



National Science Foundation – Nuclear Physics

Outline

- Staff in NSF/MPS/PHY
- FY24 & FY25 Budget Info
- Funding Announcements

Vicki Greene
NSAC
September 2024

NSAC Sept 2024





NSF/MPS/PHY Personnel

- Sethuraman Panchanathan – Director
- David Berkowitz – Assistant Director for MPS
- Denise Caldwell – Senior Advisor
- Saúl González – Physics Division Director
- Michael Cavagnero – *Acting* Deputy Division Director
- Bogdan Mihaila – Nuclear Theory Program Director
- Senta (Vicki) Greene – Nuclear Physics Program Director
- Allena Opper – *Acting* Senior Advisor for Facilities in MPS

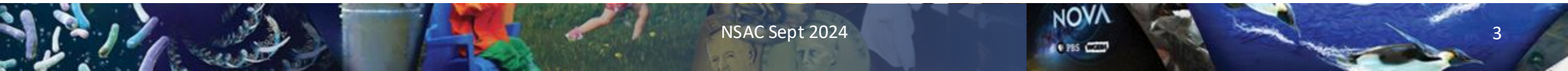
<https://beta.nsf.gov/careers/openings/mps/phy/phy-21-001>
www.nsf.gov/careers/rotator



FY24 Budget: President's Request, House, Senate (\$M)



NSF by Account	FY 2022 Actual	FY 2023 Estimate Total	FY 2024 Request	House Mark	Senate Mark
Research & Related Activities	\$6,964.66	\$7,826.80	\$9,029.90	\$7,867	\$7,608
STEM Education	\$1,146.72	\$1,371.00	\$1,444.18	\$1,006	\$1,228
Major Res. Equip. & Fac. Construction	\$120.60	\$187.23	\$304.67	\$254	\$187
Agency Operations & Award Mgmt.	\$420.21	\$463.00	\$503.87	\$472	\$448
Office of Inspector General	\$18.89	\$23.39	\$26.81	\$27	\$23
National Science Board	\$4.52	\$5.09	\$5.25	\$5	\$5
Total, NSF Discretionary Funding	\$8,675.61	\$9,876.51	\$11,314.68	\$9,630	\$9,500



FY24

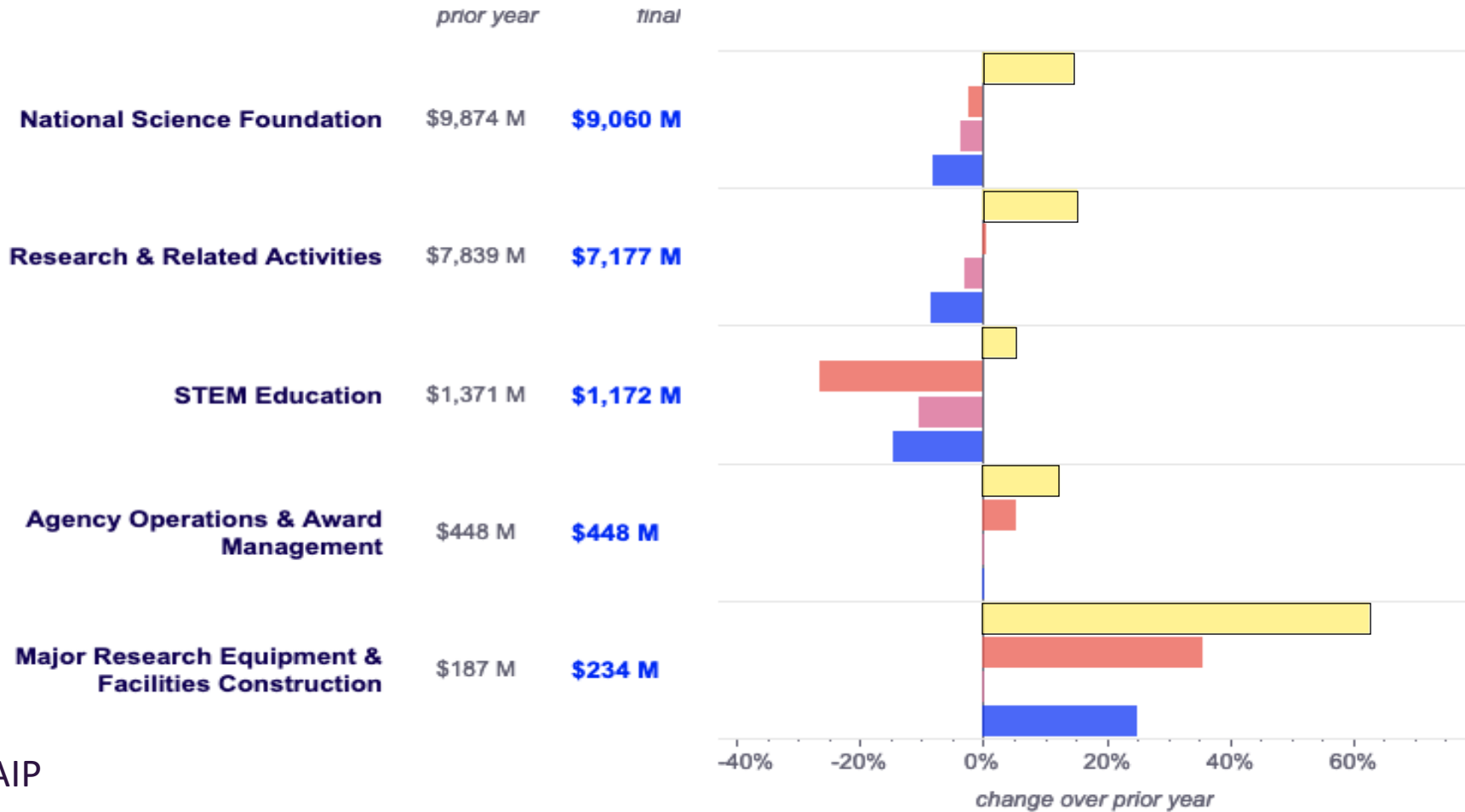
FY2024 Appropriations: National Science Foundation



