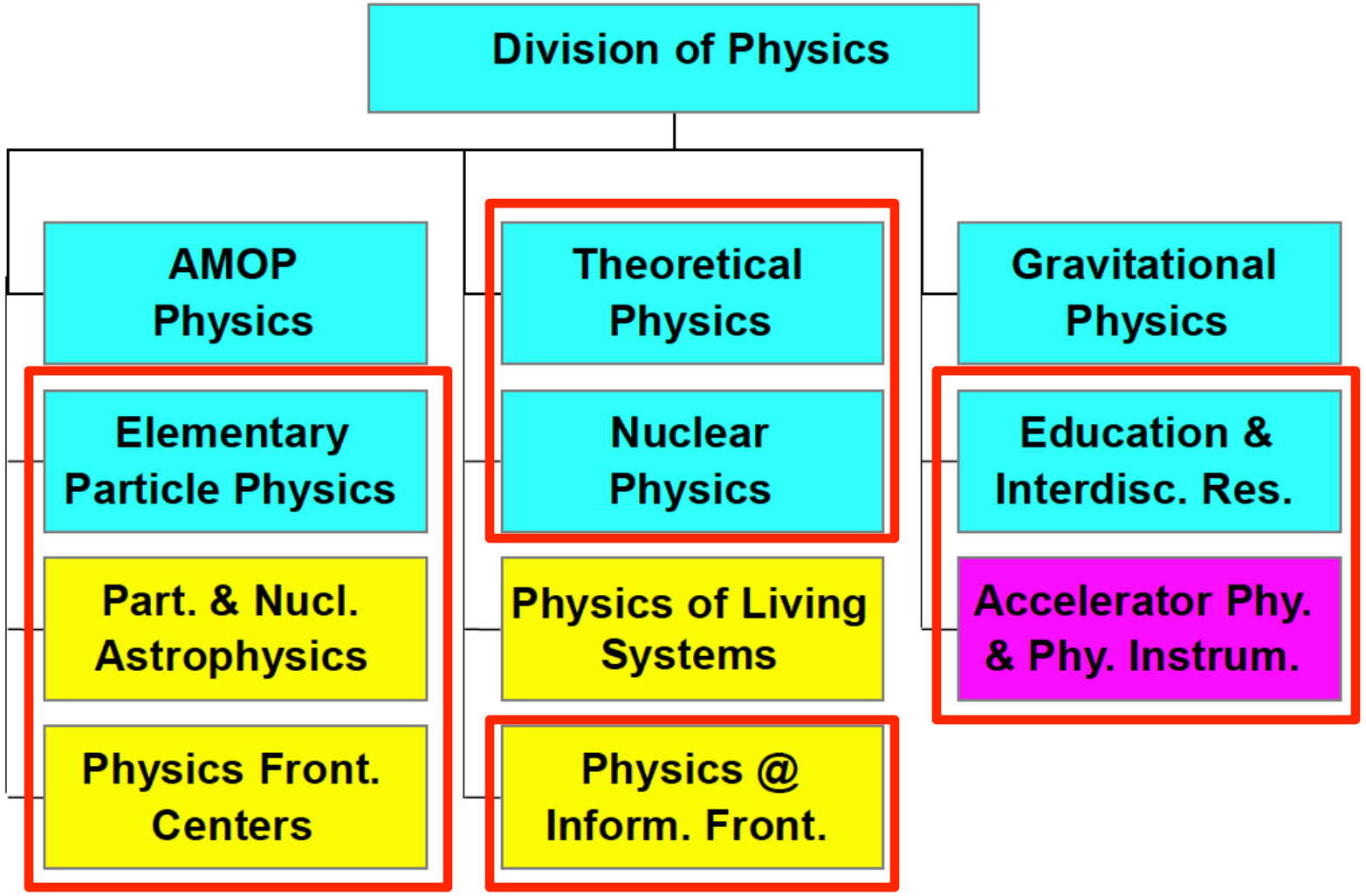
J. Cottam-Allen, K. Dienes, M. Goldberg, S. Gonzalez, J. Kotcher, R. Ruchti, J. Whitmore


