NSF Report: Particle Physics Programs within the Division of Physics

Jim Shank (EPP Exp.), Keith Dienes (EPP Theory) , D. Grant (PA),
W. Wester (PA, Ice Cube), M. Coles (LHC)
National Science Foundation
Division of Physics

HEPAP Meeting

Nov. 1, 2021

NSF Particle Physics Programs & Funding Opportunities

- Updates on personnel in Physics Division (PHY)
- Status of EPP/PA/THY Programs
- Funding Opportunities
- Status of Artificial Intelligence solicitation

Division of Physics – Individual Investigator Programs

Atomic, Molecular, & Optical Physics
Experiment: John Gillaspy; Kevin Jones, Anthony Calamai
Theory: Robert Forrey

Plasma Physics
Slava Lukin, Jose Lopez

Elementary Particle Physics
Experiment: Jim Shank
Theory: Keith Dienes

Particle Astrophysics
Experiment: Darren Grant, William Wester
Theory (+cosmology): Keith Dienes

Gravitational Physics + LIGO research
Pedro Marronetti

Nuclear Physics
Experiment: Allena Opper; Alfredo Galindo-Uribarri
Theory: Bogdan Mihaila

Physics of Living Systems
Krastan Blagoev

Quantum Information Science
(Alex Cronin); [Julio Gea-Banacloche]

New faces:

Jose Lopez
Darren Grant
William Wester
Anthony Calamai
Alfredo Galindo-Uribarri

Physics at the Information Frontier
Bogdan Mihaila

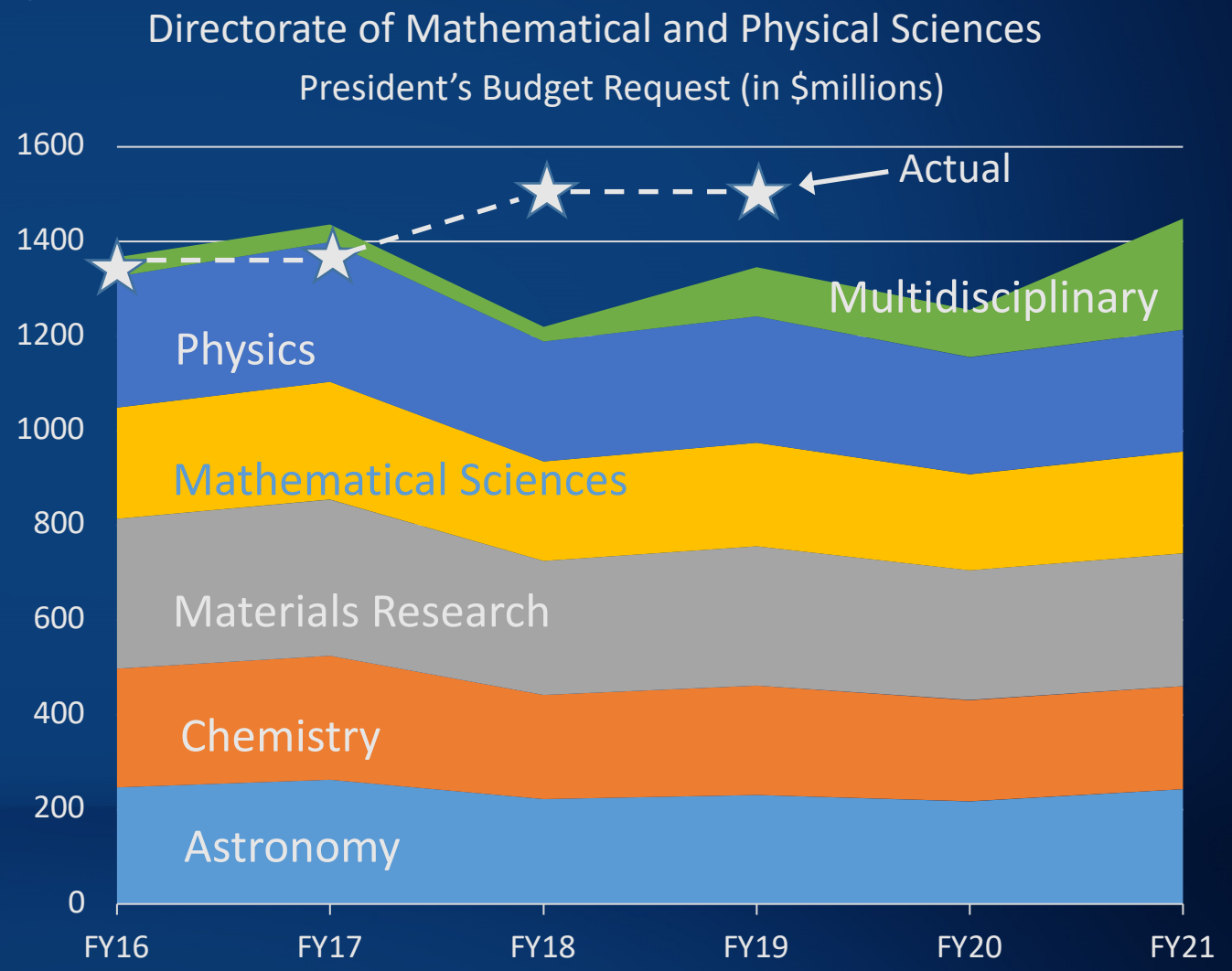
Integrative Activities in Physics
(REU Sites, MRI, CAREER, BP) Jose Lopez
Kathy McCloud (soon)

Physics Frontiers Centers
Jim Shank

Large Facilities
Mark Coles

Physics Funding at NSF

- PHY FY21 Request is 9.6% *below* FY19 Actual
- Particle physics funding is ~1/3 of Physics budget
- Increasing importance of NSF multidisciplinary "Big Ideas"
- Overall, FY20 enacted is ~3% *above* FY19 Actual for NSF



FY2022 President's Request

NATIONAL SCIENCE FOUNDATION
SUMMARY TABLE
FY 2022 BUDGET REQUEST TO CONGRESS
(Dollars in Millions)