- REQUEST
- SENATE
- HOUSE
- FINAL

FISCAL YEAR ×

2024 ▾

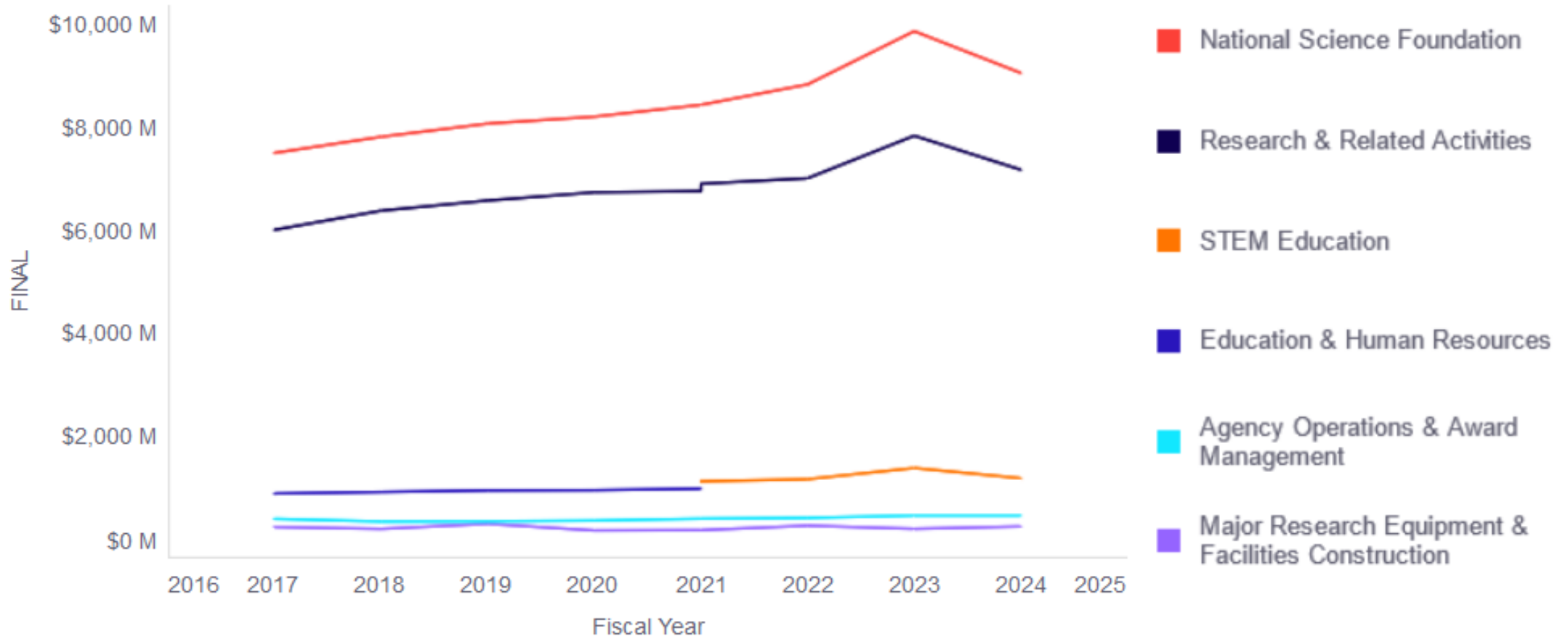


From AIP





NSF Appropriations – figure from the AIP





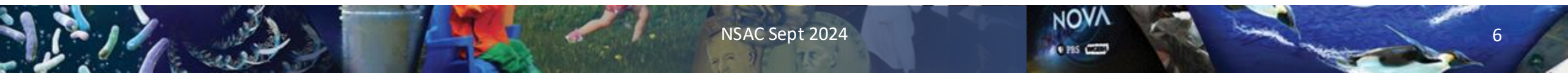
FY25 President's Budget Request – NSF (\$M)

NSF by Account	FY 2023 Base Plan ¹	FY 2024 (TBD)	FY 2025 Request	Change over FY 2023 Base Plan	
				Amount	Percent
Research & Related Activities²	\$7,631.02	-	\$8,045.32	\$414.30	5.4%
STEM Education²	\$1,229.28	-	\$1,300.00	\$70.72	5.8%
Major Res. Equip. & Fac. Construction	\$187.23	-	\$300.00	\$112.77	60.2%
Agency Operations & Award Mgmt.	\$463.00	-	\$504.00	\$41.00	8.9%
Office of Inspector General	\$23.39	-	\$28.46	\$5.07	21.7%
National Science Board	\$5.09	-	\$5.22	\$0.13	2.6%
Total, NSF Discretionary Funding	\$9,539.01	-	\$10,183.00	\$643.99	6.8%
Advancing Scientific Discovery: Artificial Intelligence	-	-	50.00	50.00	N/A
STEM Education - H-1B Visa	192.54	-	138.93	-53.61	-27.8%
Donations	40.00	-	40.00	-	-
Total, NSF Mandatory Funding	\$232.54	-	\$228.93	-\$3.61	-1.6%
Total, NSF Budgetary Resources	\$9,771.55	-	\$10,411.93	\$640.37	6.6%

Totals exclude reimbursable amounts.

¹ Reflects the anticipated transfer of \$15.0 M of carryover within R&RA to AOAM to be completed in FY 2024.

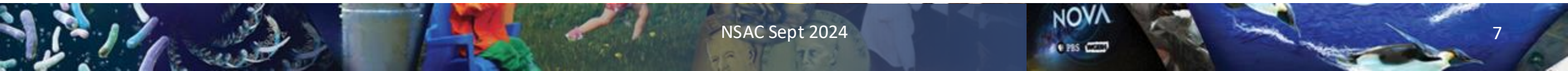
² FY 2023 R&RA and STEM Education accounts are restated to show consolidation of NSF mission support activities within R&RA comparably with FY 2025; STEM Education account shifts \$16.72 million to R&RA in FY 2023 display column.





FY25 President's Budget Request – MPS (\$M)

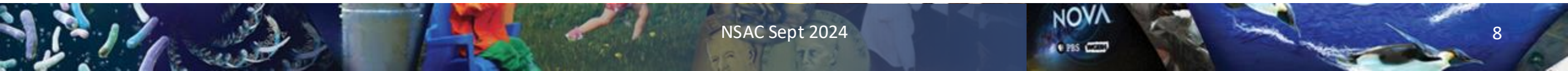
	FY 2023			Change over	
	Base	FY 2024	FY 2025	FY 2023 Base Plan	
	Plan ¹	(TBD)	Request	Amount	Percent
Astronomical Sciences (AST)	\$288.21	-	\$318.53	\$30.32	10.5%
Chemistry (CHE)	264.99	-	264.99	-	-
Materials Research (DMR)	334.50	-	345.72	11.22	3.4%
Mathematical Sciences (DMS)	248.40	-	248.40	-	-
Physics (PHY)	308.65	-	312.90	4.25	1.4%
Office of Strategic Initiatives (OSI)	215.20	-	191.09	-24.11	-11.2%
Total	\$1,659.95	-	\$1,681.63	\$21.68	1.3%



FY25 Budget: President's Request, House, Senate (\$M)



	FY24 Enacted	FY25 Request	House Mark	Senate Mark
National Science Foundation	\$9,060	\$10,183	\$9,259	\$9,550
Research & Related Activities	\$7,177	\$8,045	\$7,547	\$7,528
STEM Education	\$1,172	\$1,300	\$1,000	\$1,225
Agency Operations & Award Management	\$448	\$504	\$448	\$465
Major Research Equipment & Facilities Construction	\$234	\$300	\$235	\$300
NSF Office of Inspector Gen'l	\$24	\$28	\$24	\$27
National Science Board	\$5	\$5	\$5	\$5





FY 2025 BUDGET REQUEST TO CONGRESS



U.S. National Science Foundation



STRENGTHENING ESTABLISHED NSF

Driving discovery and enhancing state-of-the-art research capabilities are and will continue to be NSF's central focus.