NSF Organizational Chart
National Science Board (NSB)
Director
Deputy Director
Office of the Inspector General (OIG)
Office of Cyberinfrastructure
Office of Equal Employment Opportunity Programs
Office of the General Counsel
Office of Integrative Activities
Office of International Science & Engineering
Office of Legislative & Public Affairs
Office of Polar Programs
Biological Sciences (BIO)
Computer & Information Science & Engineering (CISE)
Engineering (ENG)
Geosciences (GEO)
Mathematical & Physical Sciences (MPS)
Social, Behavioral & Economic Sciences (SBE)
Education & Human Resources (EHR)
Budget, Finance & Award Management (BFA)
Information & Resource Management (IRM)

MPS Organization



Physics Organization



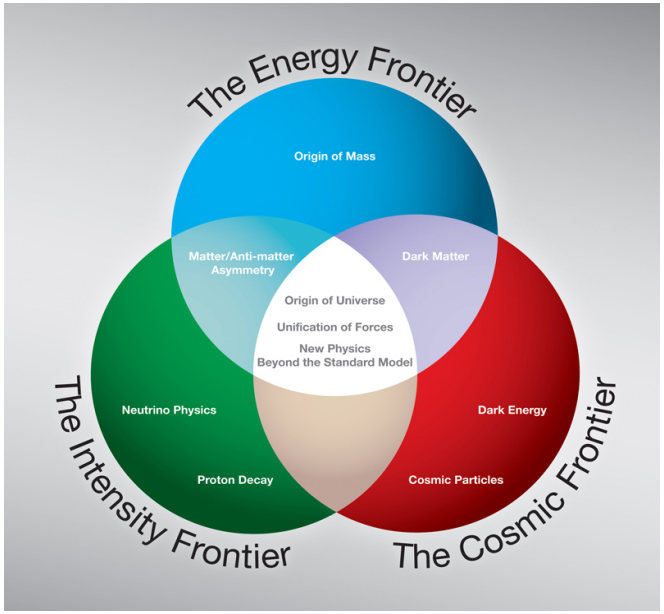
NSF's Mission

- Public Law 81-507 (1950): "*to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes*"
  - Empowering university-based investigators
  - Adding value through partnerships and broadening participation
- Coordination
  - Programs are coordinated with other U.S. and non-U.S. agencies and organizations (DOE/HEP/NP, NASA, NSF, + International)
  - Solicit advice and strategic direction from advisory committees such as HEPAP, AAAC, NSAC and from the National Academy of Science
- Physics Division Priorities
  - Address fundamental questions in Physics – strive to transform understanding
  - Cooperation across intellectual and organizational boundaries
  - Recruit, train, and retain an exceptional and diverse scientific workforce

Program Scope in Particle Physics

- Scientific Frontiers:
  - Energy Frontier - Elementary Particle Physics (EPP)
  - Intensity Frontier - Elementary Particle Physics (EPP)
  - Cosmic Frontier - Particle Astrophysics (PA)

- Broader Impacts:
  - Accelerator R&D
  - Detector R&D
  - Computing
  - Education and Outreach



