Report from NSF

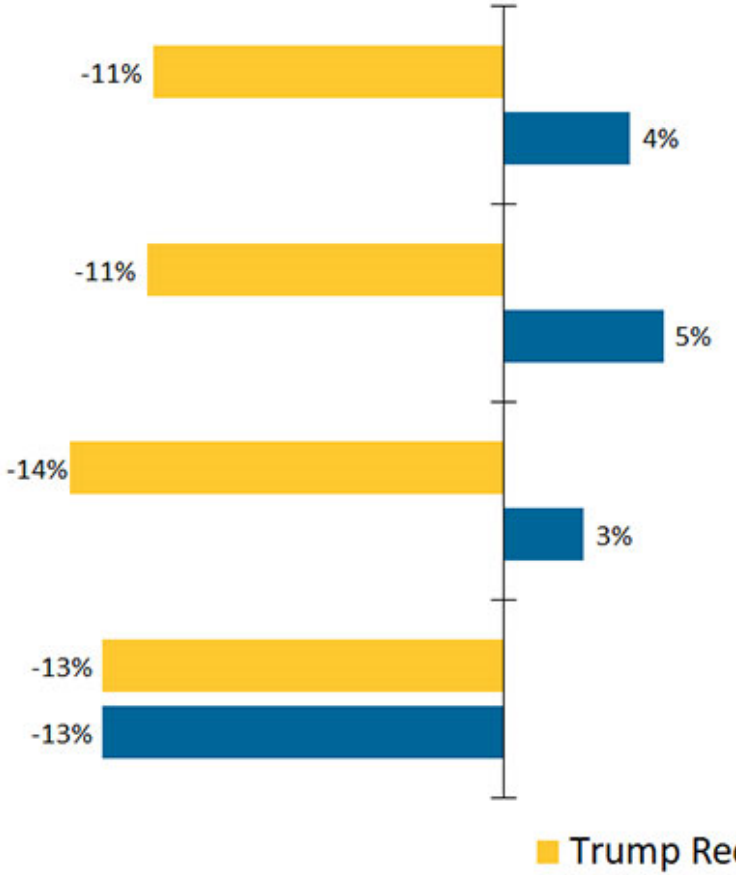
Allena K. Opper

- Budget
- Funding Opportunities
- Final Notes

2018 Low Energy Community Meeting

Final FY18 Funding: National Science Foundation

% change from FY17 enacted
$ in ( ) are the FY18 amounts



NSF Total ($7.77 B)

~ $300M above FY17 enacted

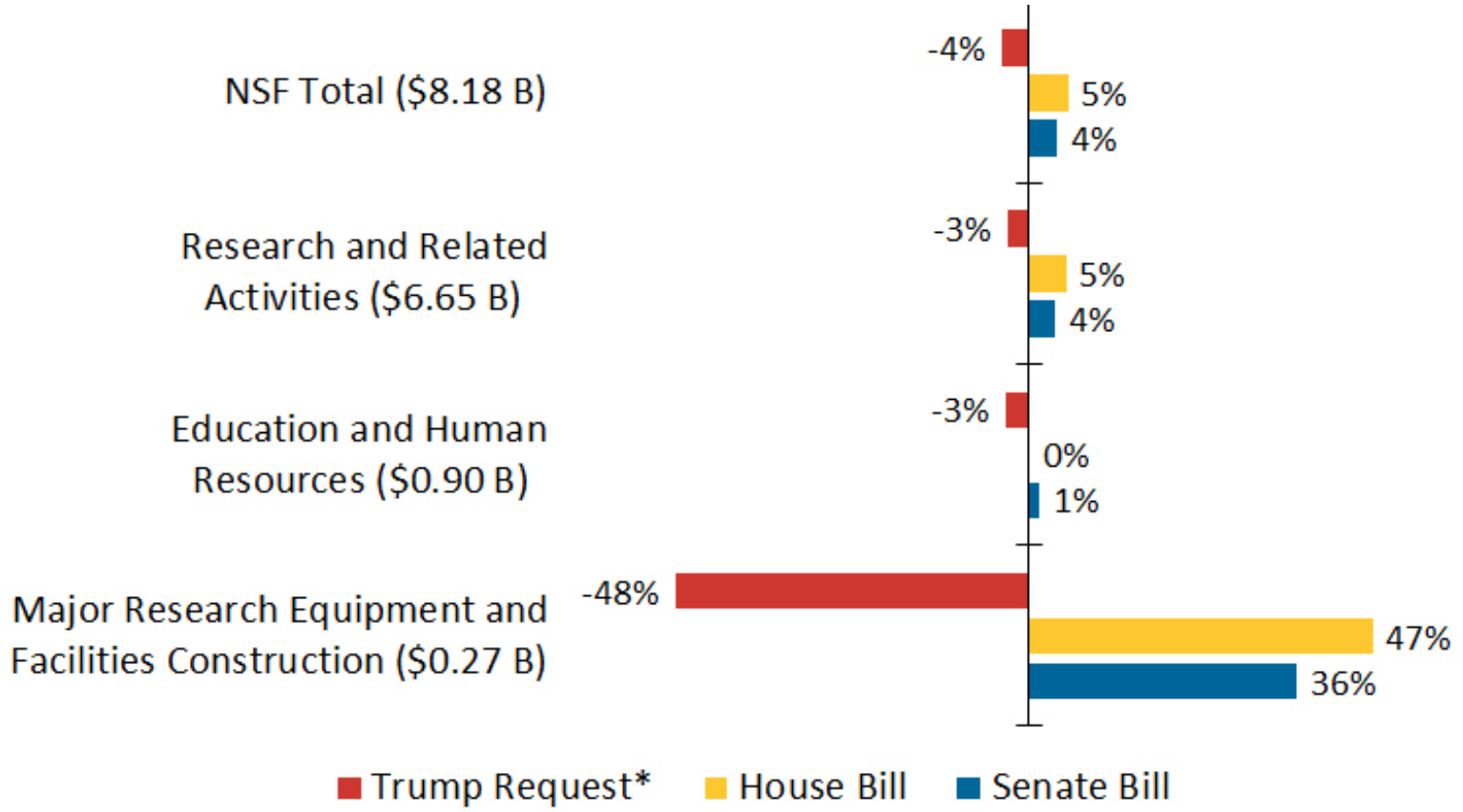
Research and Related Activities ($6.33 B)