INSPIRING MISSING MILLIONS

NSF will continue to scale up existing pathways into STEM fields for every demographic and socioeconomic group in every geographic region of the country.



ACCELERATING TECHNOLOGY AND INNOVATION

NSF will continue to support advancing breakthrough technologies, translating research results to the market and society, fostering partnerships, and nurturing diverse STEM talent.

Four Major Themes

1. Advance Emerging Industries for National and Economic Security
2. Create Opportunities Everywhere
3. Build a Resilient Planet
4. Strengthen Research Infrastructure



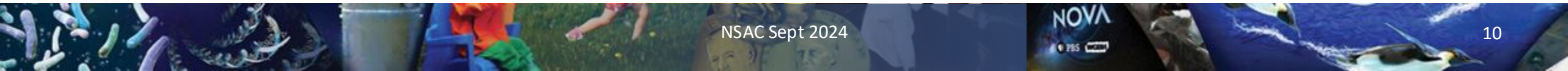
Early Faculty Career Development Program (CAREER)



- Awards in support of early-career faculty who have the potential to serve as academic role models in research **and education**, and to lead advances in the mission of their department or organization.
- Eligibility – must be untenured assistant professor in position that is at least 50% tenure-track
- Required department chair may not be a letter of support; should
 - Affirm PI's pre-tenure status
 - Indicate that the proposed research and education objectives of the proposal are supported by and advance department's goals
 - Describe how proposed goals are related to mission of department and how dept will provide appropriate mentoring
- Submission through Research.gov or Grants.gov
- Deadline: Fourth Wednesday in July ⇒ **July 24, 2024**

NSF 22-586

PAST





Major Research Instrumentation (MRI) NSF 23-519

- Three tracks:
 - Track 1 \$100 k < \$ from NSF < \$1.4 M; up to 2/university
 - Track 2 \$1.4 M < \$ from NSF < \$4 M; 1/university
 - Track 3 acquisition, development, installation, operation, and maintenance of equipment and instrumentation to reduce consumption of helium; 1/university
- Two types: development and acquisition; both need to be “shovel ready”
- Deadlines & details
 - October 15 – November 15, 2024, (a window of opportunity)
 - <https://www.nsf.gov/od/oia/programs/mri/>
 - <https://new.nsf.gov/funding/opportunities/major-research-instrumentation-program-mri>
 - *Contact your program directors well ahead of time to discuss & avoid pitfalls*
 - Awards above \$1M compete across the entire Foundation
 - ~~30% cost share req'd for PhD granting institutions~~



Funding Opportunities (cont): PHY Mid-scale Instrumentation

- Design and Construction *or* Acquisition of Instrumentation
 - “shovel ready”
 - R & early D, operations *funded by research programs*
- ~ \$4M < TPC < ~ \$20M; over multiple years
- Selection based on
 - merit review
 - exceptional opportunity
 - research community priorities.
- Currently 3 ENP Midscale projects (BL3, LEGEND-200, MOLLER)
- For more info, see PHY Solicitation & talk with PHY program directors



NSF Mid-scale Research Infrastructure

- Mid-scale Research Infrastructure-1 (MsRI-1) [NSF 24-598](#) posted Aug 2024
 - Implementation = “shovel ready”; \$4M < total request < \$20M
 - Design/development = to prepare MsRI implementation proposal; \$400,000 < total request < \$20M
 - Preproposals (required) due 18-Nov-2024
 - Full proposals (invited) due 19-Mar-2025
- Mid-scale Research Infrastructure-2 (MsRI-2) [NSF 23-570](#) posted Mar 2023
 - Total request: \$20M - \$100M
 - “Shovel ready”
- Solicitations published every two years
- Solicitation scope: NSF-wide

Questions? Contact me



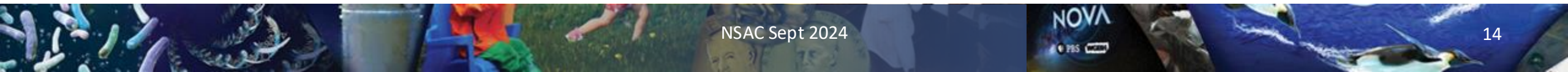
Funding Announcements

PHY Investigator Initiated Research NSF 23-615

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

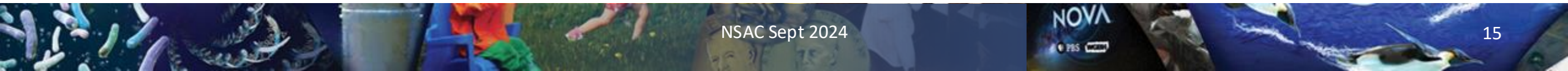
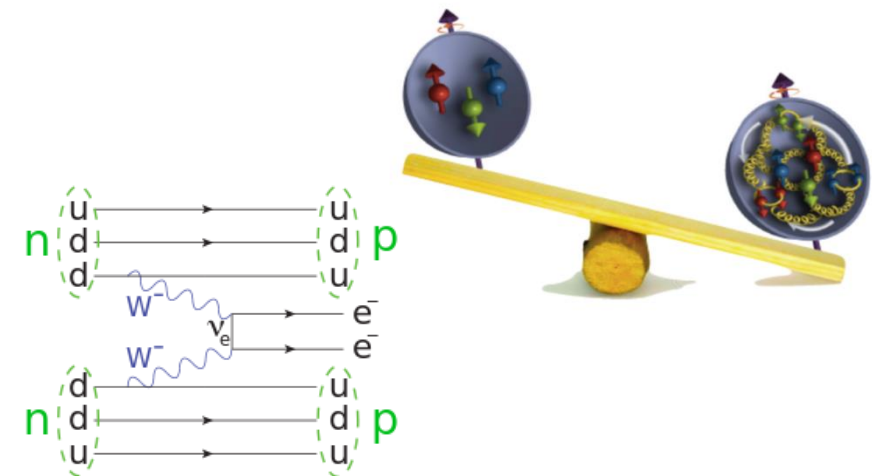
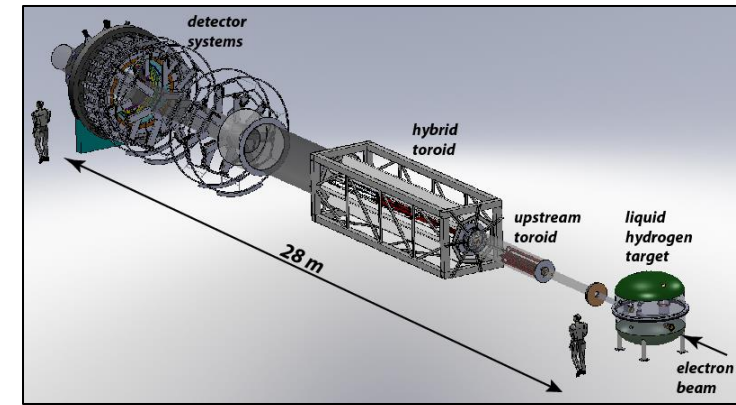
- **Deadlines:** Second Tuesday in December for *Experimental & Theoretical Nuclear Physics*
→ **December 10, 2024 5 pm in your home institution's time zone**
- Follow instructions that are specific to this solicitation; **non-compliant proposals may be returned without review**
- Must conform to the NSF Proposal & Award Policies & Procedures Guide (PAPPG)
<https://new.nsf.gov/policies/pappg/24-1>
 - **Updated instructions regarding Current and Pending Support and Biographical Sketches of senior personnel**
- Submission through Research.gov or Grants.gov

Questions – contact cognizant program director.