Program Elements - EPP

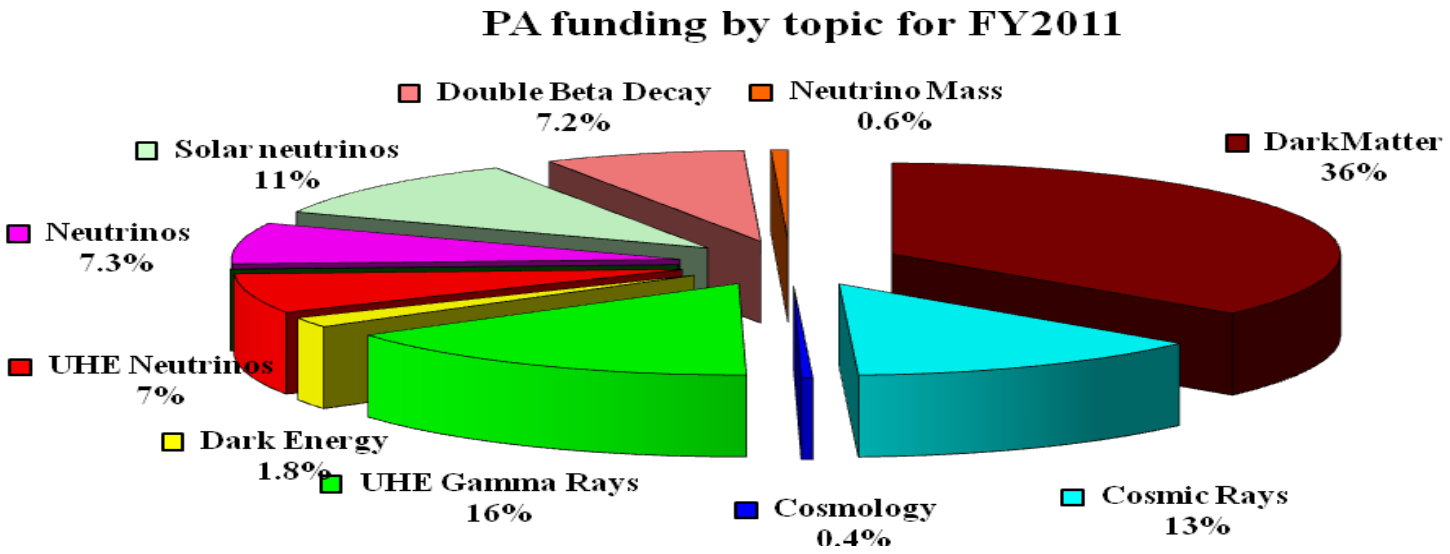
- Energy Frontier
  - LHC
    - ATLAS, CMS
  - Tevatron
    - CDF, D0
  - ILC
    - GDE

- Intensity Frontier
  - Neutrinos
    - MINERvA
    - MINOS/NOvA
    - MiniBooNE/MicroBooNE
  - BaBar
  - BES-III
  - LHC – LHCb
  - CESR TA

NSF Particle Astrophysics Program

Supported activities in FY11 Program:

- 36% Searches for Dark Matter particles through direct detection
- 36% Probing the High Energy Universe through the studies of cosmic rays, gamma-rays, and neutrinos
- 26% Measurements of solar neutrinos and attempts to determine the absolute value of the mass of Neutrinos as well as some of their elusive properties.
- 2.2% Studies of Dark Energy and Cosmology