Education and Human Resources ($0.90 B)

Major Research Equipment and Facilities Construction ($0.18 B)

DKIST, LSST, Regional Class Research Vessels

NSF FY19 Spending Proposals (% change from FY18 enacted) $ in ( ) = FY18 House Marks



*The administration submited the budget request to Congress before the final amounts for fiscal year 2018 were set.

FY19 NSF Request $7,472 M

NATIONAL SCIENCE FOUNDATION
SUMMARY TABLE
FY 2019 BUDGET REQUEST TO CONGRESS
(Dollars in Millions)

NSF by Account	FY 2017 Actual	FY 2018 Annualized CR	FY 2019 Request	FY 2019 Request change over FY 2017 Actual Amount	Percent
Research & Related Activities	$6,006.51	$5,992.67	$6,150.68	$144.17	2.4%
Education & Human Resources	$873.37	$874.02	$873.37	-	-
Major Research Equipment & Facilities Construction	$222.78	$207.58	$94.65	-$128.13	-57.5%
Agency Operations & Award Management	$382.06	$327.76	$333.63	-$48.43	-12.7%
National Science Board	$4.27	$4.34	$4.32	$0.05	1.2%
Office of Inspector General	$15.10	$15.10	$15.35	$0.25	1.6%
Total, NSF	$7,504.10	$7,421.47	$7,472.00	-$32.10	-0.4%

NSF's 10 Big Ideas

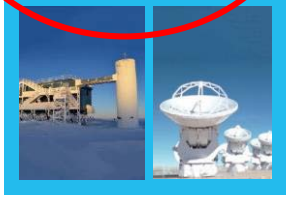
RESEARCH IDEAS

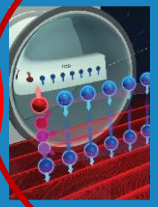
Harnessing Data for 21st Century Science and Engineering

Work at the Human-Technology Frontier: Shaping the Future

Navigating the New Arctic

Windows on the Universe: The Era of Multi-messenger Astrophysics





The Quantum Leap: Leading the Next Quantum Revolution

Understanding the Rules of Life: Predicting Phenotype

PROCESS IDEAS

Mid-scale Research Infrastructure

NSF 2026

Growing Convergence Research at NSF

NSF INCLUDES: Enhancing STEM through Diversity and Inclusion

FY19 Funding for NSF Big Ideas

(Dollars in Millions)

Big Ideas	FY 2019 Request
Research Ideas	**$180.00**
Harnessing the Data Revolution for 21st- Century Science and Engineering - HDR (CISE/ITR)[1]	30.00
Navigating the New Arctic - NNA (GEO/ICER)	30.00
The Future of Work at the Human-Technology Frontier - FW-HTF (ENG/EFMA)[1]	30.00
The Quantum Leap - QL (MPS/OMA)	30.00
Understanding the Rules of Life - URoL (BIO/EF)	30.00
Windows on the Universe - WoU (MPS/OMA)	30.00
Process Ideas	**$102.50**
Growing Convergence Research - GCR (IA)	16.00
Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science - NSF INCLUDES (EHR)	20.00
Mid-Scale Research Infrastructure (IA)	60.00
NSF 2026 Fund (IA)	6.50
Total, NSF Big Ideas	**$282.50**

