

NSF Nuclear Physics Overview for NSAC



Allena K. Opper

- ▶ NSF Nuclear Physics Goals
- ▶ Budget
 - Process
 - FY18
 - FY17
- ▶ Announcements
 - Solicitations
 - Other funding opportunities
- ▶ Physics Division Personnel

Goals of the Nuclear Physics Program



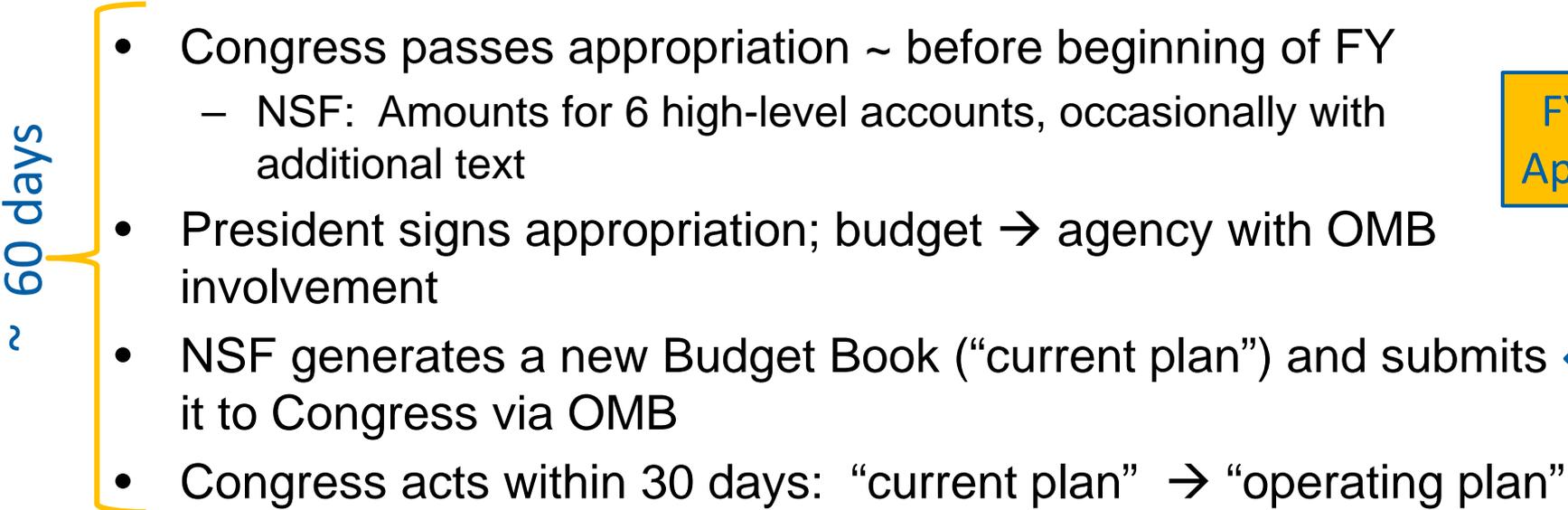
- *Identify research opportunities and the most compelling physics through the peer review process*
- *Support as much of the above as possible while managing a balanced portfolio*

Our goals and actions remain the same –
regardless of the budget



“Typical” Budget Process

- Agency budget request → OMB ~ end of summer
- “Pass Back”: OMB provides numbers to agency ~ end of Nov
 - May also include additional instructions
- President’s Budget Request set ~ end of cal year
 - Much activity → NSF Budget Book





FY18 NSF Request \$6,652.89 M

National Science Foundation
FY 2018 Budget Request to Congress
 (Dollars in Millions)