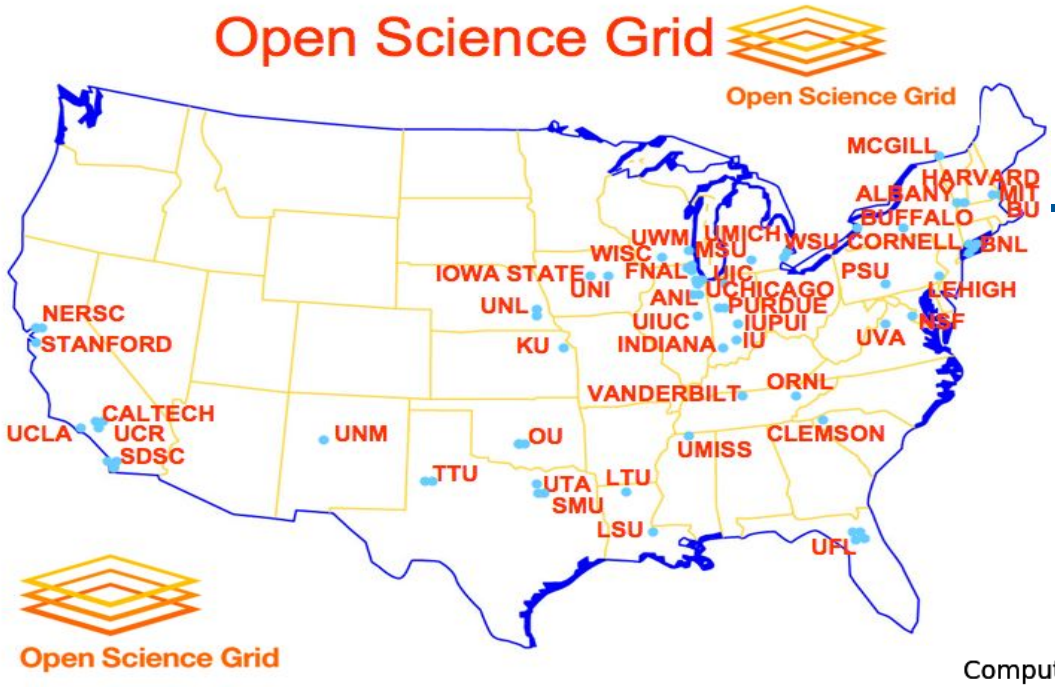
Enabling Tools for EPP and PA Research

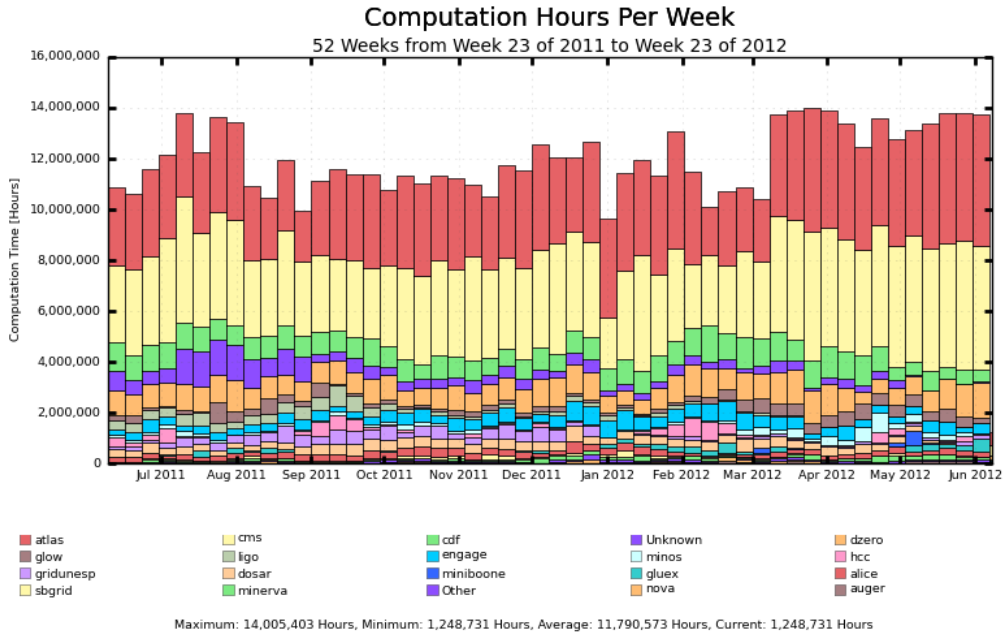
- R&D Detectors
  - LHC Detector Upgrades
  - Diamond Detectors
  - ILC
  - LAr TPC (LBNE)
  - Large Area psec PD
  - Materials Developments for Underground
    - Barium tagging for EXO
    - Depleted Ar
    - NaI in Borexino
    - Ge Purification
  - Airshower Microwave Bremsstrahlung Experimental Radiometer (AMBER)
  - Bistatic Radio Detection in TA
  - Askaryan Radio Array (ARA)
- R&D Accelerators
  - CESR TA
  - ILC
  - Muon Colliders (MuCOOL, MICE)
  - Plasma Acceleration
  - Project X (SRF, CESR TA)
- Computing
  - Open Science Grid
  - Tier 2, Tier 3, UltraLight
  - Anydata, Anytime, Anywhere
  - iSGTW