NSF and DOE Coordination in Nuclear Physics

- MOLLER – parity violating Moller (elastic $\vec{e} e$) scattering
 - CD-1 Dec 2020, CD-2/3 May 2024
 - NSF PHY Mid-scale award for specific scope
- EIC – the Electron Ion Collider
 - DOE CD-1 in Jul 2021, CD-3A, ...
 - Project includes EIC + 1 detector (ePIC)
- Next Generation $0\nu\beta\beta$
 - Demonstrators: CUOREcino, CUORE, MJD, 200, KamLAND-Zen, NEMO, ...
 - DOE $0\nu\beta\beta$ portfolio review
 - LEGEND-200



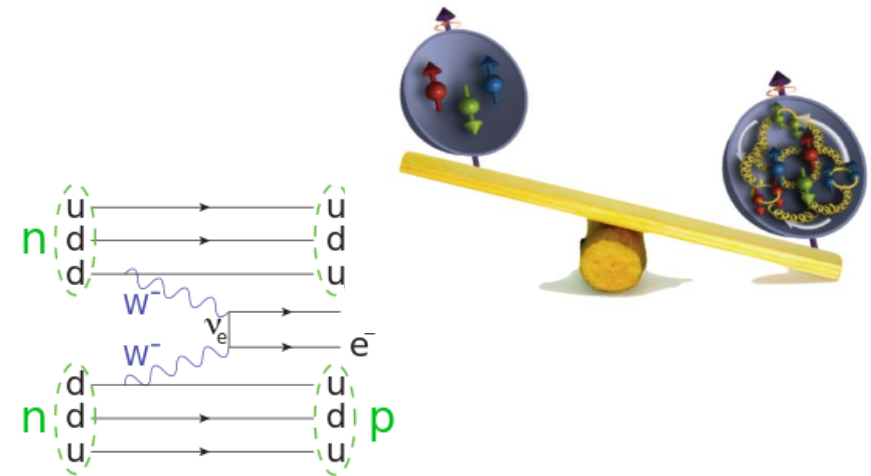
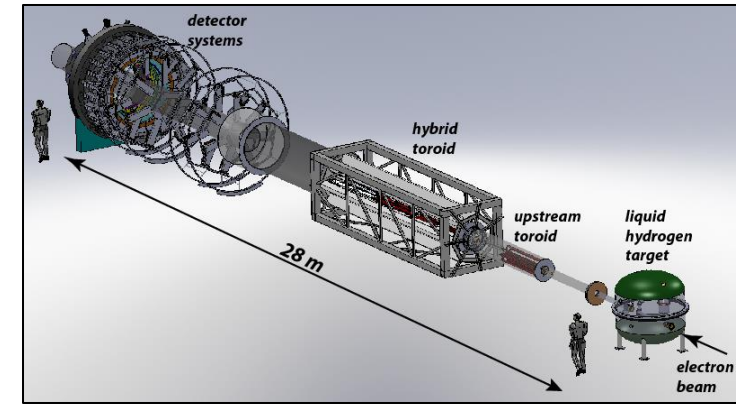


NSF and DOE Coordination in Nuclear Physics

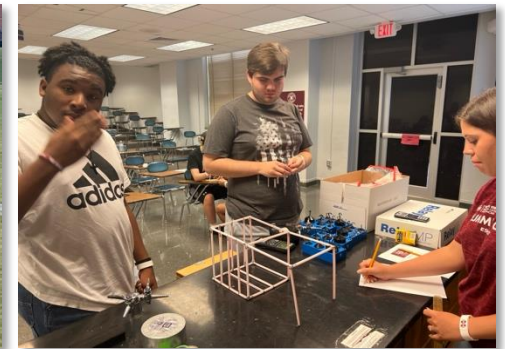
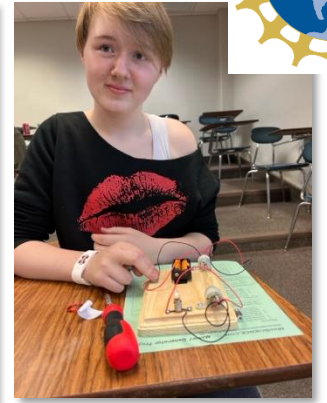
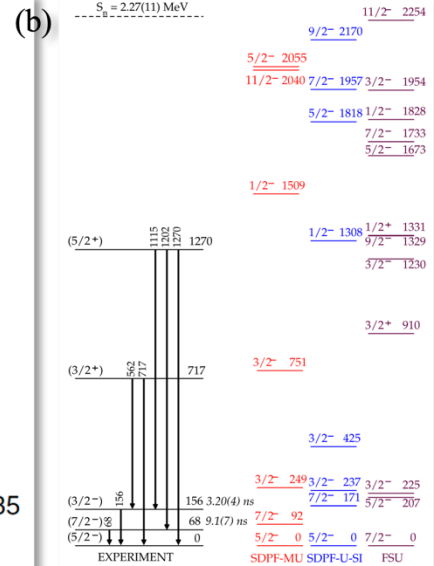
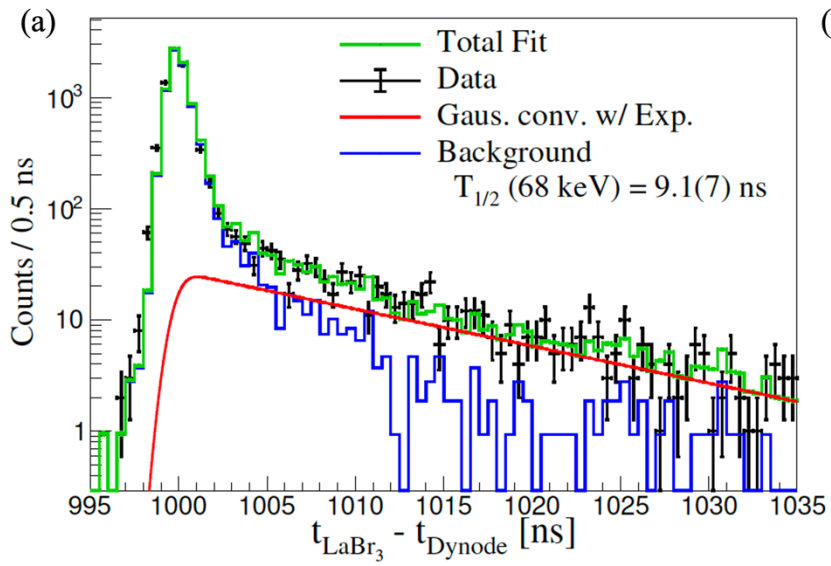