NSF by Account	FY 2016 Actual	FY 2017		FY 2018 Request		FY 2018 Request change over	
		Annualized CR	FY 2018 Request	Amount	Percent		
Research & Related Activities	\$5,998.09	\$6,022.18	\$5,361.65	-\$636.44	-10.6%		
Education & Human Resources	\$884.10	\$878.33	\$760.55	-\$123.55	-14.0%		
Major Research Equipment & Facilities Construction	\$241.50	\$199.93	\$182.80	-\$58.70	-24.3%		
Agency Operations & Award Management	\$351.11	\$329.37	\$328.51	-\$22.60	-6.4%		
National Science Board	\$4.31	\$4.36	\$4.37	\$0.06	1.5%		
Office of Inspector General	\$14.76	\$15.13	\$15.01	\$0.25	1.7%		
Total, NSF	\$7,493.86	\$7,449.30	\$6,652.89	-\$840.98	-11.2%		



FY18 PHY \$253.30M

- Approximately 2% for Operations
 - Panels, IPA Appointments and Travel, M&S
- Approximately 30% for M&O for Facilities
 - IceCube, LHC, LIGO, NSCL
- Approximately 8% for Physics Frontiers Centers
 - Currently 10 (one of which is JINA-CEE)
 - Near end of tri-annual competition
- Approximately 3% for Education and Broadening Participation
 - REU Sites, LIGO Education Center, ...
- Approximately 57% (\$152.09 M) for six major areas of Physics (AMO, EPP, GP, NP, PA, PoLS, Plasma)
 - Experimental and Theoretical

FY18 PHY \$253.30M



PHY Funding

(Dollars in Millions)

	FY 2016 Actual	FY 2017 (TBD)	FY 2018 Request	Change Over	
				FY 2016 Actual Amount	Percent
Total	\$276.91	-	\$253.30	-\$23.61	-8.5%
Research	174.12	-	152.09	-22.03	-12.7%
CAREER	8.12	-	7.30	-0.82	-10.1%
STC: Center for Bright Beams (CBB)	-	-	5.00	5.00	N/A
Education	5.40	-	4.80	-0.60	-11.1%
Infrastructure	97.39	-	96.41	-0.98	-1.0%
IceCube	3.48	-	3.50	0.02	0.6%
Large Hadron Collider (LHC)	20.00	-	16.00	-4.00	-20.0%
Laser Interferometer Gravitational Wave Observatory (LIGO)	39.43	-	39.43	-	-
Nat'l Superconducting Cyclotron Lab. (NSCL)	24.00	-	23.00	-1.00	-4.2%
Midscale Research Infrastructure	10.48	-	8.18	-2.30	-21.9%
Pre-construction planning:	-	-	6.30	6.30	N/A
High-Luminosity LHC Upgrade Planning	-	-	6.30	6.30	N/A

Awards made in FY17: yr1 = \$XXX yr2 = \$(XXX)*0.90 yr3 = \$(XXX)*0.90

Budget Trends – NSF Nuclear Physics



~ 25% = Research
~ 75% = Operations

Includes co-funding and other leveraged funds

FY	Nucleon & Hadron QCD (k\$)	Nuclear Astroph, Reactions, Structure (k\$)	Prec Meas'ts & Fund. Symm. (k\$)	Total Exp't Nuclear Physics (k\$)	Nuclear Theory (k\$)	Nuclear Program Total (k\$)	NSCL (k\$)	JINA & JINA -CEE (k\$)	MRI (k\$)	Mid-Scale (k\$)	Total Nuclear Physics (k\$)
2011				19,164	3,719	22,883	21,500	2,150	729		47,262
2012	7,969	4,185	6,343	18,497	3,829	22,326	21,500	2,150	2,744		48,720
2013	6,183	4,693	5,653	16,509	3,474	20,008	21,500	2,150	2,996	490	47,144
2014	5,826	5,189	5,999	17,014	3,514	20,528	22,500	2,280	1,038	1,188	47,533
2015	6,769	4,702	7,304	18,774	4,183	22,957	23,000	2,280	1,801	1,367	51,406
2016	7,141	5,046	7,391	19,579	4,223	23,802	24,000	2,280	1,869	3,238	55,189
2017				17,800 +			24,000	2,280		2,990	

FY15 Fundamental Symmetries: + \$1.32M for $0\nu\beta\beta$

MRI: competes each year; one-time acquisition/development funds

Mid-scale: ad hoc competition; design and construction funds (nEDM & MUSE)



Solicitation for NSF Physics Division Investigator-Initiated Research Projects 17-561

All proposals submitted to the Division of Physics programs must go through this solicitation.