Adding Value

- QuarkNet
  - (NSF:PHY, EIR/EHR, DOE:OHEP)
- CHEPREO
  - (NSF:OCI/EIR, OMA, EHR, OISE)
- I2U2
  - (NSF:EIR, OMA, EHR, PHY)
- PIRE
  - (NSF:OISE)
- ISGTW, OSG
  - (NSF:OCI)

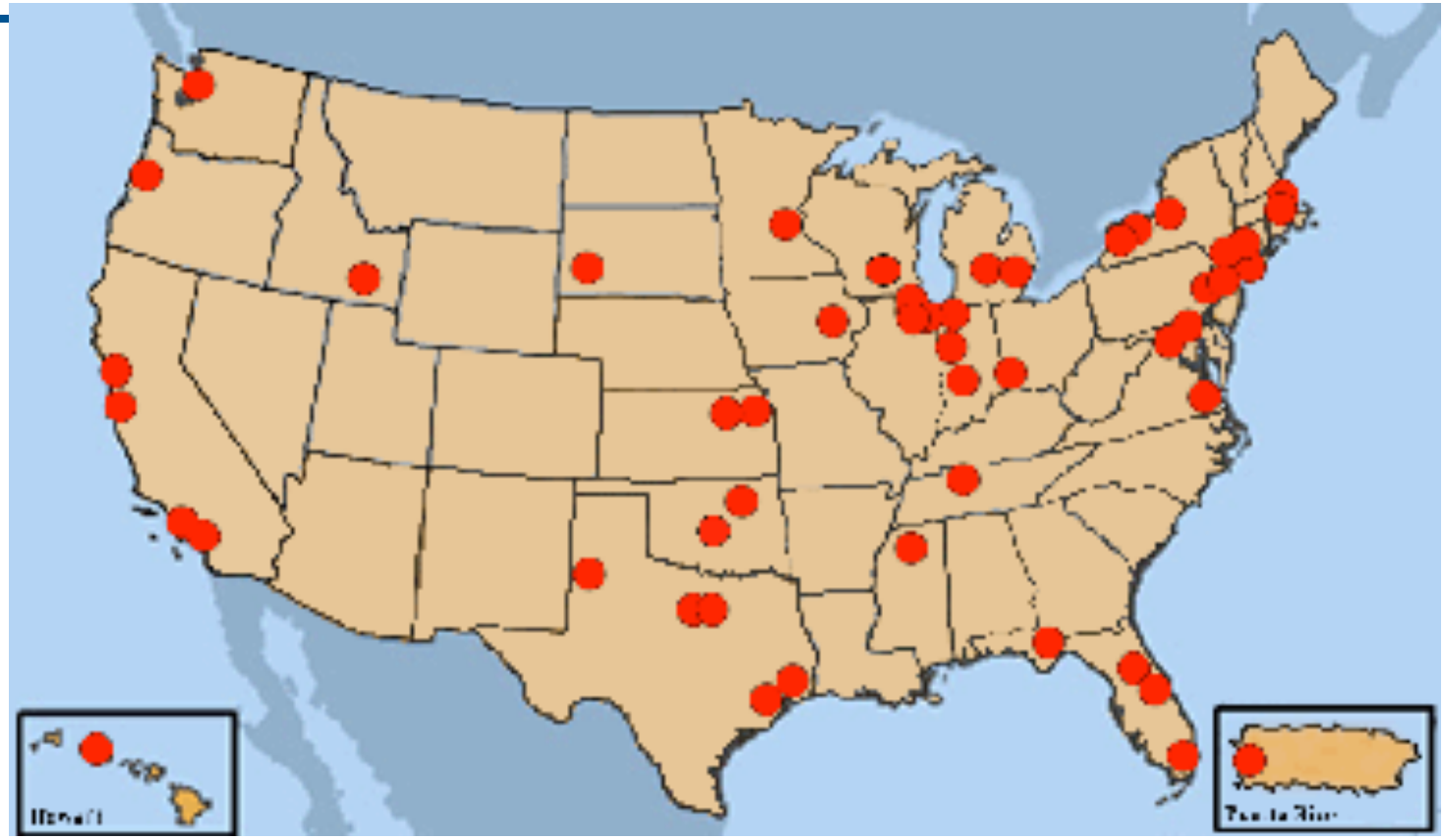
- Founded in EPP:
  - Particle Astrophysics (PA)
  - Grids for Data Intensive Science (PIF)
  - QuarkNet
  - I2U2