NSF by Account	FY 2020 Actual	FY 2020 CARES Act Actual	FY 2021 Enacted[1]	FY 2022 Request	FY 2022 Request change over: FY 2020 Actual Amount	FY 2020 Actual Percent	FY 2021 Enacted Amount	FY 2021 Enacted Percent
BIO	$809.31	$19.00	-	$948.51	$139.20	17.2%	N/A	N/A
CISE	996.40	15.00	-	1,116.06	119.66	12.0%	N/A	N/A
ENG	754.31	15.00	-	916.79	162.48	21.5%	N/A	N/A
GEO	993.72	-	-	1,194.92	201.20	20.2%	N/A	N/A
MPS	1,530.12	6.00	-	1,690.74	160.62	10.5%	N/A	N/A
SBE	280.35	9.50	-	319.66	39.31	14.0%	N/A	N/A
TIP[2]	352.31	3.55	-	864.87	512.56	145.5%	N/A	N/A
TIP Programs	*120.25*	*0.80*	-	*590.23*	*469.98*	*390.8%*	*N/A*	*N/A*
SBIR/STTR, including Operations	*232.06*	*2.75*	-	*274.64*	*42.58*	*18.3%*	*N/A*	*N/A*
OISE	51.04	-	-	75.32	24.28	47.6%	N/A	N/A
OPP	480.59	-	-	506.29	25.70	5.3%	N/A	N/A
IA[3]	352.97	1.95	-	504.90	151.93	43.0%	N/A	N/A
U.S. Arctic Research Commission	1.60	-	-	1.65	0.05	3.1%	N/A	N/A
Research & Related Activities	**$6,602.70**	**$70.00**	**$6,909.77**	**$8,139.71**	**$1,537.01**	**23.3%**	**$1,229.94**	**17.8%**
Education & Human Resources[3]	**$1,084.24**	**$5.00**	**$968.00**	**$1,287.27**	**$203.03**	**18.7%**	**$319.27**	**33.0%**
Major Research Equipment & Facilities Construction	**$154.84**	**-**	**$241.00**	**$249.00**	**$94.16**	**60.8%**	**$8.00**	**3.3%**
Agency Operations & Award Management	**$347.58**	**$1.00**	**$345.64**	**$468.30**	**$120.72**	**34.7%**	**$122.66**	**35.5%**
Office of Inspector General	**$16.30**	**-**	**$17.85**	**$20.42**	**$4.12**	**25.2%**	**$2.57**	**14.4%**
Office of the National Science Board	**$4.43**	**-**	**$4.50**	**$4.60**	**$0.17**	**3.9%**	**$0.10**	**2.2%**
Total, NSF Discretionary Funding	**$8,210.09**	**$76.00**	**$8,486.76**	**$10,169.30**	**$1,959.21**	**23.9%**	**$1,682.54**	**19.8%**
Education and Human Resources - H-1B Visa	114.78	-	157.00	162.47	47.69	41.6%	5.47	3.5%
Donations	21.06	-	40.00	10.00	-11.06	-52.5%	-30.00	-75.0%
Total, NSF Mandatory Funding	**$135.83**	**-**	**$197.00**	**$172.47**	**$36.64**	**27.0%**	**-$24.53**	**-12.5%**
Total, NSF Budgetary Resources	**$8,345.92**	**$76.00**	**$8,683.76**	**$10,341.77**	**$1,995.85**	**23.9%**	**$1,658.01**	**19.1%**

Major Research Equipment Account

FY2022 President's budget request

MREFC Account Funding, by Project (Dollars in Millions)	FY 2020 Actual	FY 2021 Estimate[1]	FY 2022 Request	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	FY 2026 Estimate	FY 2027 Estimate
Antarctic Infrastructure Recapitalization	$48.78	$90.00	$90.00	$60.00	$60.00	TBD	TBD	TBD
DKIST	-	-	-	-	-	-	-	-
HL-LHC Upgrade	33.00	33.00	36.00	33.00	18.00	-	-	-
Mid-scale Research Infrastructure[2]	-	76.25	76.25	76.25	76.25	76.25	76.25	76.25
NEON	0.74	-	-	-	-	-	-	-
RCRV	25.00	-	5.00	15.00	-	-	-	-
Vera C. Rubin Observatory	46.35	40.75	40.75	15.00	-	-	-	-
Dedicated Construction Oversight	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total	**$154.84**	**$241.00**	**$249.00**	**$200.25**	**$155.25**	**$77.25**	**$77.25**	**$77.25**

FY2022 President's budget request

PHY Funding (Dollars in Millions)					
	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Percent
Total	$304.39	$303.90	$316.59	$12.69	4.2%
Research	175.08	187.32	203.22	15.90	8.5%
CAREER	10.24	7.30	7.30	-	-
Centers Funding (total)	7.45	7.70	11.00	3.30	42.9%
Artificial Intelligence Research Institutes	2.79	2.70	6.00	3.30	122.2%
STC: Center for Bright Beams (PHY)	4.66	5.00	5.00	-	-
Education	5.76	4.92	4.92	-	-
Infrastructure	105.86	96.66	90.15	-6.51	-6.7%
IceCube	3.50	3.50	3.65	0.15	4.3%
LHC	20.00	20.00	20.50	0.50	2.5%
LIGO	45.00	45.00	45.00	-	-
Midscale Research Infrastructure	15.36	12.66	18.50	5.84	46.1%
NSCL	22.00	15.50	2.50	-13.00	-83.9%
Research Resources	-	1.00	2.50	1.50	150.0%

Particle Physics Research Programs

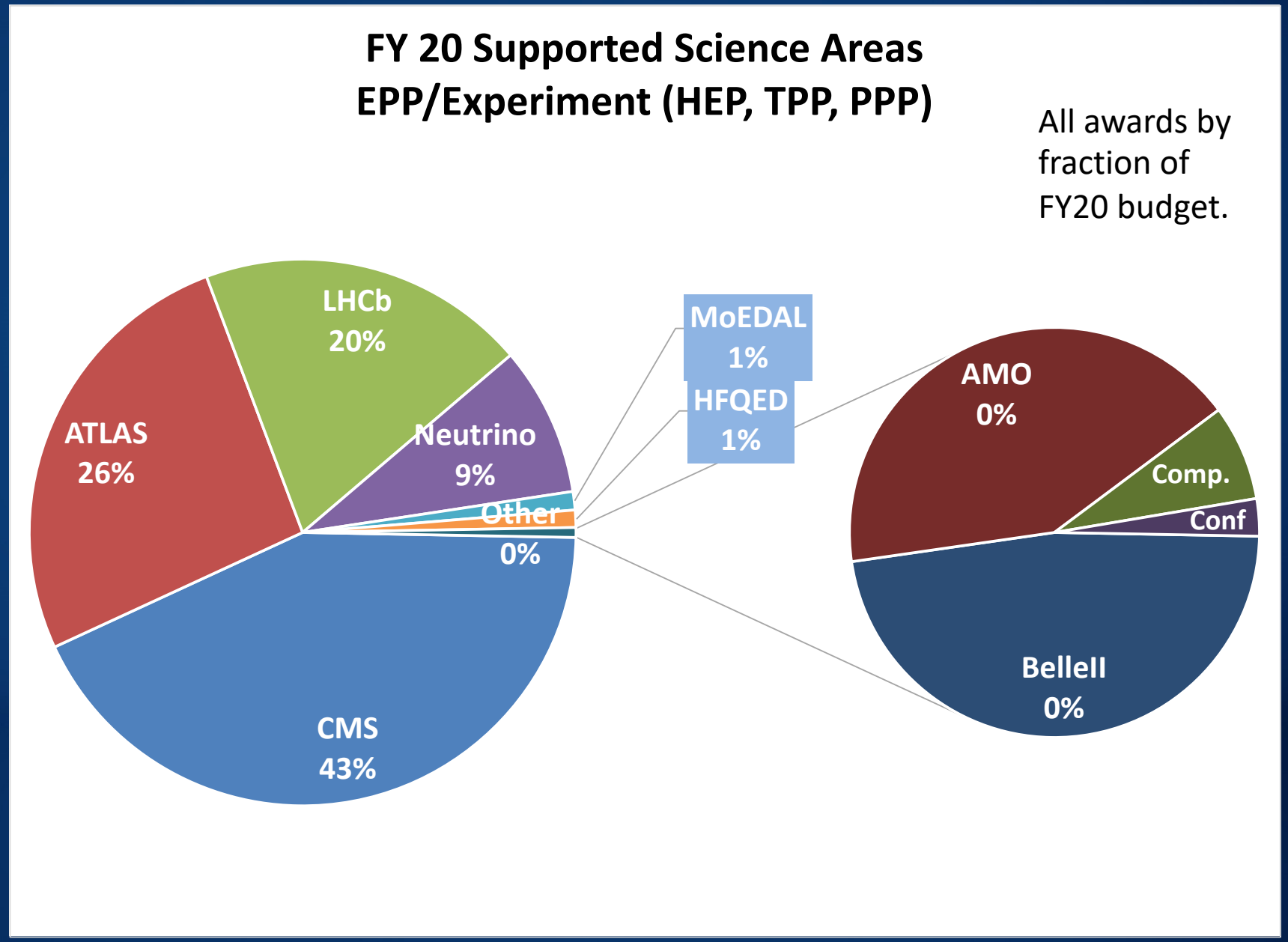
Experimental EPP Program

- Elementary Particle Physics (EPP) Program, which primarily supports particle physics at accelerators and advances in detector development.
- Range of program coverage:
  - High Energy Physics (ATLAS, CMS,…)
  - Precision Experiments (Neutrinos, LHCb, Rare-K, EDMs, …), LHCb M&O
  - Tools for Particle Physics (Artificial Intelligence, Instrumentation,…)