- **Deadlines:**
 - October 25, 2017 for Particle Astrophysics, Elementary Particle Phy
 - **November 8, 2017 for Experimental Nuclear Physics & Theoretical Nuclear Physics**
- Text on Midscale Instrumentation and Long Duration Efforts
- Follow Proposal & Award Policies & Procedures Guide (PAPPG)
https://www.nsf.gov/pubs/policydocs/pappg17_1/index.jsp
 - Follow the Proposal Preparation checklist
- Collaborators and Other Affiliations Template (as of 24-apr-2017)
- Follow instructions that are specific to this solicitation
 - **PIs who have or anticipate having concurrent support ... (Merit Review Criterion)**
 - For large collaborations ...



NSF Physics Division: Investigator-Initiated Research Projects (17-561)

- Proposals to the Nuclear Physics Program for schools, workshops and conferences, must be submitted through this solicitation.
 - Priority will be given to schools.
 - Broad scope that serves a wide nuclear physics community
 - Involvement of under-represented groups
 - Contact us!
- **However: Research at Undergraduate Institutions (RUI) proposals should be submitted through the RUI solicitation (14-579) by the deadlines in this PHY solicitation according to the closest disciplinary match.**

Midscale Instrumentation



- Design and Construction *or* Acquisition of Instrumentation
 - R & early D, operations funded by research programs
- ~ \$4M < TPC < ~ \$15M; over multiple years
- Selection based on
 - merit review
 - exceptional opportunity
 - research community priorities.
- Currently 6 Midscale projects
- For more info, see PHY Solicitation 17-561

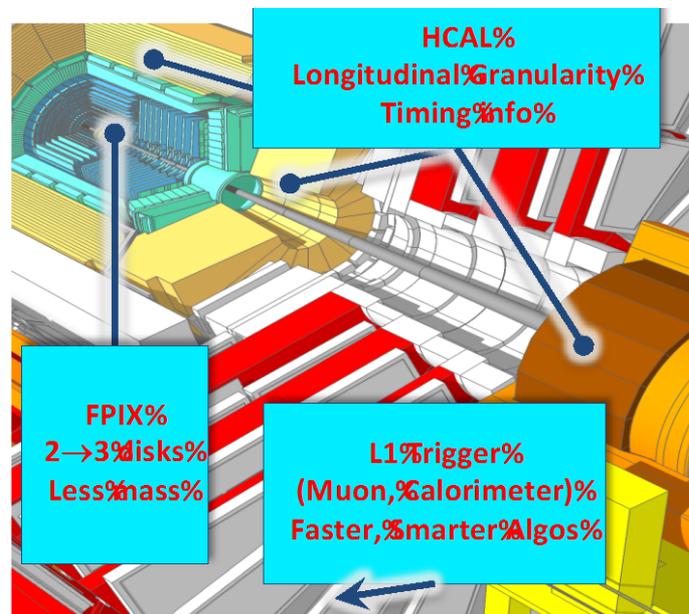
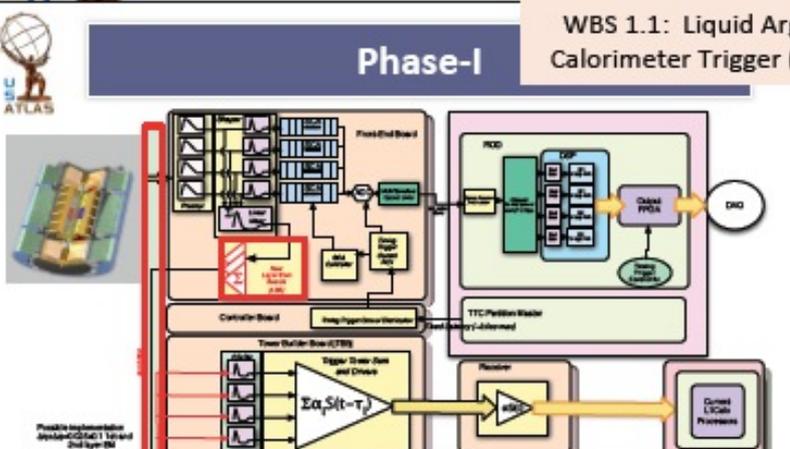
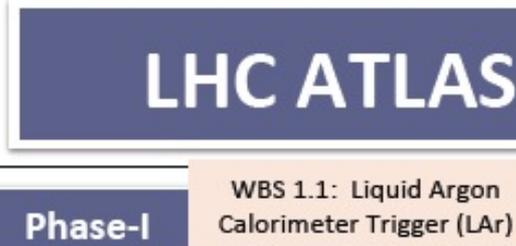


