U.S. DEPARTMENT OF ENERGY | Office of Science

A Few Perspectives from DOE's Office of Science

June 6, 2019

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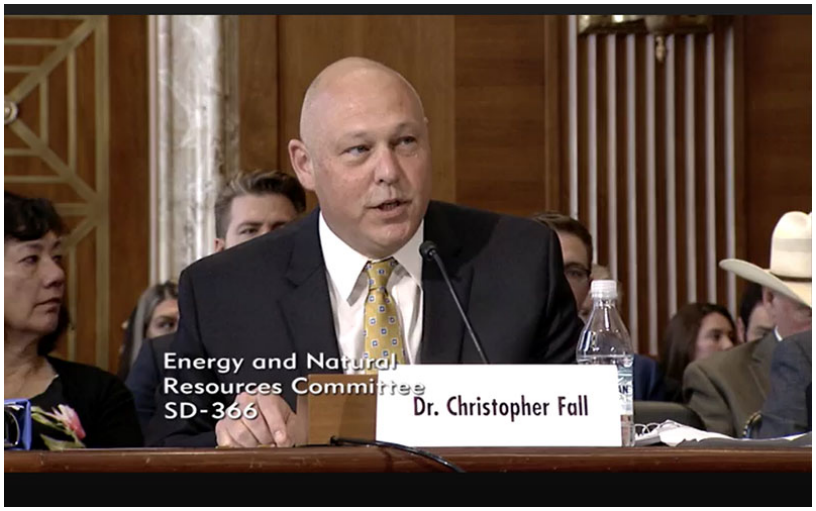
www.science.energy.gov

Biggest Recent News? Confirmation of Dr. Chris Fall

From *The Scientist*—
Fall is currently the principal deputy director of the Department of Energy's (DOE) Advanced Research Projects Agency-Energy (ARPA-E), which develops new research findings into commercial products. Before joining the DOE, he worked at the Office of Naval Research (ONR) for six years, where he oversaw studies of new technology for naval systems. Prior to that, he served for three years at the White House Office of Science and Technology Policy (OSTP) during President Obama's administration. In that role, Fall was the assistant director for Defense Programs and later, the acting lead for the National Security and International Affairs Division.
Fall was a faculty member in the bioengineering and anatomy and cell biology departments at the University of Illinois at Chicago before joining the Obama administration. During his career in research, he investigated energy production in neurons and the link between cellular signaling systems and cellular energy production. He holds a PhD in neuroscience from the University of Virginia.

Dr. Chris Fall has been confirmed as the new Office of Science Director



DOE's Office of Science: World Leading Science

To Meet the Nation's Challenges Today and into the 21st Century

The DOE Office of Science (SC) mission is the delivery of scientific discoveries and major scientific tools to transform our understanding of nature and advance the energy, economic, and national security of the United States.

- **Advancing the frontiers of science**
  - Providing largest Federal support in the physical sciences
  - Supporting **over 22,000** Ph.D.s, graduate students, undergraduates, engineers, and support staff at more than 300 universities and at all 17 DOE laboratories
- **Advancing DOE missions**
  - Supporting energy and environmental research including 36 Energy Frontier Research Centers and 4 Bioenergy Research Centers for the study of cellulosic biofuels
- **Serving the Nation's scientists**
  - Providing world-leading scientific user facilities to **over 32,000** users per year

Major Programmatic Responsibilities

Support of Fundamental Research

SC funds programs in physics, chemistry, materials science, biology, environmental science, applied mathematics, computer science and computational science, and is the Federal steward for several disciplines within these fields such as: high energy physics and nuclear physics; fusion sciences; high performance computing science and technology; and accelerator and detector science and technology. SC is also the largest Federal supporter of fundamental research relevant to future solutions for clean energy.

Support of 21st Century Tools for Science

SC supports the planning, design, construction, and operation of state-of-the-art scientific user facilities considered the most advanced tools of modern science. **Over 32,000** investigators perform research at these open-access facilities each year. Large facilities can have costs in excess of $1B and can be in design and construction for a decade. Most of our facilities are at DOE labs, but increasingly we engage in international cooperation due to the cost of some of the facilities.