NSF responds to proposals

- No guarantee of NSF participation in a future mission-driven project
- Will not get out ahead of DOE
- Successful proposals will have clearly defined scope with high impact
- All NSF proposals have at least two merit review criteria:
 - Intellectual Merit
 - Broader Impacts



Selected Updates from Mississippi State University and PHY-1848177 (CAREER): PI Ben Crider



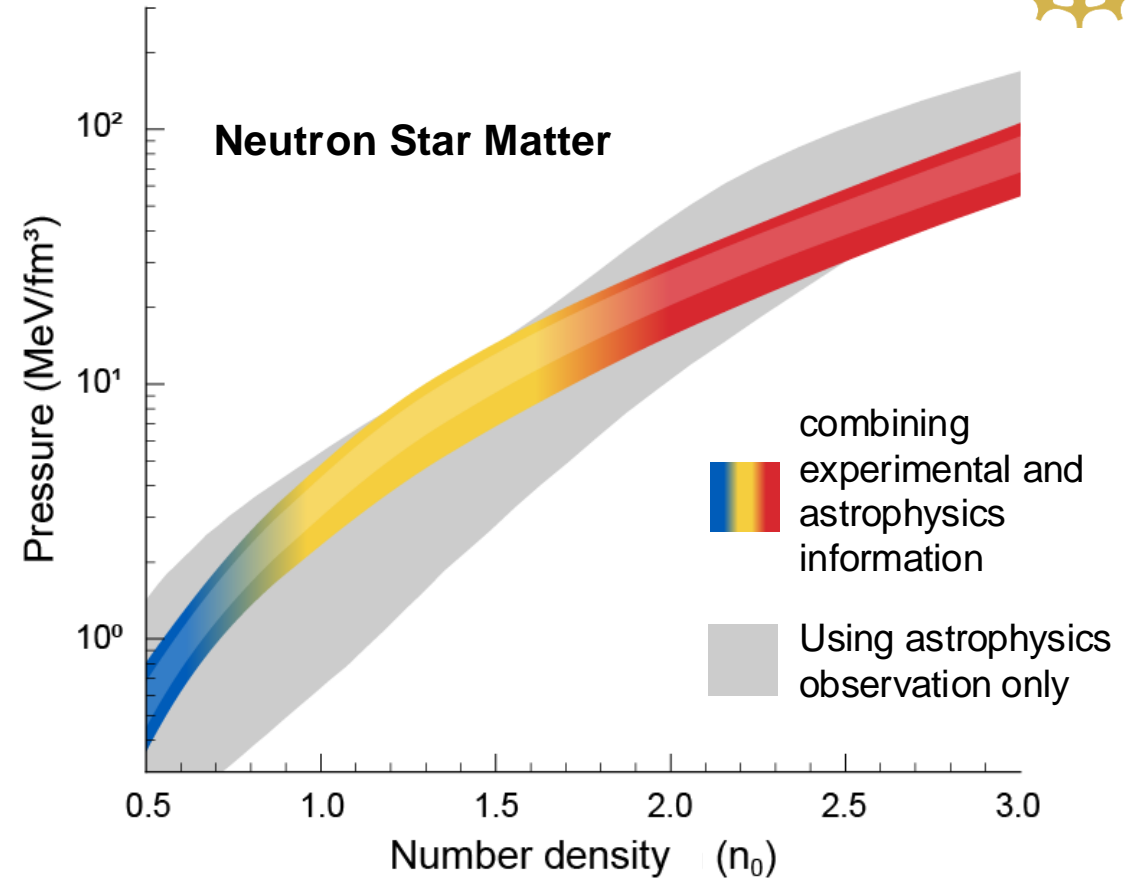
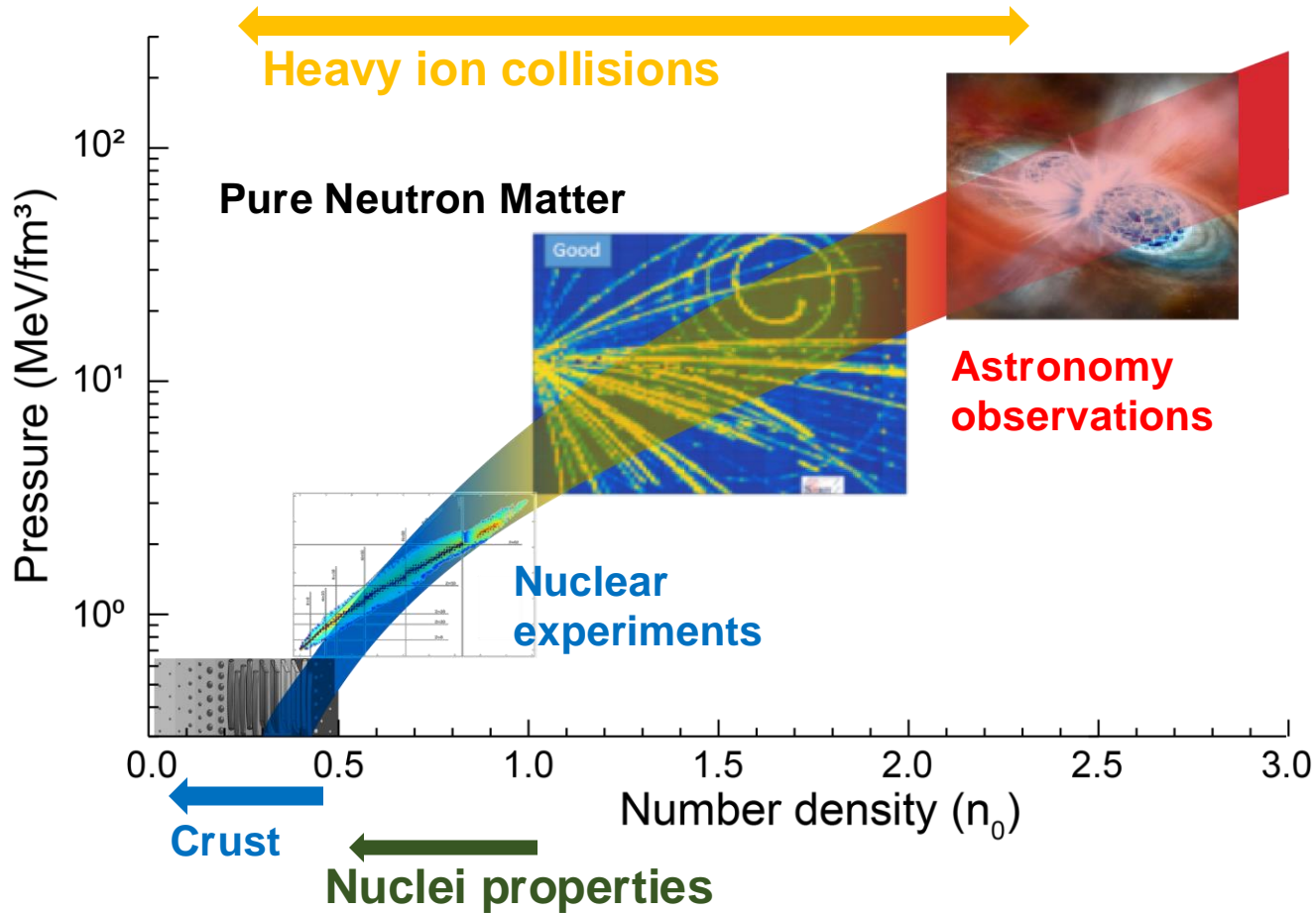
Newly observed 68-keV isomer found in ^{37}Si using bg timing techniques (a), which validates SM predictions in neutron-rich, odd-A Si isotopes (b).