FY19 PHY $266.73M

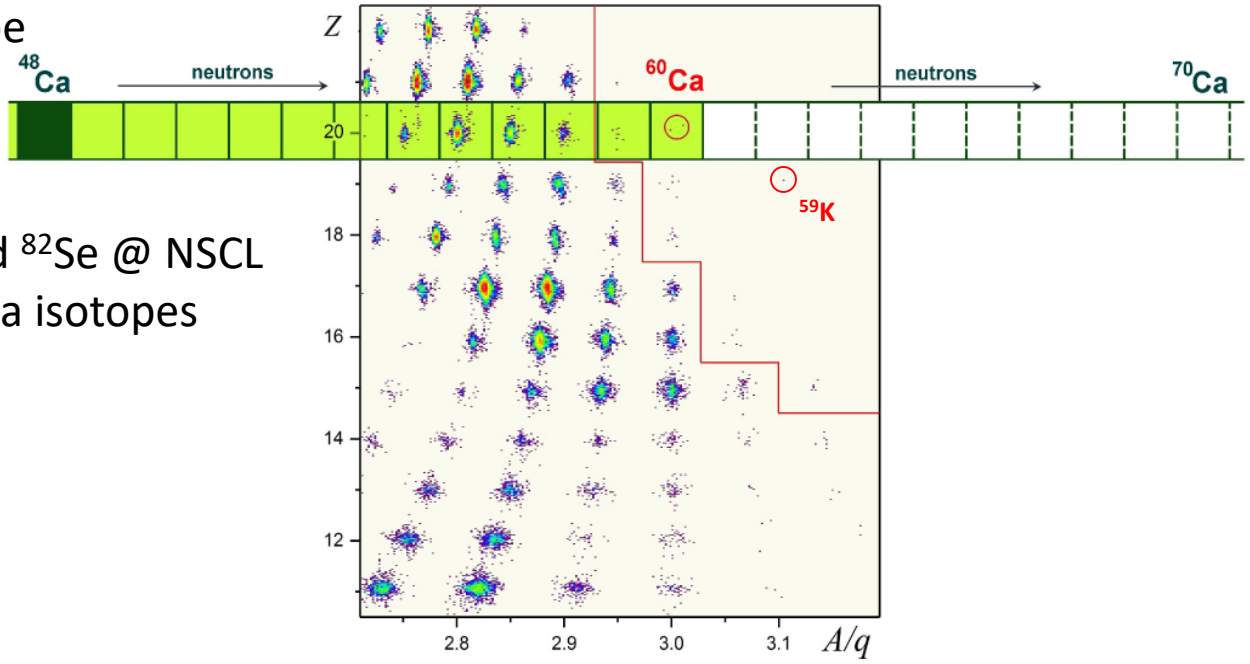
(Dollars in Millions)

	FY 2017 Actual	FY 2018 (TBD)	FY 2019 Request	Change Over FY 2017 Actual Amount	Change Over FY 2017 Actual Percent
Total	**$281.43**	**-**	**$266.73**	**-$14.70**	**-5.2%**
Research	**178.57**	**-**	**159.01**	**-19.56**	**-11.0%**
CAREER	10.04	-	7.30	-2.74	-27.3%
Centers Funding (total)	4.60	-	5.00	0.40	8.7%
STC: Center for Bright Beams	4.60	-	5.00	0.40	8.7%
Education	**5.87**	**-**	**4.92**	**-0.95**	**-16.2%**
Infrastructure	**96.99**	**-**	**102.80**	**5.81**	**6.0%**
IceCube Neutrino Observatory (IceCube)	3.50	-	3.50	-	0.0%
Large Hadron Collider (LHC)	16.00	-	16.00	-	0.0%
Laser Interferometer Gravitational Wave Observatory (LIGO)[1]	41.93	-	45.00	3.07	7.3%
National Superconoducting Cyclotron Laboratory (NSCL)	24.00	-	24.00	-	0.0%
Midscale Research Infrastructure	5.85	-	8.00	2.15	36.8%
Pre-construction Planning:					
High-Luminosity LHC Upgrade Planning	5.71	-	6.30	0.59	10.3%

[1]FY 2017 includes one-time supplemental funding of $2.50 million for a critical vacuum repair.

Discovery of ^{60}Ca & Implications for the Stability of ^{70}Ca
by MSU led group at RIKEN RIBF

Heaviest stable Ca isotope



Fragmentation of ^{76}Ge and ^{82}Se @ NSCL
→ ^{57,58}Ca and other non-Ca isotopes

Why ^{60}Ca?