Program Director: J. Shank

EPP Program	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Funding (in $k)	$19,913	$19,183	$19,133	$20,522	$17,325	$21,090
Awards issued	19	12	7	18	15	15
CAREER awards	1	2	1	1	0	3

Full EPP program at the end of 2020



Experimental Particle Astrophysics Programs

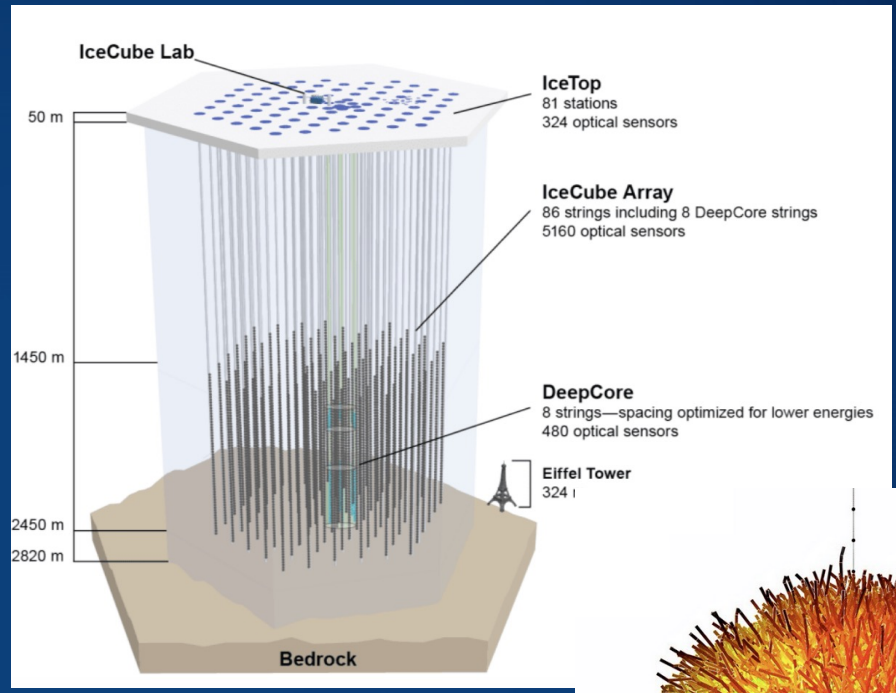
- Underground Physics (PA): This area supports university research that generally locates experiments in low background environments:
  - IceCube Science Program
  - Underground experiments, reactor neutrinos
  - Neutrino mass measurements
  - Searches for the direct detection of Dark Matter
- Cosmic Phenomena (PA): This area supports university research that uses astrophysical sources and particle physics techniques to study fundamental physics:
  - Astrophysical sources of cosmic rays, gamma rays, neutrinos

Program Directors: D. Grant, W. Wester

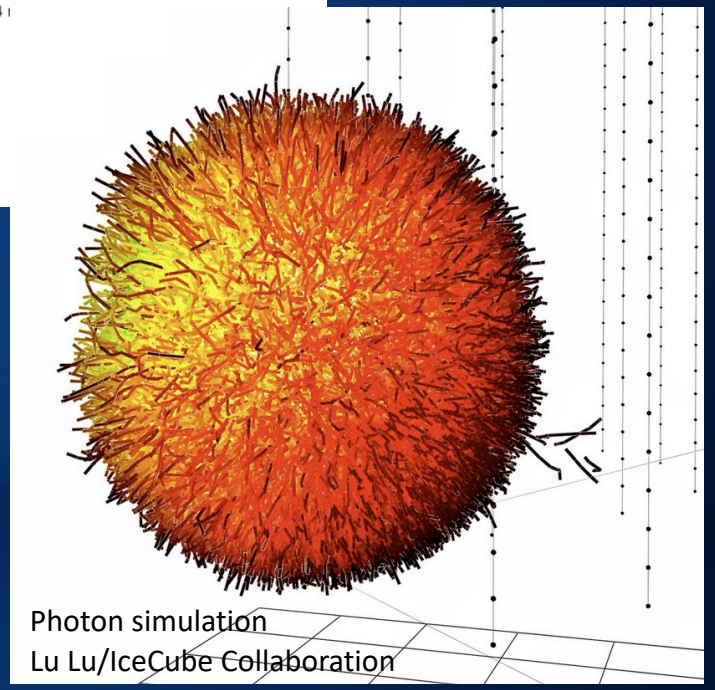
Particle Astrophysics	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY2020
Funding (in $k)	$19,665	$18,253	$18,142	$18,717	$16,632	$19,035
Awards issued	26	16	17	25	18	28
CAREER awards	2	3	1	1	1	0

PHY Highlight: Ice Cube

- 2011-2021: 10 years of IceCube
  - Highest energy neutrino interactions
  - Multi-messenger astronomy
    - Extra-galactic source
  - Fundamental neutrino physics
  - Observation of Glashow resonance
    - Natural production of a W boson



- Current Upgrade Project
  - 7 new columns of photosensors, densely embedded near bottom center of existing array
  - Enhances calibration ➔better understanding of glacial ice optical properties
  - Enables reprocessing the 10-year data archive ➔ >3X better angular tracking resolution



Photon simulation
Lu Lu/IceCube Collaboration

Glashow Resonance Event
Nature **591**, 220-224, 2021

Theory Program for Particle Physics

- Particle Theory is essential to the success of the entire Particle Physics mission. We support cutting-edge investigator-driven research in two programs:
  - Theoretical High-Energy Physics
  - Theoretical Particle Astrophysics and Cosmology
- Regular interactions with EPP, PA, Gravity Theory, Nuclear Theory, Astronomy, Materials Research, Mathematical Sciences, etc.
- Supporting individuals, RUI's, and special facilities or initiatives (Aspen Center for Physics, TASI summer school, LHC Theory Initiative, etc.)
- Trend: Dramatic increase in number of proposals—factor of two in last 5 years, +20% last year

Program Director: K. Dienes

Theory Programs	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Funding (in $k)	$13,751	$13,232	$13,388	$13,427	$12,029	$13,559
Awards issued	28	30	26	32	23	32
CAREER awards	2	1	2	1	1	1

LHC Status

- Recent reviews
  - NSF M&O Reviews of ATLAS , CMS went well
  - External reviews of the NSF scope in the HL LHC Detector Upgrades went well
- Upcoming reviews
  - Joint DOE/NSF review of ATLAS, CMS Operations Jan 31 – Feb 3, 2022
- Current LHC Long Shutdown 2 about to end
  - Start Run 3 ~ Feb. 22, 2022. All experiments will be ready, but very tight schedule for LHCb
- HL-LHC Upgrades
  - COVID delays are being tracked➔ there will probably be a re-baseline, but after the CERN schedule is revisited.
    - ATLAS, CMS delays overall are about 1 year
  - NSF has fully funded current baseline projections of FY22 needs for both ATLAS & CMS➔ reducing worry about any possible govt. shutdown
- CERN RRB and Council (See J. Mnich talk in public session of RRB , 25 Oct. 2021)
  - Upcoming Schedule discussions: P2UG, LHCC Nov. 2021
  - Final decision on schedule will probably be presented at March 2022 Council
    - Possibilities: extension of Run 3, postpone start of LS3 by ~1 year, extend LS3 by 6 months.