8 Tier 2s for the LHC Program
Supported through EPP and OCI (and DOE HEP)

QuarkNet in 2012



- LHC Data: to Teachers and Students through e-Labs and Masterclasses
- Research experiences and Professional Development:
  - Per year 450 teachers, 100 student researchers, 100 physicists

Items of Interest and Opportunities

- Recent MRI:
  - ATLAS (3): Chicago, UCSC, Cal State Fresno
  - CMS: Kansas
  - LHCb/LIGO: Syracuse
  - Muon Collider: Mississippi
  - ARIANNA: Wisconsin
  - RADAR-TA: Utah
- PIRE: Kansas, KSU, UNeb, UIC, UPM
- CAREERs: Two awarded in EPP and two in PA for FY'12.
- Work to assist with COLA and Leadership – however funding stress makes this difficult.
- Current Opportunity: Data Infrastructure Building Blocks (DIBBs):
  - "**Math and Physical Sciences** will use DIBBs in support of existing efforts to ensure disparate data are widely interoperable; will consider proposals for efforts that are complementary to existing infrastructure; and will consider proposals that offer availability, accessibility, and broad usability to heterogeneous data sets." http://www.nsf.gov/pubs/2012/nsf12557/nsf12557.htm

NSF Budget Context

National Science Foundation
Summary Table
FY 2013 Request to Congress
(Dollars in Millions)

NSF by Account	FY 2011 Actual	FY 2012 Estimate	FY 2013 Request	FY 2013 Request over: FY 2011 Actual Amount	FY 2011 Actual Percent	FY 2012 Estimate Amount	FY 2012 Estimate Percent
BIO	$712.27	$712.38	$733.86	$21.59	3.0%	$21.48	3.0%
CISE	636.06	653.59	709.72	73.66	11.6%	56.13	8.6%
ENG	763.33	826.17	876.33	113.00	14.8%	50.16	6.1%
ENG Programs	*636.86*	*673.41*	*711.13*	*74.27*	*11.7%*	*37.72*	*5.6%*
SBIR/STTR	*126.47*	*152.76*	*165.20*	*38.73*	*30.6%*	*12.44*	*8.1%*
GEO	885.32	885.27	906.44	21.12	2.4%	21.17	2.4%
MPS	1,312.42	1,308.94	1,345.18	32.76	2.5%	36.24	2.8%
SBE	247.33	254.25	259.55	12.22	4.9%	5.30	2.1%
OCI[1]	300.75	211.64	218.27	-82.48	-27.4%	6.63	3.1%
OISE	49.03	49.85	51.28	2.25	4.6%	1.43	2.9%
OPP[2]	440.70	435.87	449.74	9.04	2.1%	13.87	3.2%
IA	259.60	349.59	431.52	171.92	66.2%	81.93	23.4%
U.S. Arctic Research Commission	1.58	1.45	1.39	-0.19	-11.8%	-0.06	-4.1%
Research & Related Activities	**$5,608.38**	**$5,689.00**	**$5,983.28**	**$374.90**	**6.7%**	**$294.28**	**5.2%**
Education & Human Resources	**$861.04**	**$829.00**	**$875.61**	**$14.57**	**1.7%**	**$46.61**	**5.6%**
Major Research Equipment & Facilities Construction	**$125.37**	**$197.06**	**$196.17**	**$70.80**	**56.5%**	**-$0.89**	**-0.4%**
Agency Operations & Award Management	**$299.29**	**$299.40**	**$299.40**	**$0.11**	**0.0%**	-	-
National Science Board	**$4.47**	**$4.44**	**$4.44**	**-$0.03**	**-0.7%**	-	-
Office of Inspector General	**$13.92**	**$14.20**	**$14.20**	**$0.28**	**2.0%**	-	-
OIG FY 2011 ARRA Obligations	$0.08	-	-	-	-	-	-
Total, NSF	**$6,912.55**	**$7,033.10**	**$7,373.10**	**$460.55**	**6.7%**	**$340.00**	**4.8%**

MPS

Totals may not add due to rounding.