ab initio calcs: ^{59}Ca unbound
^{60}Ca marginally bnd or un-bnd

EDF models: ^{59,60}Ca bound
HFB models: ^{59,60,70}Ca bound

*PRL **121**, 022501 (2018)*
Editor's Suggestion

Discovery of ^{60}Ca & Implications for the Stability of ^{70}Ca
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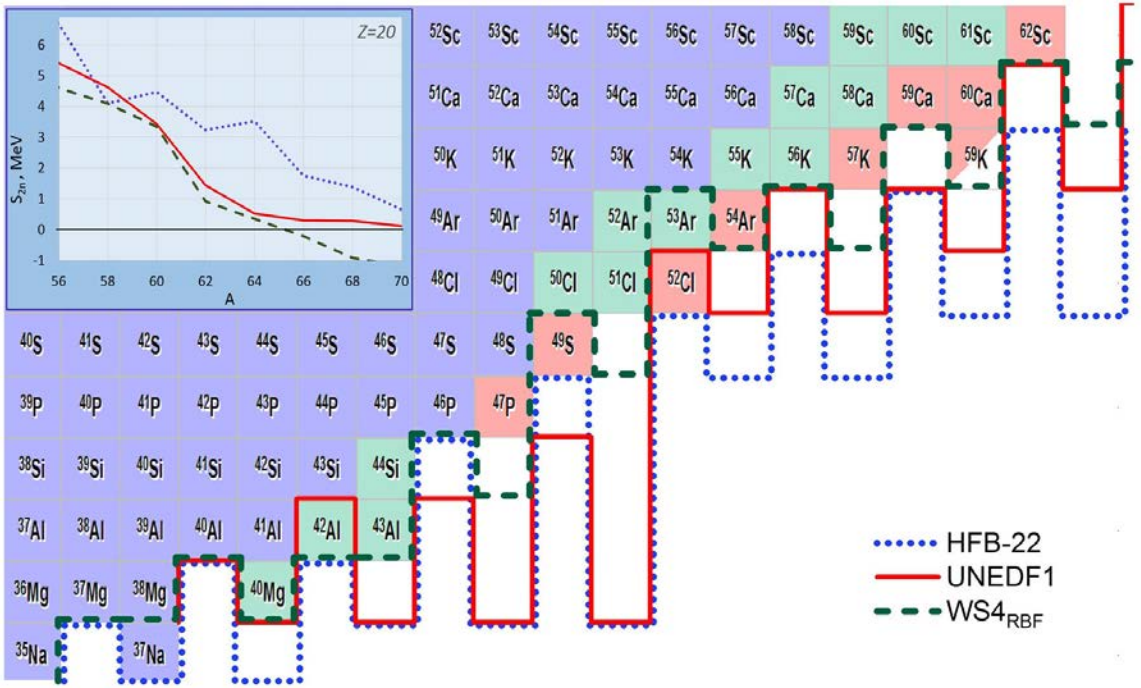

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FRIB with higher energy,
more intense beam
→ ^{70}Ca?

*PRL **121**, 022501 (2018)*
Editor's Suggestion

Solicitation for NSF Physics Division Investigator-Initiated Research Projects 18-564

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

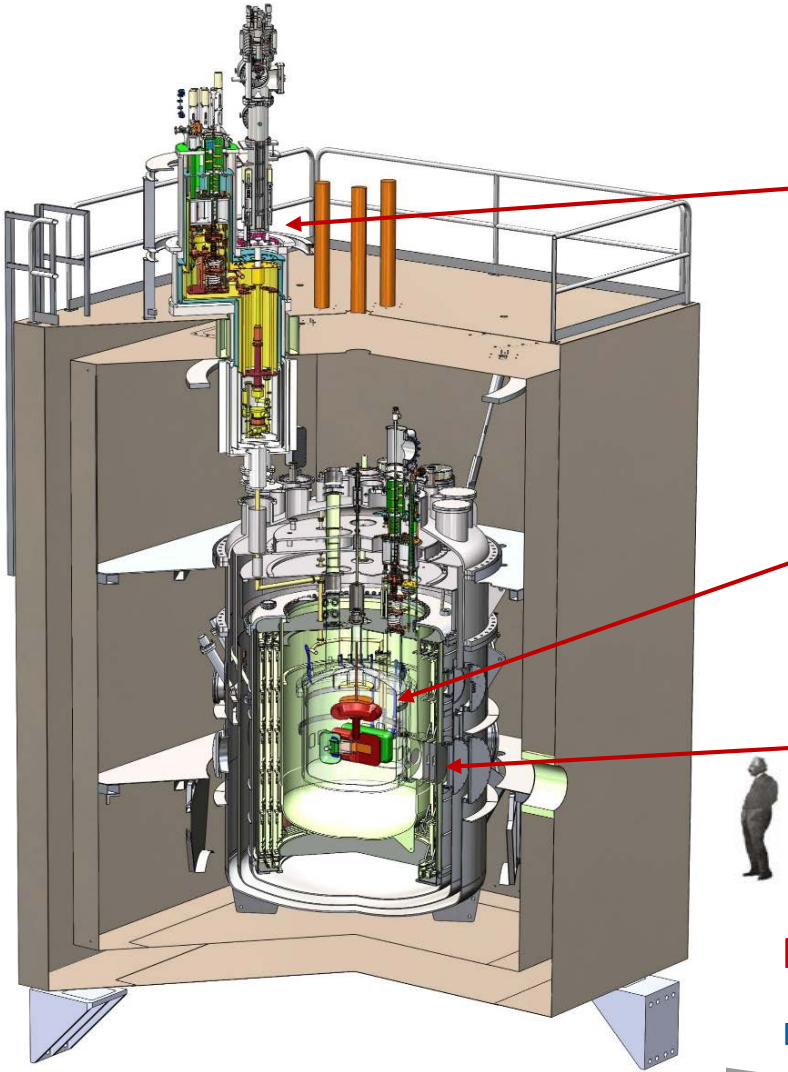
- **Deadlines:**
  - **December 4, 2018** for Particle Astrophysics, Elementary Particle Physics *Experimental & Theoretical Nuclear Physics*
- Text on Midscale Instrumentation and Long Duration Efforts
- Follow Proposal & Award Policies & Procedures Guide (PAPPG) https://www.nsf.gov/pubs/policydocs/pappg17_1/index.jsp
  - Follow the Proposal Preparation checklist
- Collaborators and Other Affiliations Template
- Follow instructions that are specific to this solicitation