Year 2 of the Physics Summer Camp for Students with ASD was a big success! We nearly doubled the number of campers from year 1 to year 2 while maintaining a high degree of engagement with physics and STEM. We look forward to year 3 of the camp!

<https://www.physics.msstate.edu/physcamp>



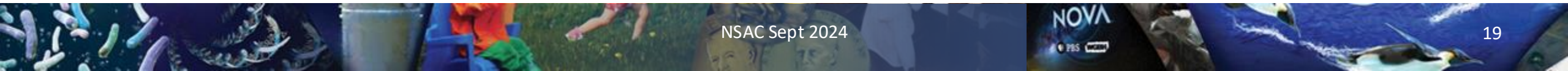
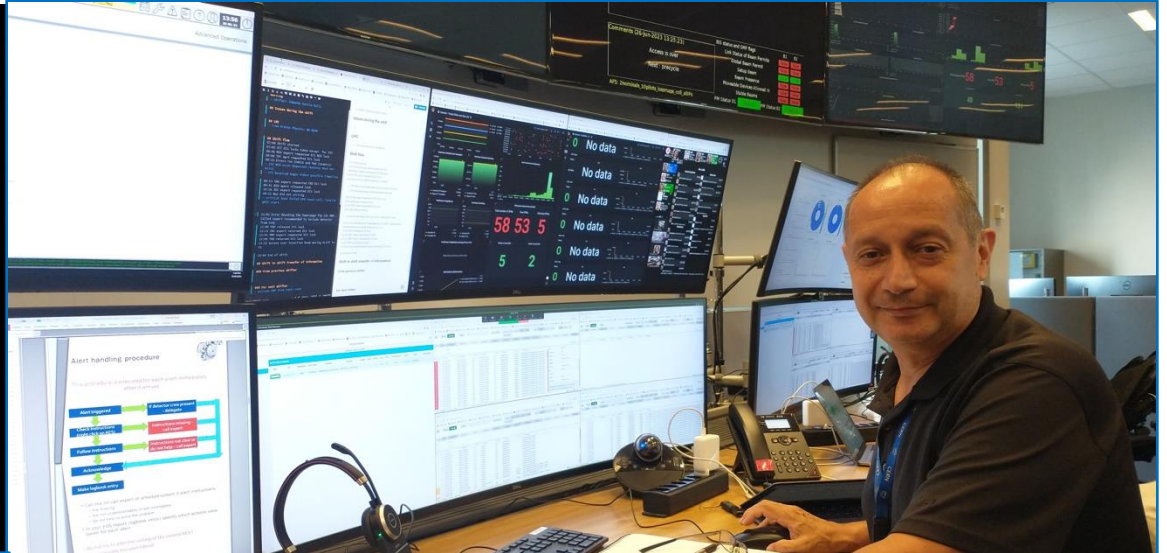
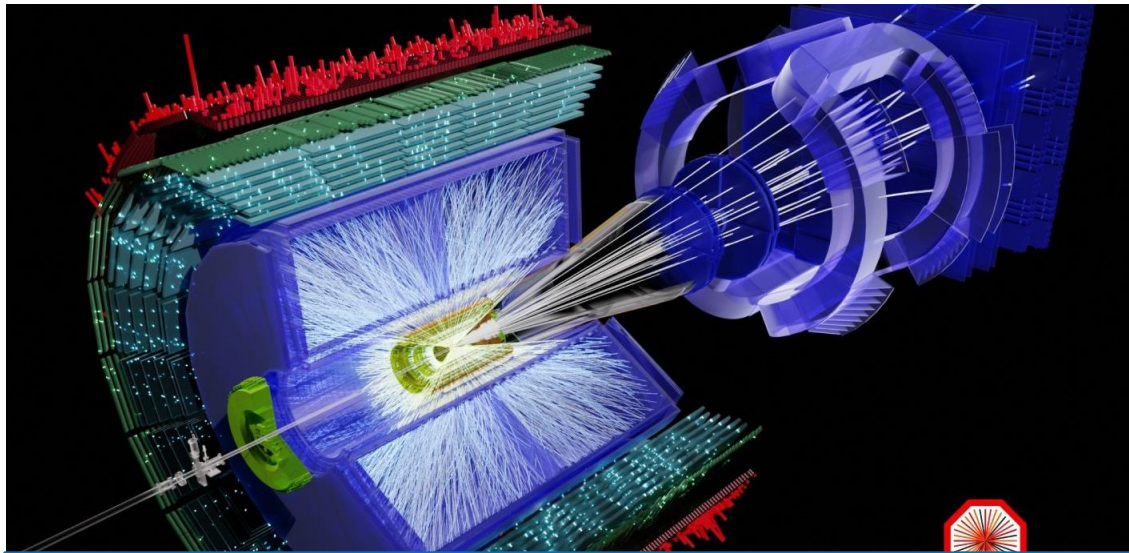
Nuclear Physics Experiments and Astronomical Observations Advance Equation-of-State Research