Midscale: Upgrades to LHC Experiments

Elementary Particle Physics

ATLAS

Lead: SUNY-Stony Brook

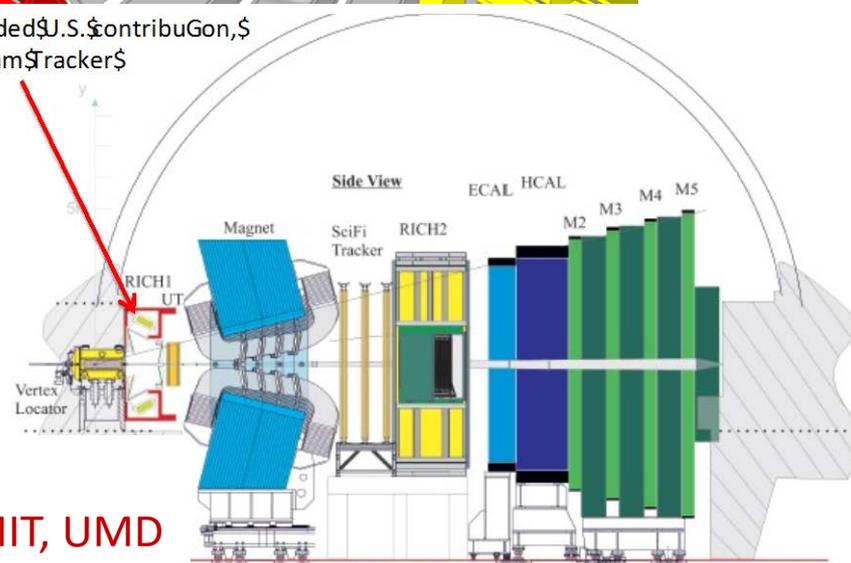


CMS

Lead:

U. Nebraska /Catholic

NSF funded U.S. contribution,
Upstream Tracker



LHCb

Leads: Syracuse, Cincinnati, MIT, UMD

Midscale: Super Cryogenic Dark Matter Search



Underground Astroparticle Physics

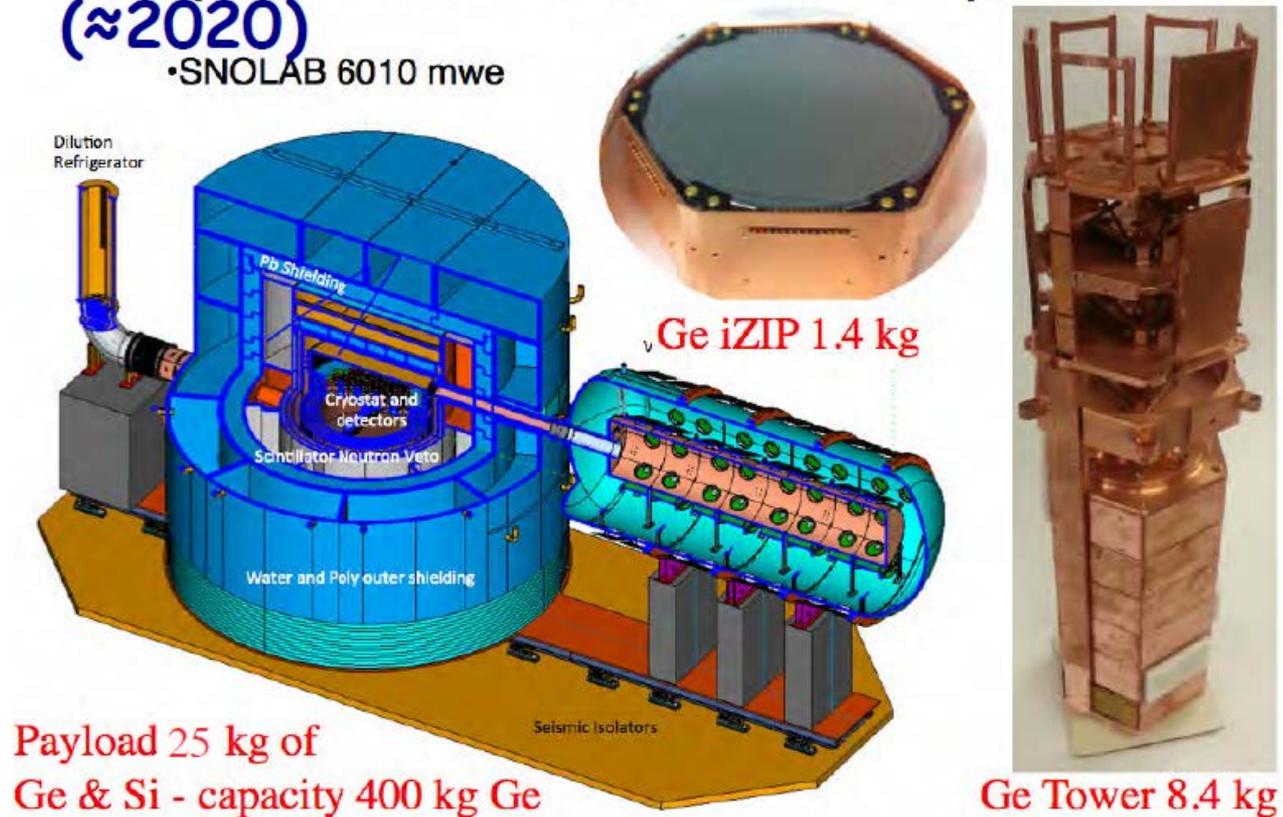
SuperCDMS (Soudan, MN)

Lead: UC-Berkeley

- Mission: to cover the low WIMP mass region: 0.5 – 10 GeV/c²
- Being baselined for CD2/3 in Dec 2017

SuperCDMS SNOLAB Experiment (≈ 2020)