PHY 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 (SCDMS, ATLAS, CMS, LHCb, 2 Nuclear Physics)
- For more info, see PHY Solicitation

Midscale: nEDM

Critical Component Design ✓ → Large Subsystem Integration



- Prepare polarized ^{3}He
- Isotopically purify ^{4}He; each meas't cycle
- Generate electric field
- Store ^{3}He & neutrons
- Monitor ^{3}He & neutron precession frequencies
- Generate uniform B-field

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

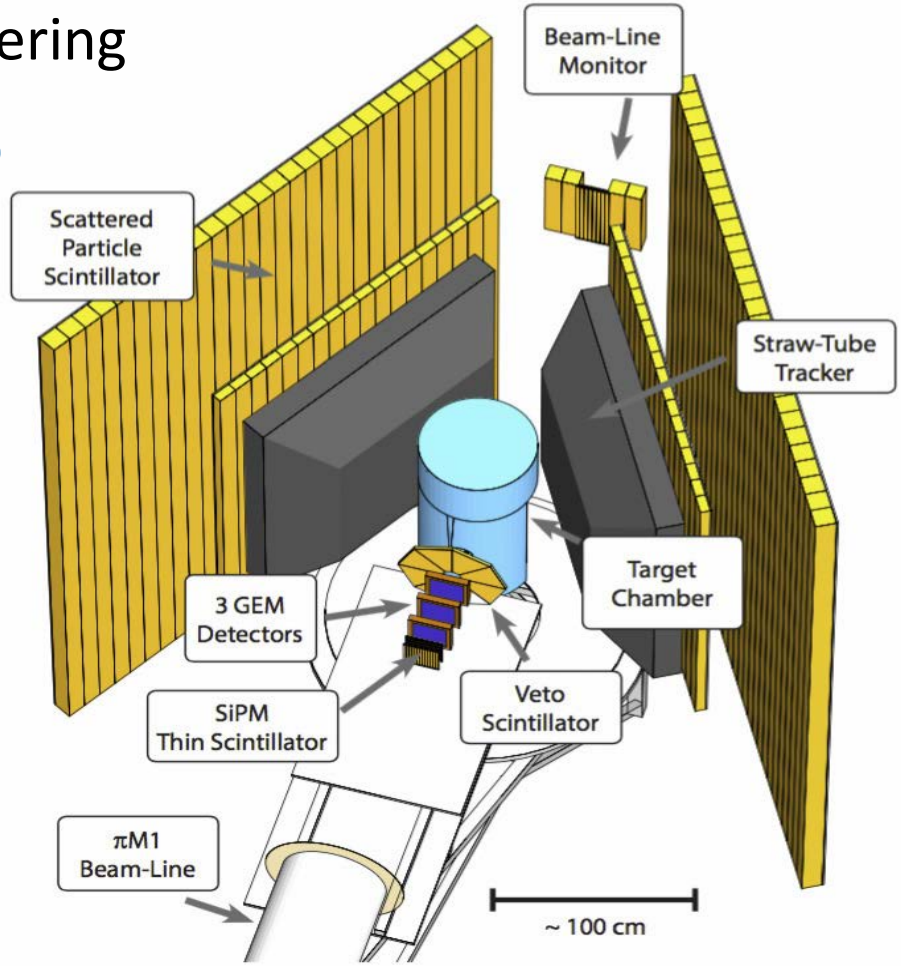
Midscale: MUSE

Proton Radius Problem: Atomic meas't μ-H → p radius
7 σ smaller than e-H and e-p scattering

Precise comparison of e-p and μ-p scattering @ PSI

- Preparing for full commissioning run (late Fall 2018)
- Data taking: 20 weeks, May – Dec, 2019
- Goal: σ for elastic scattering of μ+/- and e+/- with sub sub-1% relative precision over Q^2 from 0.002 to 0.07 GeV