Decadal Survey of EPP
National Academies of Sciences

- At request of DOE and NSF
- Details of the survey still being worked out
  - The study will explore promising new directions for the period 2022-2032.

EPP 2021 Program Awards

- We cannot show our 2021 awards until the NSF Ops program is finalized
  - Link to NSF award search
  - You can look up 2021 awards…
- https://www.nsf.gov/awards/award-search-guide.jsp

Funding Opportunities

NSF Proposal Preparation for FY2022

- All NSF proposals must conform to the NSF Proposal & Award and Procedures Guide:
  - Current submissions must follow PAPPG (NSF22001) (effective Oct. 4, 2021)
  - https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg
  - Questions can be referred to cognizant program directors.
- Proposals to other directorates – please refer to the NSF website: www.nsf.gov
- Intellectual Merit and Broader Impacts - All proposals to NSF PHY *must* address these two NSF Merit Criteria.

Physics Solicitation NSF 21-593

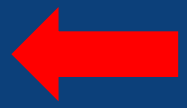
Programmatic Information and Deadlines for FY21

https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf21593&org=NSF

Experiment: Elementary Particle Physics

Proposal Deadline: Dec 7, 2021

Program Directors: Jim Shank



Split into 3 sub-programs:
HEP High Energy Physics
PPP Precision Particle Phys.
TPP Tools for Particle Phys.

Experiment: Particle Astrophysics

Proposal Deadline: Dec 7, 2021

Program Directors: Darren Grant, William Wester

Theory: Elementary Particle Physics, Particle Astrophysics/Cosmology

Proposal Deadline: Dec 14, 2021

Program Director: Keith Dienes

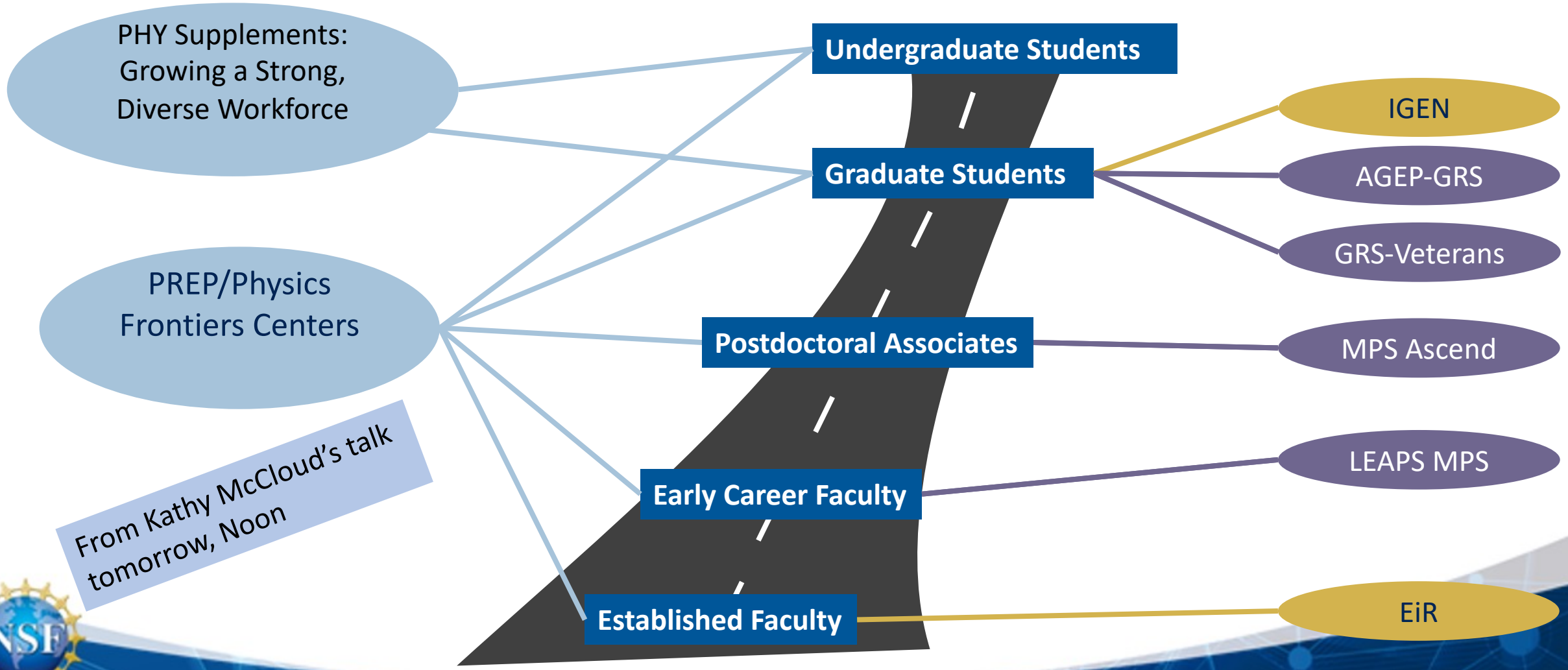
Precision Measurements

- Following an enthusiastic reception during the first year, and some new awards, The Dear Colleague Letter: Searching for New Physics Beyond the Standard Model of Particle Physics Using Precision Atomic, Molecular, and Optical Techniques (NSF 20-127) is still in effect.
- The language has not been updated since last year:
  - The NSF Division of Physics (PHY) encourages the community to explore the scientific opportunities at the intersection between Atomic, Molecular, and Optical (AMO) physics and Elementary Particle Physics (EPP).
  - This year we expand that to include broader programs related to EPP, for example, Dark matter and AMO/precision measurement.
- This DCL points to the current Physics Division Solicitation, signaling that the Physics Division considers it to remain active for a second year. Please help us spread the word.

Other opportunities for Particle Physics

- New: PHY-AMO / BSM Opportunities
  - DCL: NSF 20-127
  - Searching for New Physics Beyond the Standard Model of Particle Physics Using Precision Atomic, Molecular, and Optical Techniques
- Research at Undergraduate Institutions and Research Opportunity Awards
  - NSF 14-579 Deadlines same as EPP, PA and THY proposals
- AGEP/GRS (Details in K. McCloud talk tomorrow)
  - For current MPS awards: support additional graduate students
  - MPS Dear Colleague Letter: NSF20-083
  - Solicitation **NSF 21-576**
- Faculty Early Career Development Program (CAREER)
  - Solicitation NSF 20-525
  - Deadline for 2021 has passed, proposals still being reviewed
  - More information at: FAQs, Webinar, more…

PHY invests in people throughout the STEM pathway via PHY-specific, MPS-wide, NSF-wide and initiatives