Oversight of 10 DOE Laboratories

SC oversees the operation of 10 DOE national laboratories. It also conducts a formal laboratory strategic planning process annually with its labs to understand future directions, immediate and long-range challenges, and resource needs. As part of it's oversight of the laboratories, SC conducts an annual evaluation of the scientific, technological, managerial, and operational performance of the Management & Operating (M&O) contractors of its labs. In addition, SC funds mission-ready infrastructure and investments that foster safe and environmentally responsible operations at the labs.

R&D coordination and integration

SC coordinates its activities with the DOE technology offices, the National Nuclear Security Administration, and other federal agencies. This occurs through multi-program teams led by the DOE Under Secretary for Science (S4), SC and DOE program manager-driven informal working groups, and interagency working groups. New areas have focused on advanced materials, exascale computing, cybersecurity, subsurface technology R&D, and quantum information science. On-going coordination occurs in areas such as biofuels, solar energy utilization, superconductivity for grid applications, and vehicle technologies.

The Office of Science Research Portfolio

Advanced Scientific Computing Research	• **Delivering world leading computational and networking capabilities to extend the frontiers of science and technology**
Basic Energy Sciences	• **Understanding, predicting, and ultimately controlling matter and energy flow at the electronic, atomic, and molecular levels**
Biological and Environmental Research	• **Understanding complex biological, earth, and environmental systems**
Fusion Energy Sciences	• **Building the scientific foundations for a fusion energy source**
High Energy Physics	• **Understanding how the universe works at its most fundamental level**
Nuclear Physics	• **Discovering, exploring, and understanding all forms of nuclear matter**

DOE Support for SC National Laboratories

BERKELEY LAB

- Founded 1931
- 202 acres, 96 buildings
- 3,302 FTEs, including: 486 post-docs, 411 students, and 232 joint faculty
- 2,241 visiting scientists
- 11,403 facility users

Pacific Northwest NATIONAL LABORATORY

- Founded 1965
- 781 acres, 71 buildings
- 4,238 FTEs, including: 256 post-docs, 745 students, and 64 joint faculty
- 302 visiting scientists
- 1,742 facility users

The Ames Laboratory

- Founded 1947 (1942)
- 10 acres, 13 buildings
- 307 FTEs, including: 46 post-docs, 174 students, and 43 joint faculty
- 321 visiting scientists

Fermilab

- Founded 1967
- 6,800 acres, 366 buildings
- 1,783 FTEs, including: 88 post-docs, 94 students, and 13 joint faculty
- 9 visiting scientists
- 3,472 facility users

Argonne NATIONAL LABORATORY

- Founded 1946 (1942)
- 1,517 acres, 154 buildings
- 3,225 FTEs, including: 273 post-docs, 569 students, and 274 joint faculty
- 1,107 visiting scientists
- 8,305 facility users

SLAC NATIONAL ACCELERATOR LABORATORY

- Founded 1962
- 426 acres, 149 buildings
- 1,531 FTEs, including: 152 post-docs, 299 students, and 36 joint faculty
- 19 visiting scientists
- 2,692 facility users

Oak Ridge National Laboratory

- Founded 1943
- 4,421 acres, 271 buildings
- 4,957 FTEs, including: 320 post-docs, 633 students, and 214 joint faculty
- 1,888 visiting scientists
- 3,248 facility users

Jefferson Lab

- Founded 1962
- 169 acres, 69 buildings
- 1678 FTEs, including: 34 post-docs, 53 students, and 27 joint faculty
- 1,438 visiting scientists
- 1,597 facility users

PPPL PRINCETON PLASMA PHYSICS LABORATORY

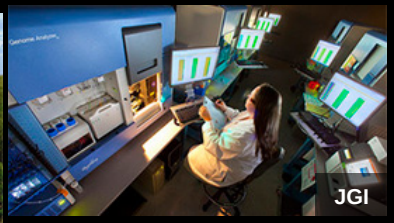
- Founded 1961 (1951)
- 91 acres, 30 buildings
- 495 FTEs, including: 21 post-docs, 48 students, and 6 joint faculty
- 50 visiting scientists
- 292 facility users