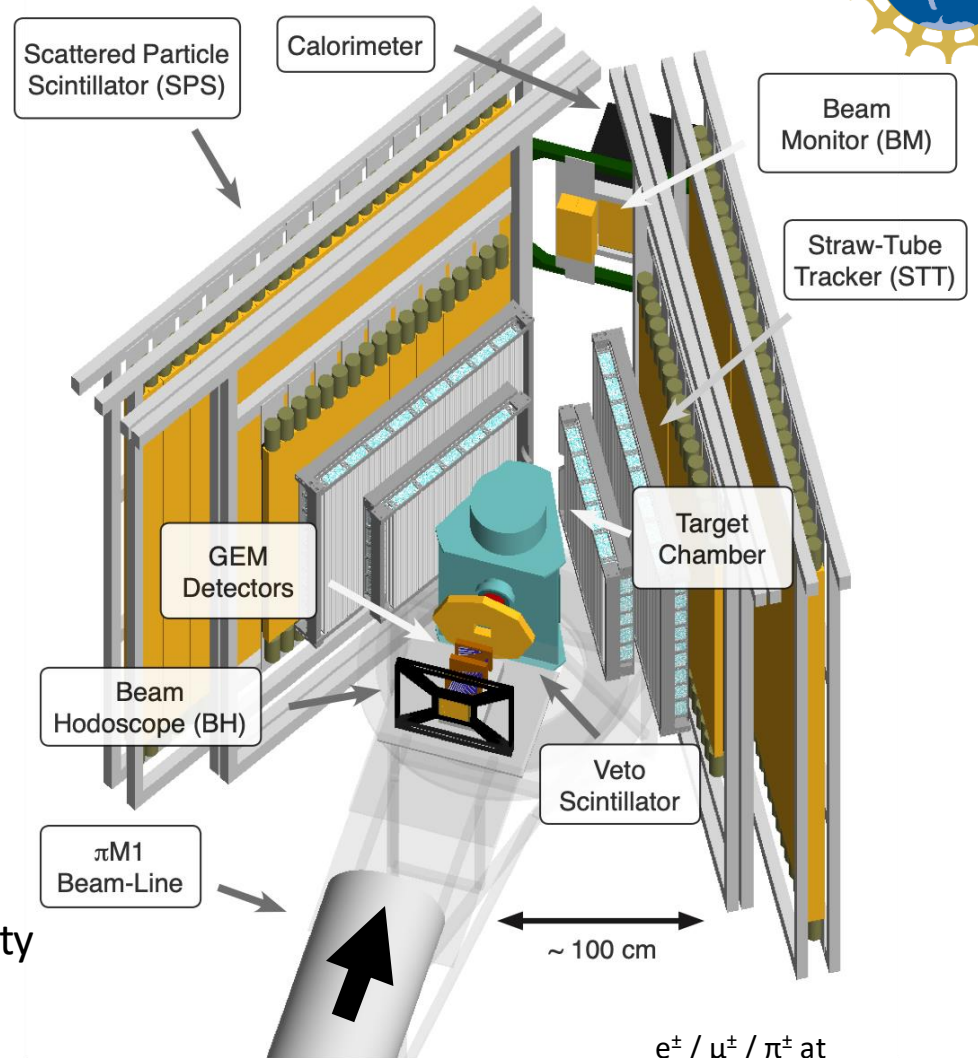
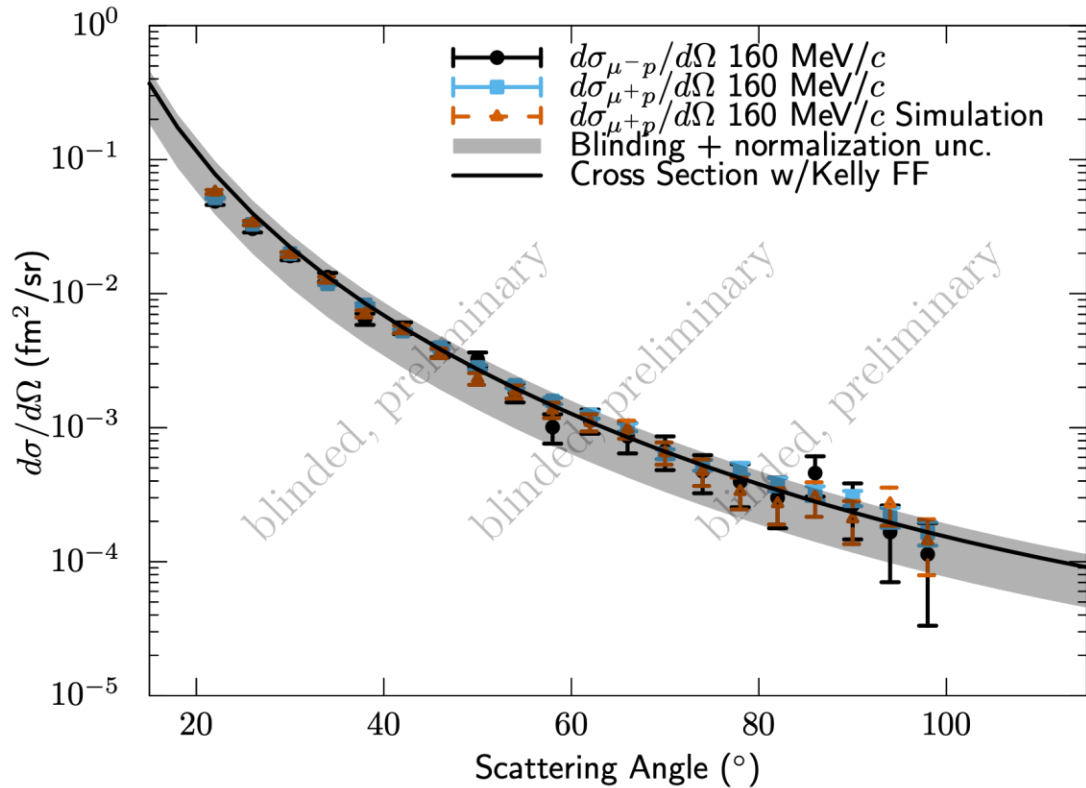
By combining astronomical observations and laboratory experiments, FRIB scientists extract nuclear matter equation of state over a wide range of densities shedding light on the neutron star properties. Incorporating nuclear physics data significantly reduces the uncertainties of the derived equation of state.



RUI: Studies of Relativistic Heavy Ions Collisions in ALICE at the LHC



MUSE Highlights

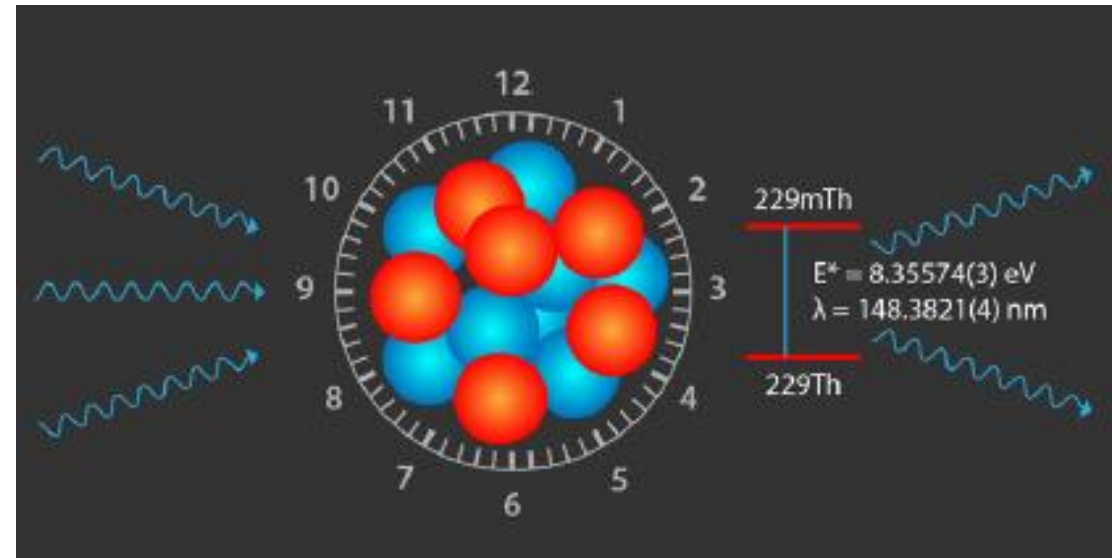


- Proton form factor, charge radius, two-photon exchange, lepton universality @ PSI elastic scattering of 115 – 210 MeV/c e^\pm, μ^\pm from hydrogen
- 2024: 5 months beam time awarded and scheduled
- 2025: similar beam time expected

$e^\pm / \mu^\pm / \pi^\pm$ at $p = 115 - 210$ MeV/c

Atomic Clock → Nuclear Clock!