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



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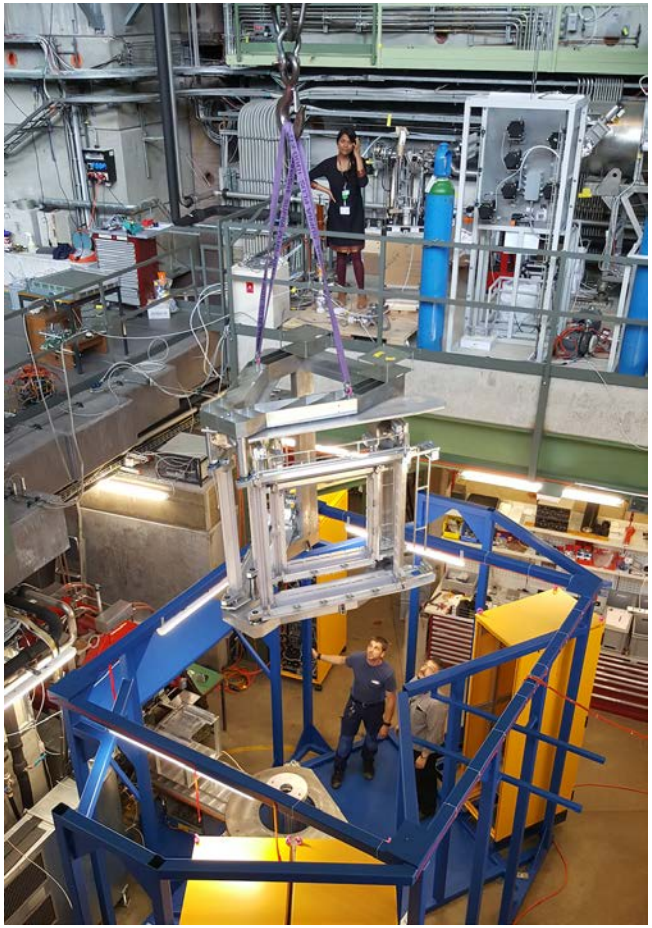
Straw Tube Tracker Frame lowered into place



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Cryotarget

Major Research Instrumentation (MRI) NSF 18-513

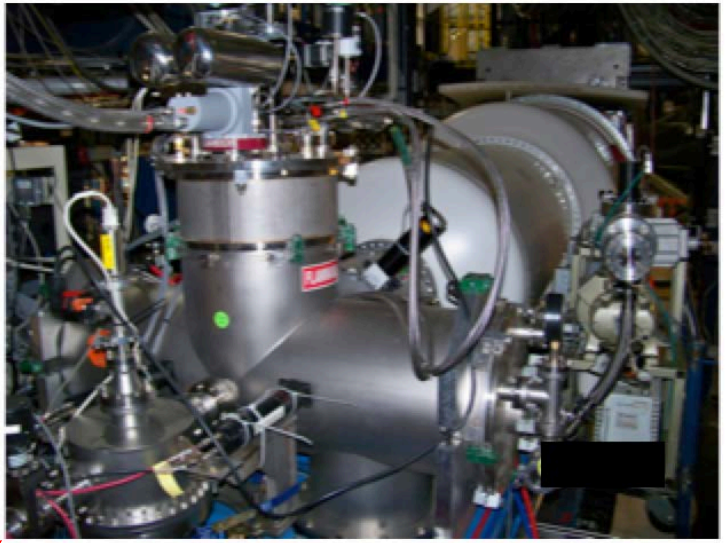
- Two tracks:
  - Track 1 $100 k < $ from NSF < $1 M; max of 2/university
  - Track 2 $1 M < $ from NSF < $4M; max of 1/university
- Two types: development and acquisition
- Contact program directors well ahead of submission to discuss (avoid pitfalls)
- Maximum award is $4M; awards above $1M compete across the entire Foundation

FY18

- *Physics: 34 proposals, 10 in ENP (7 for > $1M)*
  - *Funding recommendations have been made totaling ~ $4M for ENP*

PRad
Proton Charge Radius Experiment @ JLab

- Instrumentation
  - Novel H_2 gas flow windowless target (*funded by NSF MRI*)
  - HyCal calorimeter refurbished and tested (funded by DOE)
  - Integrated high-speed DAQ
- Data taking May-June 2016
  - Lowest Q^2 data set in ep
  - Simultaneous meas't of Moller and Mott scattering → control systematic uncertainties