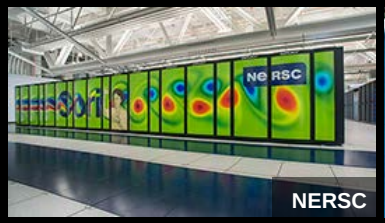
BROOKHAVEN NATIONAL LABORATORY

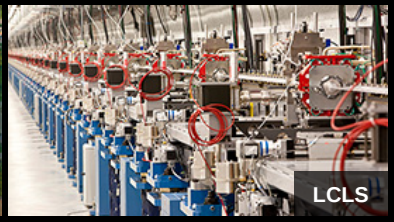
- Founded 1947
- 5,322 acres, 315 buildings
- 2,527 FTEs, including: 116 post-docs, 395 students, and 123 joint faculty
- 2,313 visiting scientists
- 2,923 facility users

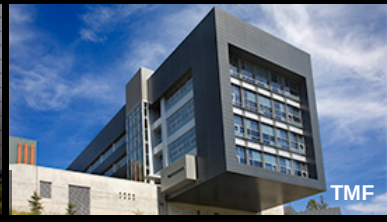
FY 2020 President's Request User Facilities

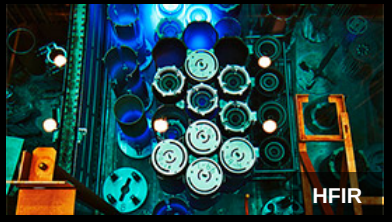
Number of User Facilities
27

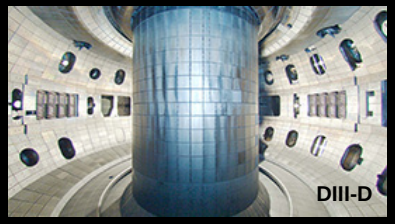


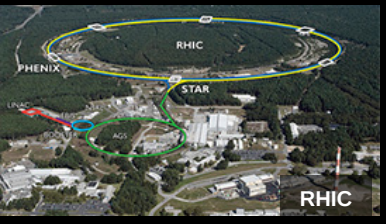


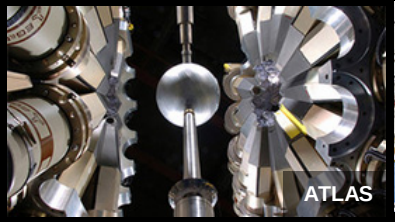






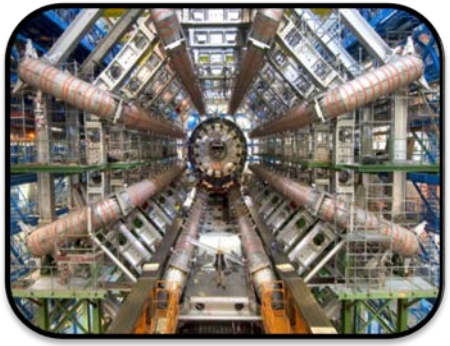






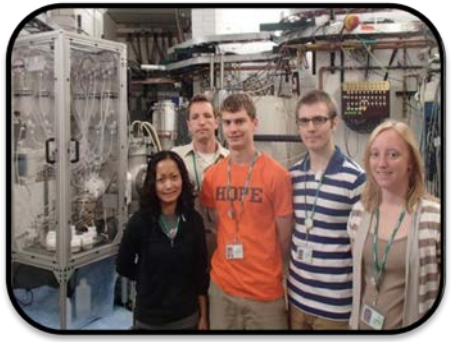
Office of Science at a Glance

FY 2020 Request: $5.55B



Largest Supporter of Physical Sciences in the U.S.