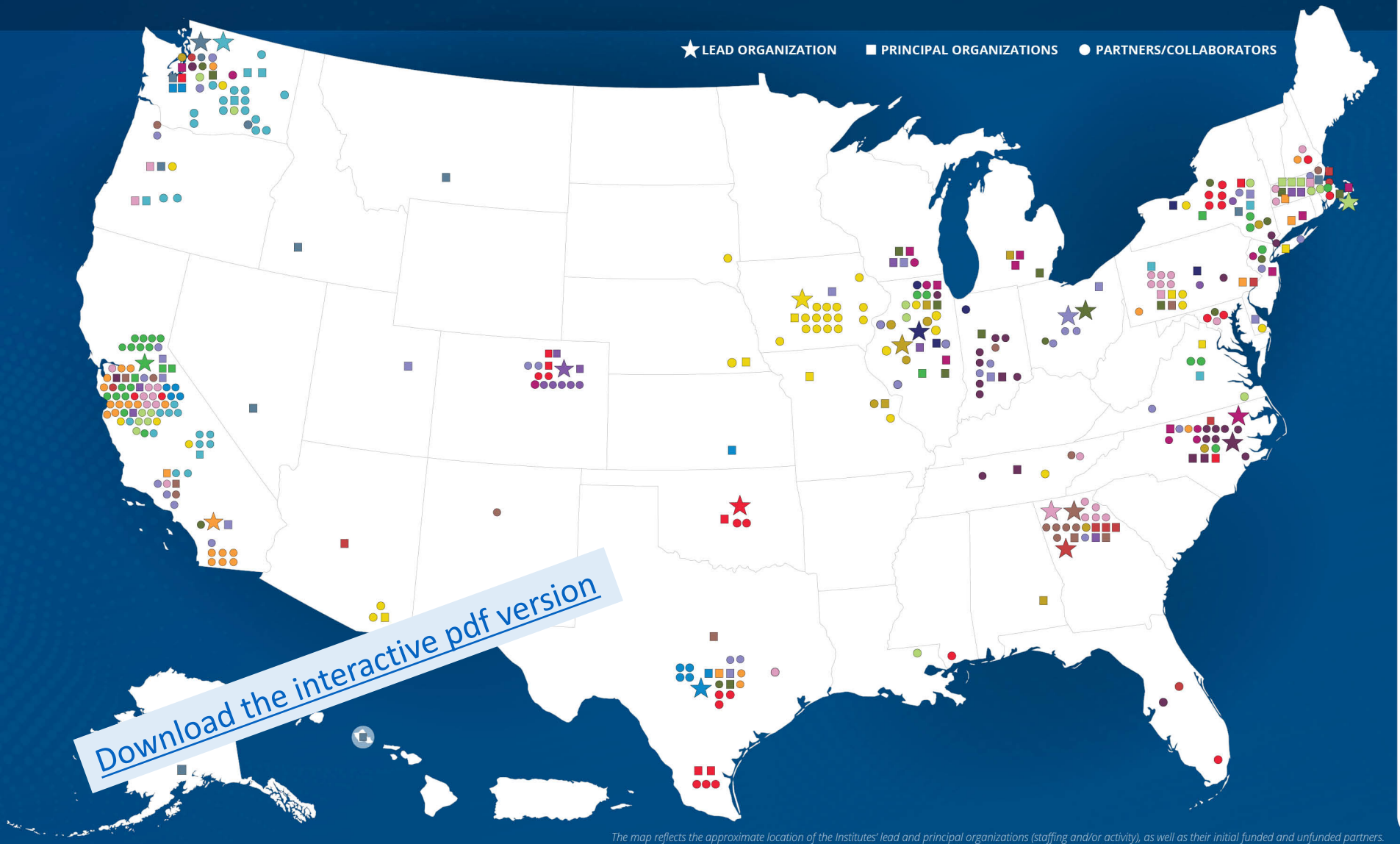
https://www.stowerec.org/wp-content/uploads/2016/09/rec-path.jpg

Artificial Intelligence at NSF

NSF-LED NATIONAL AI RESEARCH INSTITUTES

2020 and 2021 awards

*The U.S. National Science Foundation (NSF) announced a **$220** million investment in eleven new Artificial Intelligence (AI) Research Institutes, building on the first round of seven AI Institutes totaling **$140** million funded last year. **(The default map view below shows all awards combined).***



- NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography
- NSF AI Institute for Foundations of Machine Learning
- USDA-NIFA AI Institute for Next Generation Food Systems
- USDA-NIFA AI Institute for Future Agricultural Resilience, Management, and Sustainability (AIFARMS)
- NSF AI Institute for Student-AI Teaming
- Molecule Maker Lab Institute (MMLI): NSF AI Institute for Molecular Discovery, Synthetic, and Manufacturing
- NSF AI Institute for Artificial Intelligence and Fundamental Interactions
- NSF AI Institute for Collaborative Assistance and Responsive Interaction for Networked Groups (AI-CARING)
- NSF AI Institute for Learning-enabled Optimization at Scale (TILOS)
- NSF AI Institute for Optimization
- NSF AI Institute for Intelligent Cyberinfrastructure with Computational Learning in the Environment (ICICLE)
- NSF AI Institute for Future Edge Networks and Distributed Intelligence (AI-EDGE)
- NSF AI Institute for Edge Computing Leveraging Next Generation Networks (Athena)
- NSF AI Institute for Dynamic Systems
- NSF AI Institute for Engaged Learning
- NSF AI Institute for Adult Learning and Online Education (ALOE)
- USDA-NIFA AI Institute: Agricultural AI for Transforming Workforce and Decision Support (AgAID)
- USDA-NIFA AI Institute: AI Institute for Resilient Agriculture (AIIRA)

The map reflects the approximate location of the Institutes' lead and principal organizations (staffing and/or activity), as well as their initial funded and unfunded partners.
***Note:** Partners and collaborators related to an Institute may be represented with a single plot due to space limitations.*