•SNOLAB 6010 mwe



Midscale: nEDM

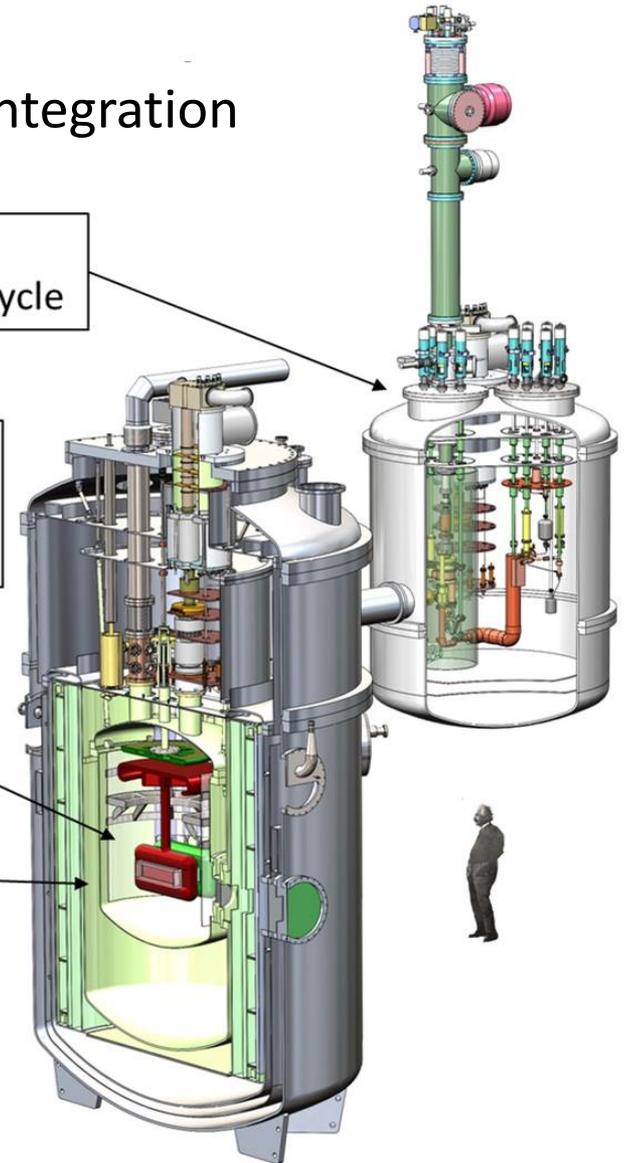
Experimental Nuclear Physics

Critical Component Design → Large Subsystem Integration

- Prepare polarized ^3He
- Isotopically purify ^4He each measurement cycle

- Generate electric field
- Store ^3He , neutrons
- Monitor ^3He , neutron precession frequencies

- Generate uniform B-field



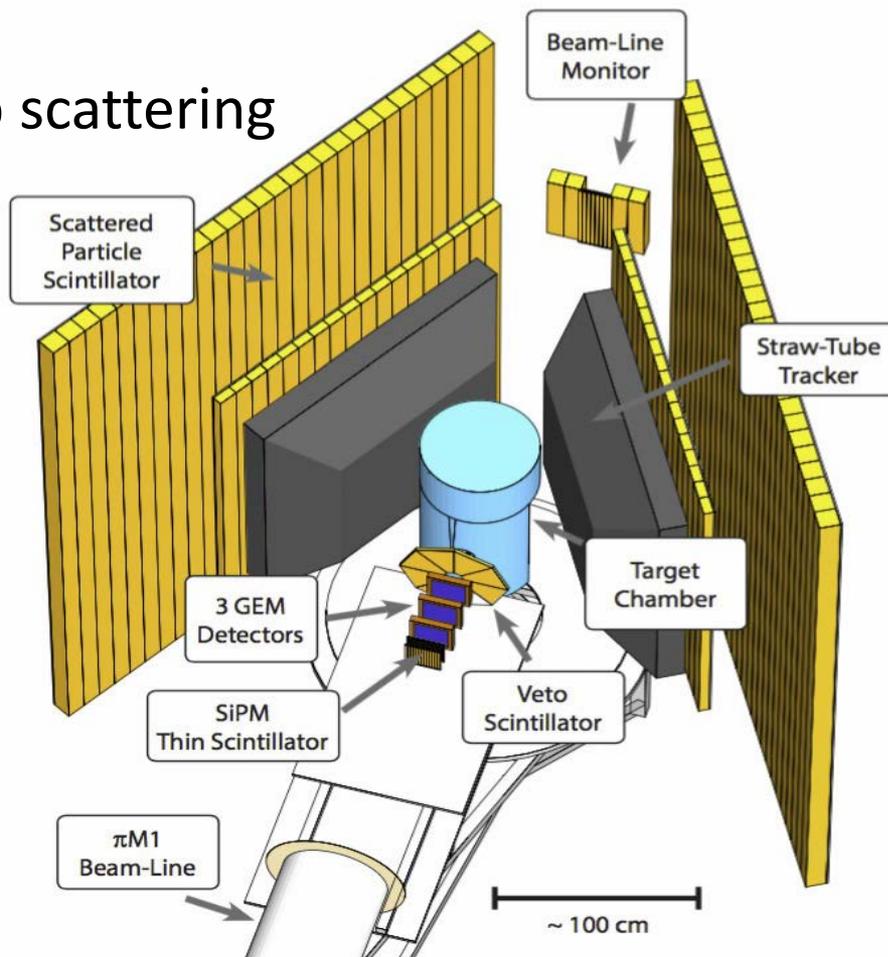
PIs: Brad Filippone (Caltech) and Doug Beck (UIUC)