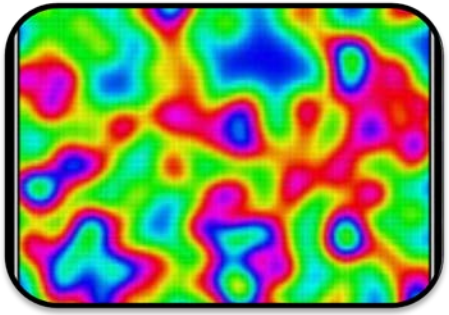
Funding at >300 Institutions, including 17 DOE Labs



Over 22,000 Researchers Supported

Over 32,000 Users of 27 SC Scientific Facilities

~40% of Research to Universities



Research: 40.6%, $2.25B

Facility Operations: 39.9%, $2.21B

Projects/Other: 19.5%, $1.09B

FY 2020 President's Budget Priorities

FY 2018 Enacted: $6.260B

FY 2019 Enacted: $6.585B

FY 2020 President's Request: $5.546B

Priorities:

- Continue operations of all the national laboratories
- Focus on the development of foundational Artificial Intelligence (AI) and Machine Learning (ML) capabilities
- Continue exascale computing research for delivery in FY 2021
- Expand quantum computing and quantum information science efforts
- Focus on cutting edge, early stage research and development
- Ensure a sustained pipeline for the science, technology, engineering, and mathematics (STEM) workforce

FY 2020 SC President's Budget Request

(Dollars in Thousands)

	FY 2018		FY 2019	FY 2020 Request		
	Enacted Approp.	Current Approp.	Enacted Approp.	President's Request	Request vs. FY 2019 Enacted	
Advanced Scientific Computing Research	810,000	788,224	935,500	920,888	-14,612	-1.6%
Basic Energy Sciences	2,090,000	2,028,719	2,166,000	1,858,285	-307,715	-14.2%
Biological and Environmental Research	673,000	648,600	705,000	494,434	-210,566	-29.9%
Fusion Energy Sciences	532,111	518,824	564,000	402,750	-161,250	-28.6%
High Energy Physics	908,000	883,573	980,000	768,038	-211,962	-21.6%
Nuclear Physics	684,000	664,694	690,000	624,854	-65,146	-9.4%
Workforce Development for Teachers and Scientists	19,500	19,500	22,500	19,500	-3,000	-13.3%
Science Laboratories Infrastructure	257,292	257,292	232,890	163,600	-69,290	-29.8%
Safeguards and Security	103,000	103,000	106,110	110,623	+4,513	+4.3%
Program Direction	183,000	183,000	183,000	183,000	...	...
SBIR/STTR (SC)	...	164,477	...	...	...	...
Subtotal, Office of Science	**6,259,903**	**6,259,903**	**6,585,000**	**5,545,972**	**-1,039,028**	**-15.8%**
SBIR/STTR (DOE)	...	116,972	...	...	...	...
Total, Office of Science	**6,259,903**	**6,376,875**	**6,585,000**	**5,545,972**	**-1,039,028**	**-15.8%**

Nuclear Physics FY2019 Budget Status

Nuclear Physics	FY 2018 Enacted	FY 2019 Enacted	FY 2019 Enacted vs FY 2018 Enacted
Operations and maintenance			
Medium Energy	174,953	184,190	+9,237
TJNAF Ops	*112,000*	*117,440*	*+5,440*
Heavy Ions	226,612	230,479	+3,867
RHIC Ops	*187,284*	*193,125*	*+5,841*
Low Energy	96,683	100,745	+4,062
ATLAS Ops	*21,000*	*21,630*	*+630*
FRIB Ops	*3,750*	*3,950*	
Nuclear Theory	47,852	55,327	+7,475
Isotope Program	40,700	44,259	+3,559
Undistributed	—	—	—
Total, Operations and maintenance	**586,800**	**615,000**	**+28,200**
Construction			
14-SC-50 Facility for Rare Isotope Beams	97,200	75,000	-22,200
Total, Construction	**97,200**	**75,000**	**-22,200**
Total, Nuclear Physics	**684,000**	**690,000**	**+6,000**

Enacted Appropriation: $690,000,000 for NP. Recommends $75,000,000 for FRIB and encourages early FRIB operations. Recommends $11,500,000 for SIPF MIE, $6,600,000 for GRETA MIE, and $5,660,000 for sPHENIX MIE. Recommends optimal operations for RHIC, CEBAF, ATLAS and BLIP.