[1] FY 2011 Actual for OCI includes $90.50 million in funds that were obligated in FY 2010, deobligated in FY 2011, and then obligated in FY 2011 to other projects in the OCI portfolio.

[2] Funding for OPP for FY 2011 excludes a one-time appropriation transfer of $53.892 million, $54.0 million less the 0.2% rescission, to U.S. Coast Guard per P.L. 112-10.

PHY and MPS Budget Context

MPS Funding

(Dollars in Millions)

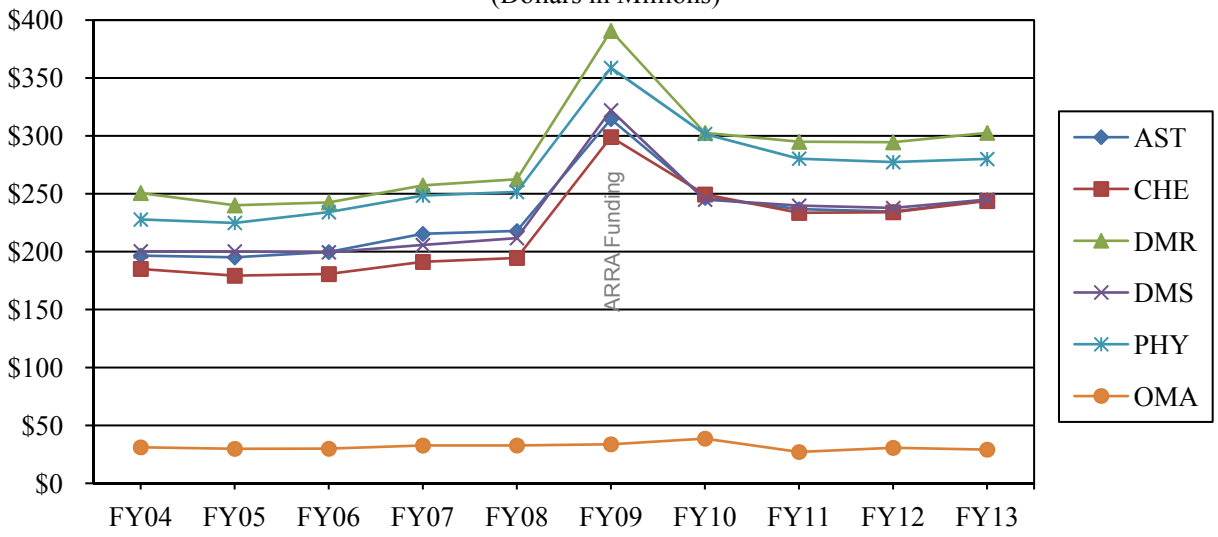
	FY 2011 Actual	FY 2012 Estimate	FY 2013 Request	Change Over FY 2012 Estimate Amount	Percent
Division of Astronomical Sciences (AST)	$236.78	$234.55	$244.55	$10.00	4.3%
Division of Chemistry (CHE)	233.55	234.06	243.85	9.79	4.2%
Division of Materials Research (DMR)	294.91	294.55	302.63	8.08	2.7%
Division of Mathematical Sciences (DMS)	239.79	237.77	245.00	7.23	3.0%
Division of Physics (PHY)	280.34	277.37	280.08	2.71	1.0%
Office of Multidisciplinary Activities (OMA)	27.06	30.64	29.07	-1.57	-5.1%
Total, MPS	**$1,312.42**	**$1,308.94**	**$1,345.18**	**$36.24**	**2.8%**

Totals may not add due to rounding.