Midscale: MUSE

Experimental Nuclear Physics

Precise comparison of e-p and μ -p scattering
 Proton charge radius

PIs: R. Gilman (Rutgers), E. Downie (GWU), M. Kohl (Hampton), W. Lorenzon (U Mich), S. Strauch (USC)



Career Program



- Solicitation: 17-537
- Must include excellent research proposal as well as excellent educational plan
- There are eligibility requirements: e.g., must be assistant professor, untenured
- 5 year awards, \$400,000 minimum
- Proposal deadline: **July 21, 2017**
- PECASE nominees are chosen from CAREER winners
- Contact program officer for information/advice ahead of time (budget, scope)

FY17: 8 ENP proposals; 2 awarded
Jaideep Singh @ MSU & Liang Yang @ UIUC

Writing proposals: Mentoring program



GOAL: make the proposal writing expertise of senior researchers available to junior investigators

How does it work?

- The Mentee requests a Mentor (email us at aopper@nsf.gov or ejgarcia@nsf.gov).
- We will send a list of Mentor Volunteers to Mentee, who contacts Mentors without identifying them to NSF.
- **The Mentor will read the Mentee's proposal and provide feedback once. Send the proposal early – Mentors are busy people!**
- NSF accepts no responsibility on the interaction/outcome of the program!

Needed: Mentors!

email us at aopper@nsf.gov or ejgarcia@nsf.gov

Major Research Instrumentation (MRI) NSF 15-504



FY17

- *Physics received 23 proposals, 10 in ENP*
 - *Review process complete*
 - *Funding recommendations soon*

FY18

- **Likely to be a new solicitation**



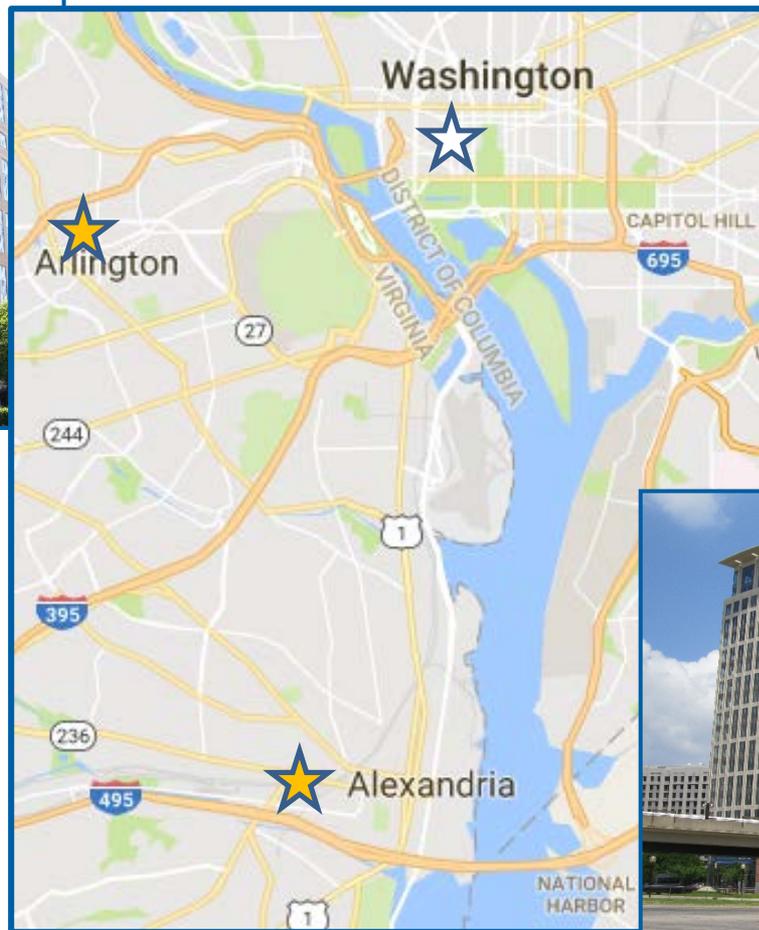
AGEP GR *Supplements*

- Available to PIs at AGEP or AGEP Legacy Institutions
https://www.nsf.gov/mps/broadening_participation/index.jsp
- Graduate Student Eligibility
 - Emphasis placed on under-represented groups
 - Not currently supported by federal government (NSF, DOE, NIH, ...)
 - US Citizen, US National, or US Permanent Resident
- Stipend, tuition, benefits, and IDC (~\$60k)
- Renewable up to two times

See us and DCL 16-125 for more information



NSF is Moving!