Target installed in Hall B beam line

$$< r_p^2 > = 6 \left. \frac{dG_E^p(Q^2)}{dQ^2} \right|_{Q^2 = 0}$$

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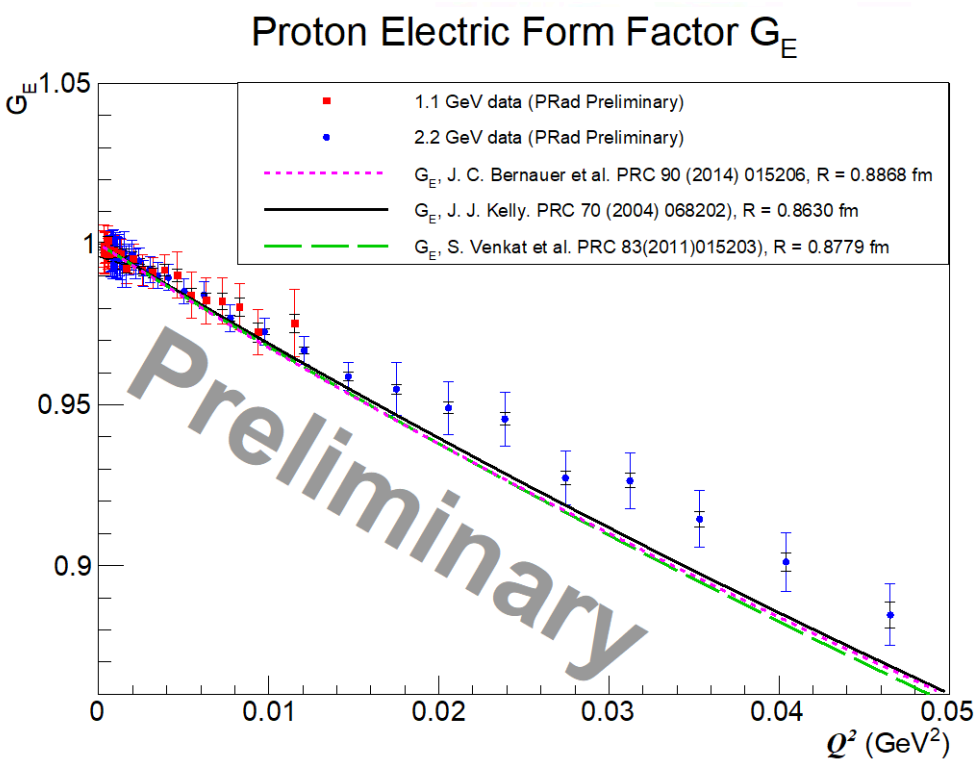


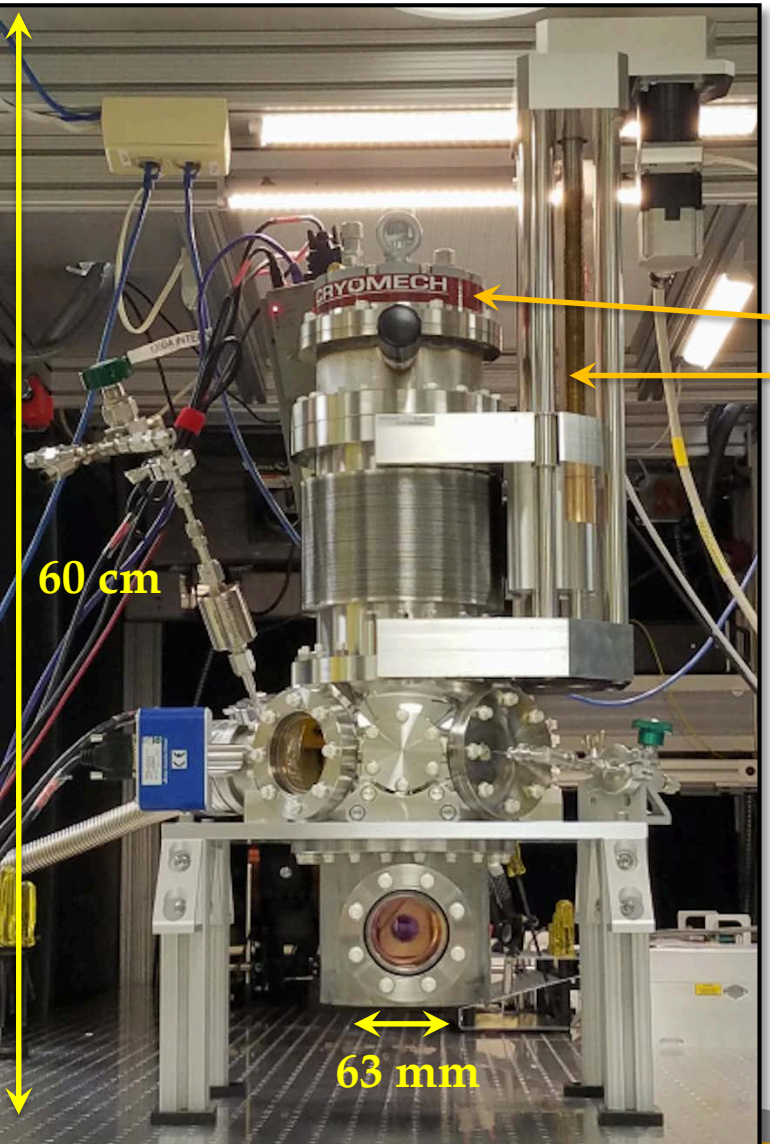
Preliminary G_E slope seems to favor smaller radius

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 20, 2018 →**
  7 proposals in ENP, 3 in NT
- PECASE nominees are chosen from CAREER winners
- Contact program officer for information/advice ahead of time (budget, scope)