Physics Division

MPS Subactivity Funding

(Dollars in Millions)



Recent PHY Budget Actions and Plans

- Have re-directed S4 funding to a generic Underground Physics program – issued “Dear Colleague Letter” in early 2012
  - Science opportunities compelling (NRC report)
  - Proposals under review
  - Expect coordination with upcoming DOE Dark Matter G2 FOA
- Midscale Instrumentation program a priority in future budget cycles
  - Capitalization fund to fabricate instrumentation that would otherwise be unaffordable by individual PHY programs (but below MREFC threshold)
- Discussing possible investment in accelerator physics research program at universities
- LHC Cooperative Agreements in place for CMS and ATLAS for 5 years; joint planning with OHEP for upgrades
- EPP and PA are down 3% from FY11 levels (effectively 9% in spending dollars)
  - Reduced support for groups spread into the out years
  - Complicated by ARRA roll off

Important EPP/PA Dates

- Now – AGEP Supplements (Alliances for Graduate Education and the Professoriate)
- July 25, 2012 – Career Proposal Deadline for FY13
- October 31, 2012 – Base Program Target Date for FY13
- January 24, 2013 – MRI Deadline
  - Limited application; universities will have pre-selection
- January 2013 (late) – EPP 2013 Panel
- February 2013 – PA 2013 Panel
- March 2013 (or later) – NSF/MPS/EPP funding levels decided
- April 2013 (or later) – Funding actions

Final Comments

- We are in the midst of very challenging budgetary climate
- We must plan, focus, and coordinate resources on excellent science with regular deliverables
  - Important planning efforts ongoing (e.g. DPF)
- One certainty: *Many* opportunities at the three frontiers
- EPP and PA research are a centerpiece for NSF Physics Division
  - It is an extraordinarily exciting time for Particle Physics.
  - Congratulations to the Tevatron, Neutrino, and LHC programs led by the laboratory and university groups.
  - You have enthusiastic support from those of us at the NSF

Program Elements - Particle Astrophysics

- The Cosmic Frontier
  - Dark Matter:
    - Xenon100, Xenon1T, DarkSide-50, S-CDMS, LUX, COUPP, PICASSO, DRIFT, ADMX-HF, DMTPC
  - UHE:
    - Cosmic Rays: Auger, TA
    - Gamma Rays: VERITAS, HAWC
    - Neutrinos: IceCube
  - Neutrinos:
    - Reactor Neutrinos: Double Chooz, Daya Bay
    - Neutrino Mass: Mare-II
    - Neutrinoless Double Beta Decay: CUORE, MJD, EXO-200, NEMO-3/ SuperNEMO
    - Solar Neutrinos: Borexino, Mini-LENS
  - Structure of the Universe:
    - ACT, QUIET, LSST

EPP/PA/Theory Budget for HEP/Astro Programs ($M)					
	FY08 Actuals	FY09 Omnibus Actuals	FY09 ARRA Actuals	FY10 Actuals	FY11 Actuals
EPP	20.45	18.79	13.99	25.79	25.03
PA/IceCube Ops	15.83/1.50	15.93/2.15	15.31/-	17.88/2.15	19.19/3.45
CESR	13.71	8.50	1.29	0 (in EPP)	--
LHC OPS	18.00	18.00		18.00	18.00
Accel /Instrumentation	4.00	2.20		2.98	4.05
DUSEL R&D	4.96	4.00	5.57	4.59	--
Underground R&D					4.59
DUSEL Planning	2.00	22.00		28.91	10.19
EPP+Astro/Cosmo Theory	11.68	11.99	6.80	13.20	14.12
EPP/PA/THY Total	92.13	103.56	42.96	113.50	98.62
Allied Funding - EPP					
MRI	1.44	2.16	0.54	9.53	4.29
PFC	6.26	5.93		5.93	6.03
OCI/CISE	1.30				0.54
PIF/OMA/ESIE/OISE	4.41	2.75		3.15	2.71
Total EPP Allied	13.41	10.84	0.54	18.61	13.57
Overall Total	105.54	114.40	43.50	132.11	112.19
PHYSICS Division Total	285.03	275.50	102.13	307.83	281.17