NSF is Moving!

Late August / Early September

- ▶ Business operations may be suspended for periods
- ▶ CGIs (Continuing Grant Increments)
 - Submit annual progress reports early



NSF/MPS/Physics Personnel

- **France Córdova** – Director
- **James Ulvestad** – Acting Assistant Director for MPS
- **Denise Caldwell** – Physics Division Director
- **Brad Keister** – Deputy Division Director
- **Bogdan Mihaila** – Nuclear Theory Program Director
- ★ **Edmundo Garcia** – Expt'l Nuclear Physics Program Director
- **Allena Opper** – Expt'l Nuclear Physics Program Director

<http://www.nsf.gov/pubs/2015/phy15001/phy15001.jsp?org=PHY>

<http://www.nsf.gov/careers/rotator/index.jsp>



For the latest updates,
check out

<http://www.nsf.gov/div/index.jsp?div=PHY>

Contact us:

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The screenshot shows the NSF website interface. At the top, there is a navigation bar with links: HOME, FUNDING, AWARDS, DISCOVERIES, NEWS, PUBLICATIONS, STATISTICS, ABOUT NSF, and FASTLANE. Below this is the NSF logo and the text "National Science Foundation Directorate for Mathematical & Physical Sciences (MPS)". A search bar and "QUICK LINKS" button are also visible. A secondary navigation bar includes: MPS HOME, MPS FUNDING, MPS AWARDS, MPS DISCOVERIES, MPS NEWS, and ABOUT MPS. The main content area is titled "Physics (PHY)" and includes a sub-header "PHY Replaces DCL with Solicitation NSF 14-576". The text below this header states: "The Physics Division has issued a solicitation (NSF 14-576) for FY2015 that replaces its prior annual Dear Colleague Letter. The solicitation follows most of the requirements in the Grant Proposal Guide, but has additional requirements that relate primarily to proposers who anticipate having multiple sources of support, and proposals involving significant instrumentation development. The solicitation also has deadlines instead of target dates. All proposals submitted to the Physics Division that are not governed by another solicitation (such as CAREER) should be submitted to this solicitation; otherwise they will be returned without review." Below this is another section titled "PHY Int'l Activities - Potential Co-Review" with text: "The Physics Division has issued a Dear Colleague Letter (NSF 14-009) to announce the guidelines for 'International Activities within the Physics Division - Potential International Co-Review'. The DCL outlines a possible coordinated review of projects involving international colleagues and counterpart funding organizations where a mutual review and funding process is beneficial to the advancement of Physics research. Contact with the appropriate NSF Program Officer is a necessary first step and additional time for this coordination must be allowed. Proposals requesting co-review will be competing with all other proposals in that area and must succeed on the strengths of their intellectual merit and broader impact." A "Special Announcements" section follows, listing: "MPS Alliances for Graduate Education and the Professoriate - Graduate Research Supplements (AGEP-GRS) Dear Colleague Letter (NSF 13-071)" and "Dear Colleague Letter - Announcement of Instrumentation Fund to Provide Mid-Scale Instrumentation for FY2014 Awards in Physics Division (NSF 13-118)". On the left side of the page, there is a sidebar with a "Physics (PHY)" header, a photo of Albert Einstein, and a list of links: PHY Home, About PHY, Funding Opportunities, Awards, News, Events, Discoveries, Publications, Career Opportunities, Facilities and Centers, PHY Program Director Jobs, and See Additional PHY Resources. Below these links is a "View PHY Staff" section with a search bar and a "MPS Organizations" section listing: Astronomical Sciences (AST), Chemistry (CHE), and Materials Research (DMR). Social media sharing icons for Email, Print, and Share are located at the top right of the main content area.