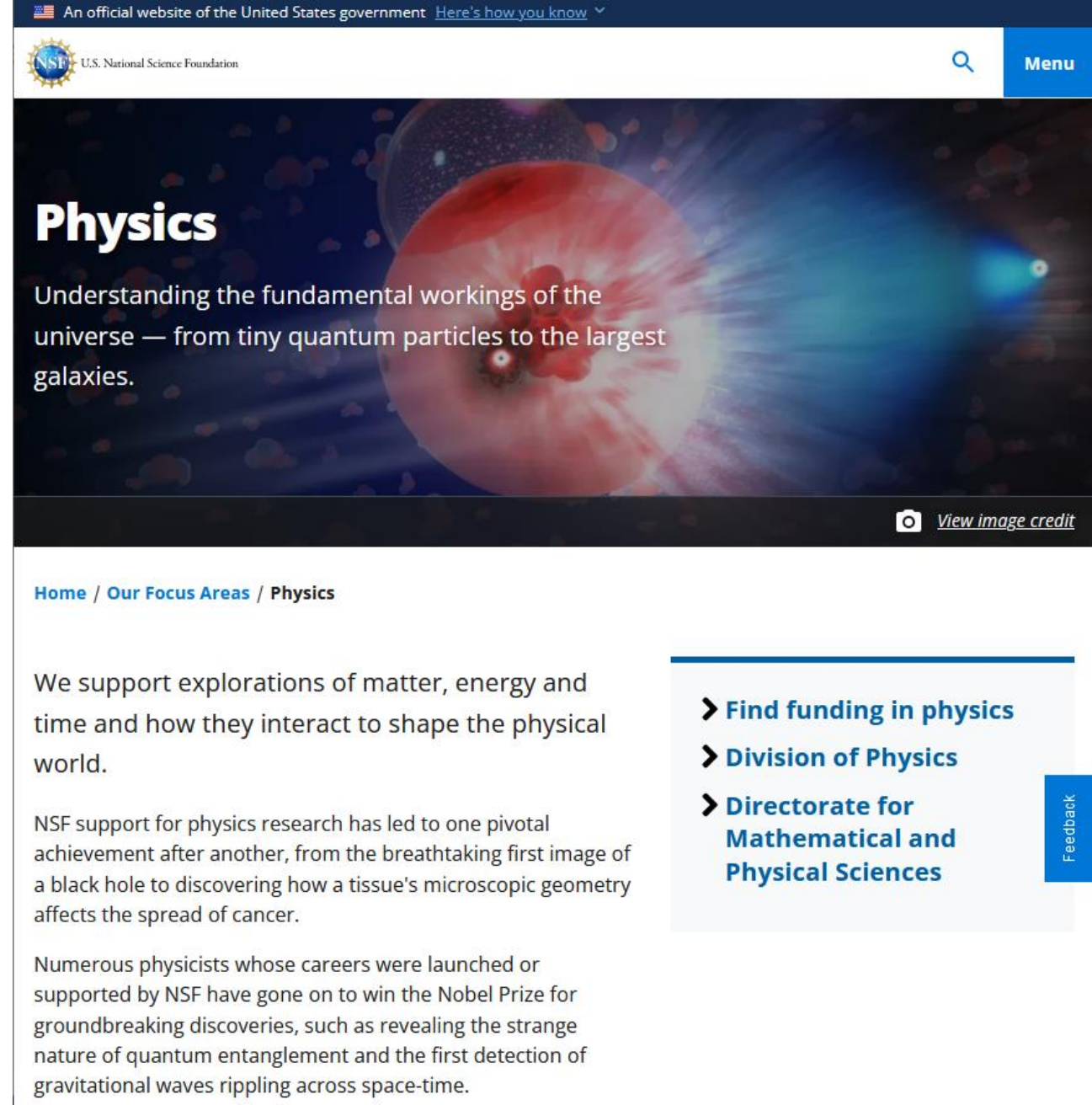
- Current standard: atomic clock using hyperfine transitions of ^{133}Cs
 - $\delta = 10^{-16}$
- Nuclear Clock: transition of a nucleus
 - Less susceptible to EM perturbations
 - $\delta = 10^{-19}$
 - Challenge: radiation source more energetic than optical lasers
- European group: VUV laser $^{229\text{m}}\text{Th}$
- Also observed by US groups
- Optical *nuclear* clocks ?



For the latest updates: <https://www.nsf.gov/physics>

Contact us at:

- Bogdan Mihaila
bmihaila@nsf.gov or
call (703)292-8235
- Vicki Greene
segreene@nsf.gov
or call (703)292-5183



The screenshot shows the NSF Physics website. At the top, there is a navigation bar with the NSF logo, the text "U.S. National Science Foundation", a search icon, and a "Menu" button. The main header features a large image of a red and white particle collision with the word "Physics" in large white text. Below the header, the text reads: "Understanding the fundamental workings of the universe — from tiny quantum particles to the largest galaxies." There is a "View image credit" link with a camera icon. Below this is a breadcrumb trail: "Home / Our Focus Areas / Physics". The main content area contains three paragraphs of text. The first paragraph states: "We support explorations of matter, energy and time and how they interact to shape the physical world." The second paragraph states: "NSF support for physics research has led to one pivotal achievement after another, from the breathtaking first image of a black hole to discovering how a tissue's microscopic geometry affects the spread of cancer." The third paragraph states: "Numerous physicists whose careers were launched or supported by NSF have gone on to win the Nobel Prize for groundbreaking discoveries, such as revealing the strange nature of quantum entanglement and the first detection of gravitational waves rippling across space-time." On the right side, there is a vertical sidebar with three blue links: "Find funding in physics", "Division of Physics", and "Directorate for Mathematical and Physical Sciences". At the bottom right of the sidebar is a "Feedback" button.

An official website of the United States government [Here's how you know](#)

NSF U.S. National Science Foundation

Physics

Understanding the fundamental workings of the universe — from tiny quantum particles to the largest galaxies.

[View image credit](#)

[Home](#) / [Our Focus Areas](#) / [Physics](#)

We support explorations of matter, energy and time and how they interact to shape the physical world.

NSF support for physics research has led to one pivotal achievement after another, from the breathtaking first image of a black hole to discovering how a tissue's microscopic geometry affects the spread of cancer.

Numerous physicists whose careers were launched or supported by NSF have gone on to win the Nobel Prize for groundbreaking discoveries, such as revealing the strange nature of quantum entanglement and the first detection of gravitational waves rippling across space-time.

- [Find funding in physics](#)
- [Division of Physics](#)
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[Feedback](#)



Thank You!