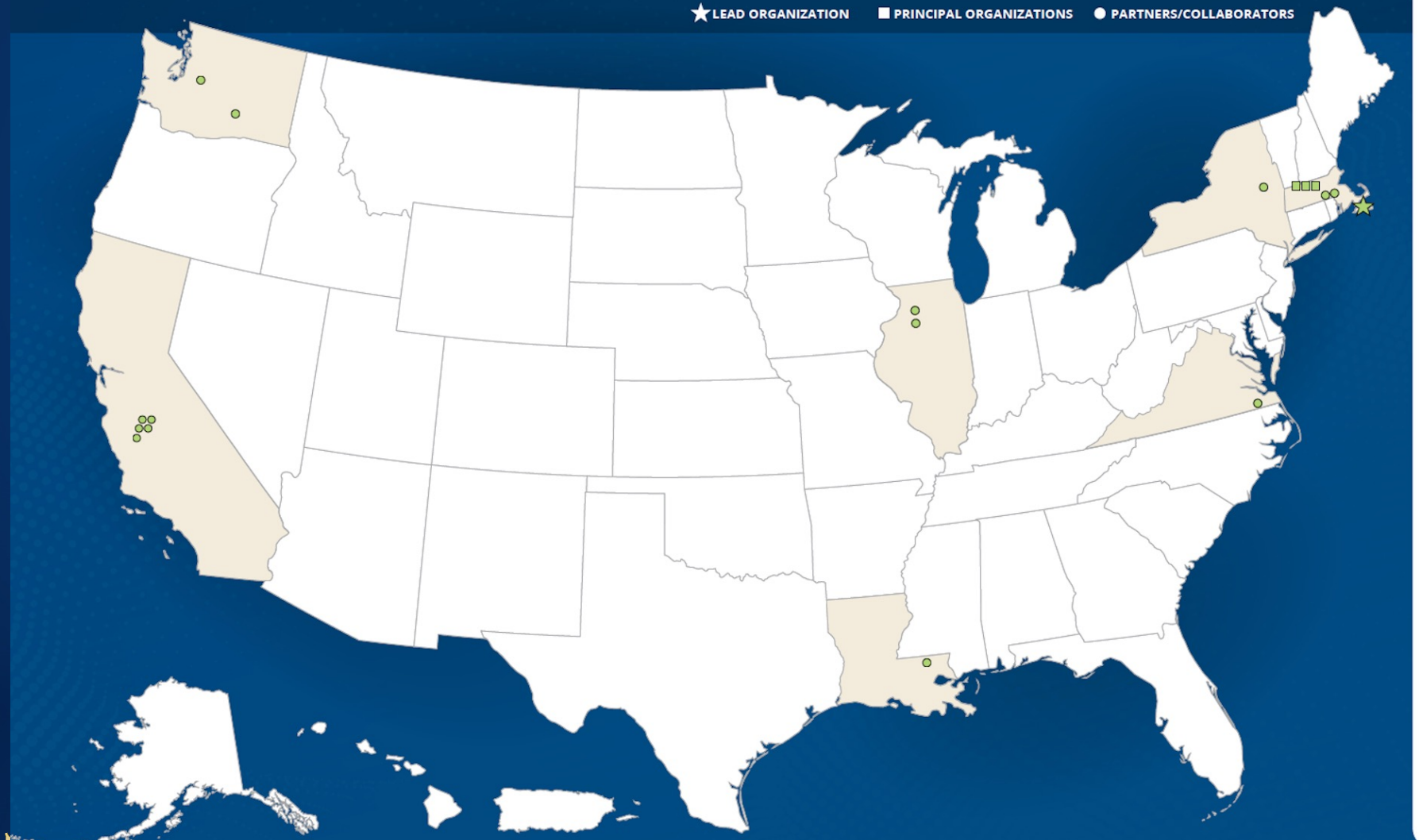
NSF-LED NATIONAL AI RESEARCH INSTITUTES

This is an Interactive PDF and is best viewed using Adobe Acrobat. Hover cursor over dates below or circles to the right to display more information. If you have issues with these features you can download a sandard PDF available here.

*The U.S. National Science Foundation (NSF) announced a **$220** million investment in eleven new Artificial Intelligence (AI) Research Institutes, building on the first round of seven AI Institutes totaling **$140** million funded last year. (The default map view below shows all awards combined).*

2020 Awards **2021** Awards

★ LEAD ORGANIZATION ■ PRINCIPAL ORGANIZATIONS ● PARTNERS/COLLABORATORS



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AWARDS

- NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography
- NSF AI Institute for Foundations of Machine Learning
- USDA-NIFA AI Institute for Next Generation Food Systems
- USDA-NIFA AI Institute for Future Agricultural Resilience, Management, and Sustainability (AIFARMS)
- NSF AI Institute for Student-AI Teaming
- Molecule Maker Lab Institute (MMLI): NSF AI Institute for Molecular Discovery, Synthetic, and Manufacturing
- **NSF AI Institute for Artificial Intelligence and Fundamental Interactions**

  LEAD:
  Massachusetts Institute of Technology

  PRINCIPAL ORGANIZATIONS:
  - Northeastern University – MA
  - Harvard University – MA
  - Tufts University – MA

  PARTNERS/COLLABORATORS:
  - MIT-Bates Computing Center – MA
  - CERN – Switzerland
  - Fermilab – IL
  - Jefferson Lab – VA
  - Argonne National Lab – IL
  - LIGO Scientific Collaboration – LA and – WA
  - Amazon – CA
  - X, the moonshot factory – CA
  - Xilinx – CA
  - IBM – NY
  - Nvidia – CA
  - DeepMind - London, UK
  - Microsoft Research – WA
  - Yandex - Moscow, Russia
  - MIT-IBM Watson AI Lab – MA
  - Sony - Tokyo, Japan
  - SalesForce – CA

- Online Education (ALOE)
- USDA-NIFA AI Institute: Agricultural AI for Transforming Workforce and Decision Support (AgAID)
- USDA-NIFA AI Institute: AI Institute for Resilient Agriculture (AIIRA)

AI Institutes

- Solicitation NSF 20-503 for 2020
- Solicitation NSF 20-604 for 2021 - less involvement with MPS
- And now Solicitation NSF 22-502 for 2022. Again, less relevance to MPS
  - National Artificial Intelligence (AI) Research Institutes Accelerating: Research, Transforming Society, and Growing the American Workforce
  - Theme 1: Intelligent Agents for Next-Generation Cybersecurity
  - Theme 2: Neural and Cognitive Foundations of Artificial Intelligence
  - Theme 3: AI for Climate-Smart Agriculture and Forestry
  - Theme 4: AI for Decision making
  - Theme 5: Trustworthy AI
  - Theme 6: AI-Augmented Learning to Expand Education Opportunities and Improve Outcomes
- MPS AI Dear Colleague Letter:
  - MPS ADAPT-DCL Started in 2021, resulting in 5 EAGER and 3 Supplement awards.
  - Continues in FY22
- CISE/OAC HDR Institutes:
  - **Harnessing the Data Revolution : Institutes for Data-Intensive Research in Science and Engineering NSF 21-519**
  - Award to U. Washington in Sept. 2021. ➔A3D3
  - No new HDR Institute, but TRIPODS solicitation is ongoing:
    - **Harnessing the Data Revolution (HDR): Transdisciplinary Research in Principles of Data Science Phase II (TRIPODS)**
    - NSF 21-604. Submission Window: January 04, 2022 - January 18, 2022

NSF Particle Physics Centers and Institutes

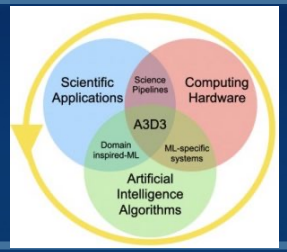
Institute for Research and Innovation in Software for High Energy Physics

Center for Bright Beams Science and Technology Center

Network for Neutrinos, Nuclear Astrophysics, and Symmetries (N3AS) (Physics Frontier Center)

Institute for Artificial Intelligence and Fundamental Interactions

Harnessing the Data Revolution Institute: Accelerated AI Algorithms for Data-Driven Discovery (A3D3) (https://a3d3.ai)
U. Washington