Optical Single Atom Microscope

– Rare Nuclear Reactions in Nuclear Astrophysics & $0\nu\beta\beta$

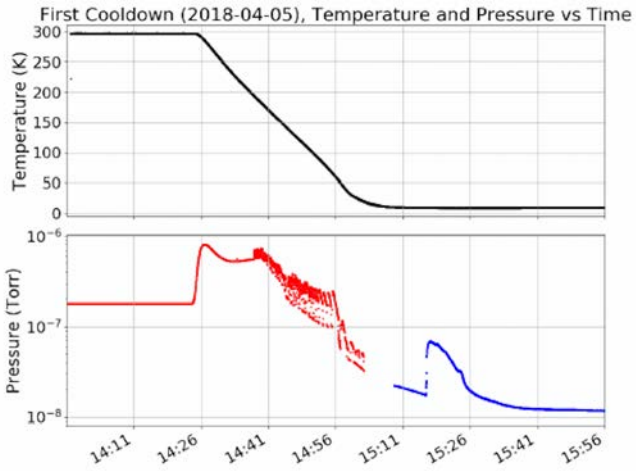


- Capture recoil products in noble gas solid
- Use resonant laser excitation to optically detect
- Goal: detect single atom of Yb in solid Ne
  - Detect ^{26}Mg in ^{22}Ne(α,n) & ^{22}Ne(α,γ) to understand slow n-capture in massive stars

Cryo-cooler

Linear Shift Mechanism

Successful neon film growth on 1st attempt!



Substrate temperature: < 7 K

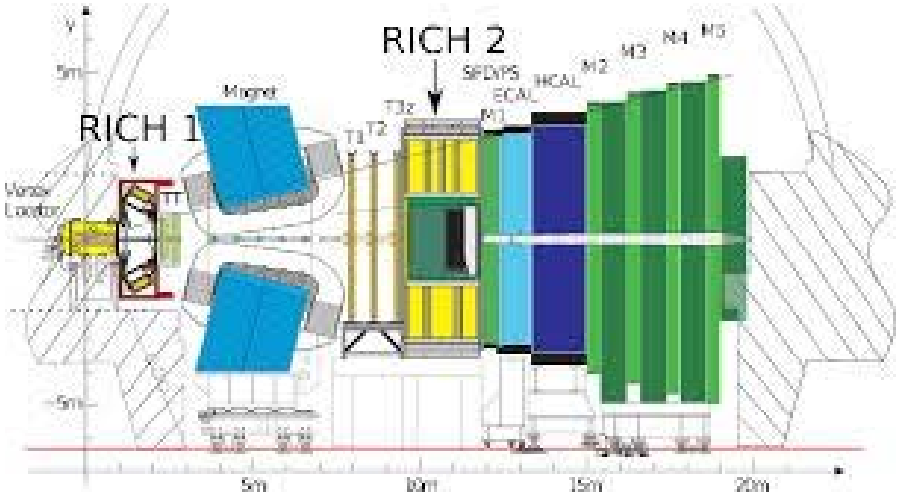
Base pressure: < 10^{-8} Torr

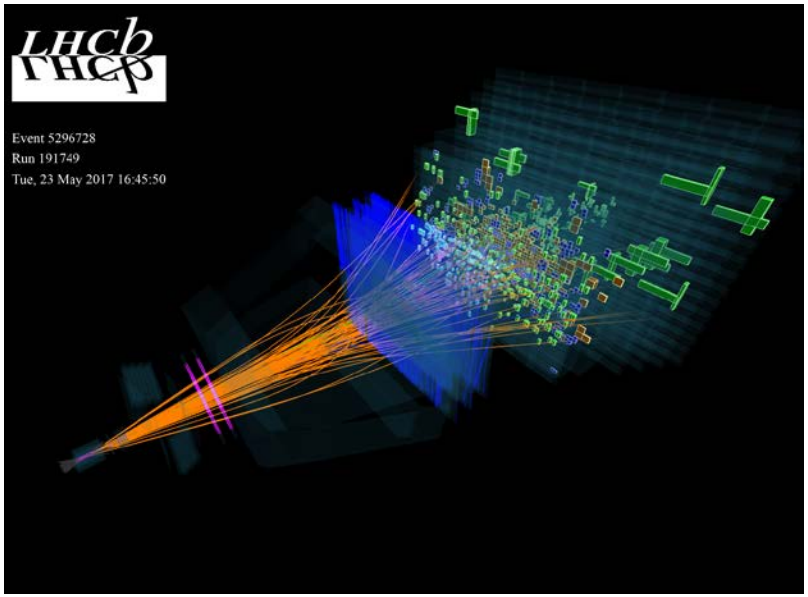
PI: Jaideep Singh PhD Student: Ben Loseth

LHCb

– Study Proton Structure and QCD

- Far forward acceptance → both high-x and low-x partons in p and Pb beams
- Extensive hadron PID + full jet reconstruction → detailed hadronization studies





- D-Y p_T and ang dist → constrain ⊥ mom dependent PDFs
- Identified hadron production within reconstructed jets
- Contribute to Upstream Tracker silicon upgrade

PI: Christine Aidala

PhD Students: William Dean, Kara Mattioli, Jordan Roth

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

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

NSF/MPS/Physics Personnel

- France Córdova – Director
- Anne L Kinney – Assistant Director for MPS
- Denise Caldwell – Physics Division Director
- Jean Cottam Alan – Acting 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

https://www.nsf.gov/div/index.jsp?div=PHY

Contact us:

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- aopper@nsf.gov
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