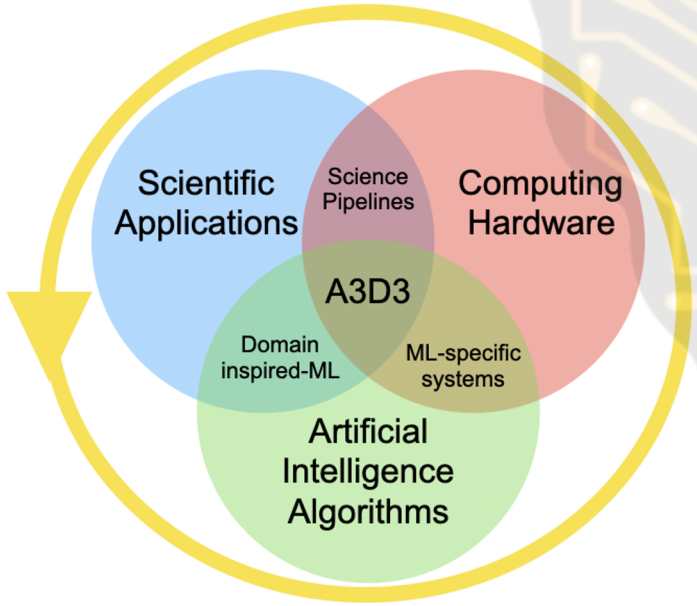
New

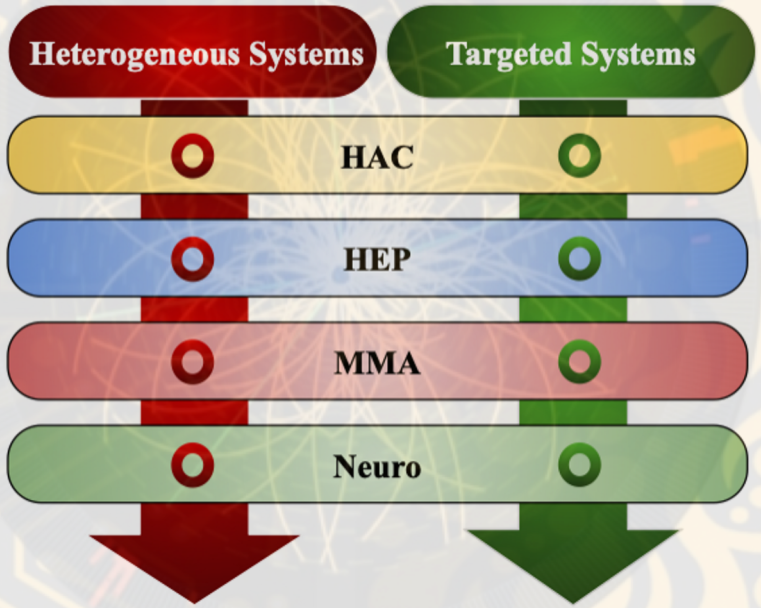
HDR Institute: Accelerated AI Algorithms for Data-Driven Discovery (A3D3)

Slide courtesy of S.-C. Hsu, U. Washington

Caltech | Duke UNIVERSITY | UC San Diego | I | M | W

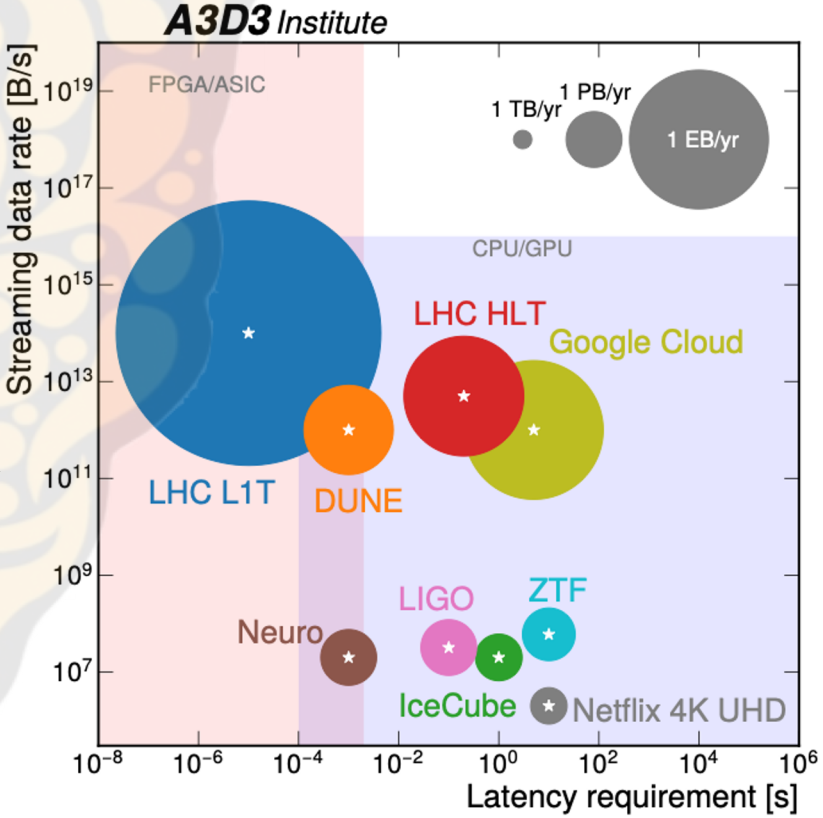
The vision of A3D3 is to establish a tightly coupled organization of **domain scientists**, **computer scientists**, and **engineers** that unite three core components which are essential to achieve real-time AI to transform science: AI techniques, Computing Hardware, Scientific Applications





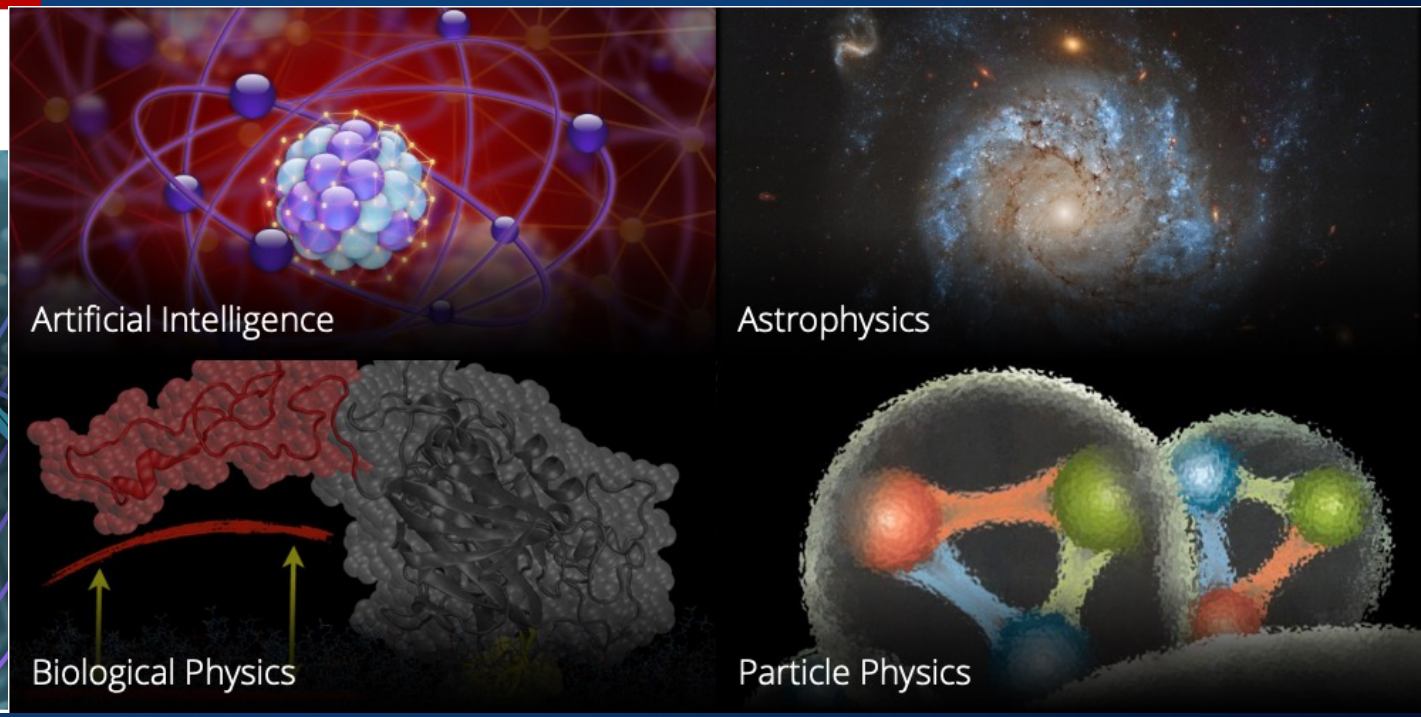
Hardware and Algorithm Codevelopment (**HAC**) and three science drivers: high energy physics (**HEP**), multi-messenger astrophysics (**MMA**), and neuroscience (**Neuro**) are integrated through common Heterogeneous and Targeted Systems

A3D3 pushes the boundaries of data processing beyond industry applications



NSF AI Planning Institute

- Carnegie Melon University. PI: Scott Dodelson
- Two year award



Research Infrastructure

Research Infrastructure Opportunities

	Project Cost (approx. in $million)		Funding Source		
Solicitation	**From**	**To**	**R&D/Planning**	**Operations**	**Scope of Competition**
Individual program	**0**	**~1.0**	**EPP or PA**	**EPP or PA**	**Program (within EPP or PA)**
MRI (70%); University (30%)	**~0.2**	**5.7**	**n/a**	**n/a**	**PHY (<1.0) NSF (>1.0)**
Midscale RI-1	**0.6-6.0**	**20**	**EPP or PA or Midscale RI-1**	**EPP or PA**	**NSF**
Midscale RI-2	**20**	**70**	**EPP or PA or Midscale RI-1**	**EPP or PA**	**NSF**
MREFC	**70**	**--**	**EPP or PA**	**EPP or PA**	**NSF**

First Awards in FY19 →

Four awards recently (FY21) →

Now 100

MSRI-II awards 2020

- **Mid-scale RI-2 Consortium: Biogeochemical-Argo: A global robotic network to observe changing ocean chemistry and biology**
  Award Number:1946578; Principal Investigator:Kenneth Johnson; Co-Principal Investigator:Jorge Sarmiento, Stephen Riser, Lynne Talley, Curtis Deutsch, Susan Wijffels; Organization:Monterey Bay Aquarium Research Institute;NSF Organization:OCE Start Date:11/01/2020; Award Amount:$15,013,704.00; Relevance:48.0;
- **Mid-scale RI-2: Grid-Connected Testing Infrastructure for Networked Control of Distributed Energy Resources**
  Award Number:1947050; Principal Investigator:Jan Kleissl; Co-Principal Investigator:Rajesh Gupta, Raymond De Callafon, Jorge Cortes, Sonia Martinez; Organization:University of California-San Diego;NSF Organization:ECCS Start Date:11/01/2020; Award Amount:$30,557,829.00; Relevance:48.0;
- **Mid-scale RI-2 Consortium: Network for Advanced NMR**
  Award Number:1946970; Principal Investigator:Jeffrey Hoch; Co-Principal Investigator:Chad Rienstra, Arthur Edison, Katherine Henzler-Wildman; Organization:University of Connecticut Health Center;NSF Organization:DBI Start Date:07/01/2021; Award Amount:$20,048,344.00; Relevance:48.0;
- **Mid-scale RI-2: A first-of-its-kind X-ray facility for new science at the high magnetic field frontier**
  Award Number:1946998; Principal Investigator:Joel Brock; Co-Principal Investigator:Carlos Cabrera, Eric Palm, Elke Arenholz; Organization:Cornell University;NSF Organization:DMR Start Date:01/01/2021; Award Amount:$8,391,000.00; Relevance:48.0;

Mid-Scale Research Infrastructure

- Webinar from Nov. 2020: weblink
- Mid-Scale RI-1 Solicitation: 21-505
- Preliminary Proposal Deadline Date: January 7, 2021
- **Full Proposal Deadline Date:** April 23, 2021 (By Invitation Only)
- Mid-Scale RI-1 Implementation projects Total cost: $6M - $20M
- Mid-Scale RI-1 Design projects Total cost: $600k - $20M
- Mid-Scale RI-2 Solicitation: 21-537
- Letter of Intent Deadline Date: **Feb.**3, 2021 , Prelim proposal: Mar. 5, Full: Sept. 20, 2021
- Mid-Scale RI-2 Projects Total cost: $20M - $100M
- Consult the Major Facilities Guide NSF 19-068

NSF/PHY: Summary

- The recent fiscal years have been challenging, but the Physics is compelling.
- We are working to understand and mitigate the full impact of the pandemic
- NSF-wide priorities offer opportunities to add value to the field.
  - Midscale Programs (NSF wide and PHY specific)
  - AI Institutes, HDR Institutes
- We continue to work on Programmatic Balance
  - Demographic and Geographic
  - Larger Scale and Smaller Scale Programs
- The HL-LHC MREFC is underway since 2020 and NSF has the planned funding in its budget planning, subject to congressional appropriation.
- We look forward with great interest to the Snowmass process

Backup

Primary NSF Physics Funding Opportunities

(relevant for high-energy physics, particle astrophysics, and cosmology)

- https://www.nsf.gov/pubs/2021/nsf21593/nsf21593.htm: **Our general, all-purpose Solicitation for our regular base grants. Use this as your default.** Deadlines in Fall 2021, depending on specific program.
- https://www.nsf.gov/pubs/2014/nsf14579/nsf14579.htm. ("RUI") Same as above, but for applicants from primarily undergraduate institutions. Check eligibility with your SRO.
- https://www.nsf.gov/pubs/2020/nsf20525/nsf20525.htm: ("CAREER") An alternative funding track for those junior (untenured) faculty who, at this point in their careers, wish to undertake a *significant education/outreach activity* in addition to their research. ***Not* simply a research-excellence prize, and *not* intended as a default for junior faculty unless you plan a major mix of research and education/outreach.** Next deadline: July 26, 2021.
- https://www.nsf.gov/pubs/2021/nsf21570/nsf21570.htm: ("LEAPS-MPS") Grants designed to "*launch* the careers of pre-tenure faculty… at minority-serving institutions (MSIs), predominantly undergraduate institutions (PUIs), and Carnegie Research 2 (R2) universities … with the goal of achieving excellence through diversity." *Launch* = you have no prior or current NSF grants (see special exceptions). Deadline for FY22 not yet determined.
- Supplements to *existing* NSF grants to fund a *new* graduate student. Emphasis placed on "increasing the involvement by members of underrepresented groups". Apply anytime, fall preferred.
  - https://www.nsf.gov/pubs/2020/nsf20083/nsf20083.jsp: "MPS AGEP-GRS" (only for allowed institutions).
  - https://www.nsf.gov/pubs/2021/nsf21065/nsf21065.jsp: "PHY-GRS" (similar, but for remaining institutions).
- https://www.nsf.gov/pubs/2021/nsf21573/nsf21573.htm: ("MPS-Ascend") Fellowships to "support postdoctoral Fellows who will broaden the participation of under-represented groups". Postdocs or graduating PhDs apply on their own after identifying a potential postdoctoral mentor. Deadline for FY22 not yet determined
- Other Divisions, such as Division of Astronomy. Contact relevant Program Directors in both Divisions.

Proposal & Award Policies & Procedures Guide:

New PAPPG in effect Oct. 4!

https://www.nsf.gov/pubs/policydocs/pappg22_1/index.jsp

PHY Contacts:

- **Jim Shank** (jshank@nsf.gov) -- HEP Experiment
- **Keith Dienes** (kdienes@nsf.gov) -- HEP Theory & Particle Astro/Cosmo Theory
- **Darren Grant** (dgrant@nsf.gov) -- Particle Astro Experiment
- **Kathy McCloud** (kmccloud@nsf.gov) -- for LEAPS-MPS and MPS-Ascend