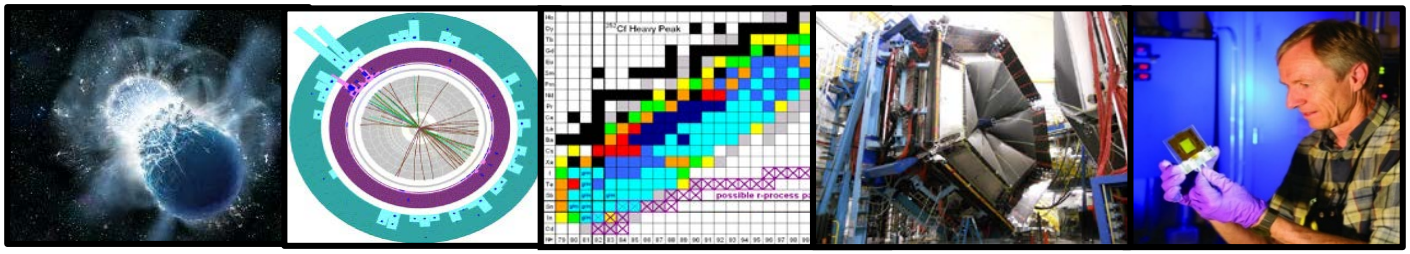
President's FY2020 Request for NP is $624,854,000

FY2020 House Mark for NP is $735,000,000

Nuclear Physics

Discovering, exploring, and understanding all forms of nuclear matter

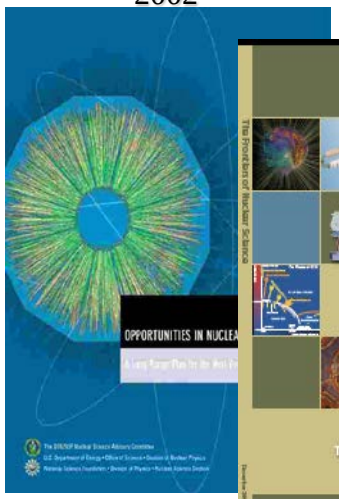
- Funding for research at national labs and universities is focused on the highest priority research in relativistic nuclear collisions, hadron physics, nuclear structure and nuclear astrophysics, and fundamental symmetries. NP continues its participation in planned coordinated SC **Quantum Information Science (QIS)** research and facility activities.
- **RHIC** operates at ~41% optimal to explore the properties of the quark gluon plasma first discovered there. The recently upgraded **12 GeV CEBAF** operates at ~24% optimal, promising new discoveries and an improved understanding of quark confinement. Operations at **ATLAS** are supported at ~31% optimal, providing high-quality beams of all the stable elements up to uranium, as well as selected beams of short-lived nuclei for nuclear structure and astrophysics experiments. **FRIB operations** begins to ramp up.
- Construction continues on the **Facility for Rare Isotope Beams. The Gamma-Ray Energy Tracking Array (GRETA)** MIE is continued to extend FRIB's reach in studying the nuclear landscape**.** The **sPHENIX MIE** continues within current RHIC funding levels for precision, high rate particle jet studies. The last year of funding is provided to the **Stable Isotope Production Facility (SIPF)** MIE to produce kilogram quantities of enriched stable isotopes.
- The **Moller MIE** is initiated for ultra-precise measurements with the upgraded CEBAF machine. The **Ton-Scale Neutrinoless Double Beta Decay MIE** is initiated to determine whether the neutrino is its own antiparticle. **The High Rigidity Spectrometer (HRS)** scientific equipment is supported to study beams of rare isotopes at maximum production rates for fragmentation.
- Conceptual design efforts and R&D (OPC) are supported for the planned **Electron Ion Collider (EIC)** whose critical importance to world-leadership in nuclear physics and accelerator science was recently affirmed by the National Academy of Sciences.
- Increased funding for the DOE Isotope Program supports robust mission readiness of facilities for isotope production and processing, university network operations, development of production capabilities of isotopes for QIS, and critical capital investments to increase availability of isotopes, including FRIB isotope harvesting. The **U.S. Stable Isotope Production and Research Center (SIPRC)** construction project is initiated to significantly increase production capabilities for stable isotopes and eliminate sole dependence on foreign supply.



The Science Case for An Electron-Ion Collider

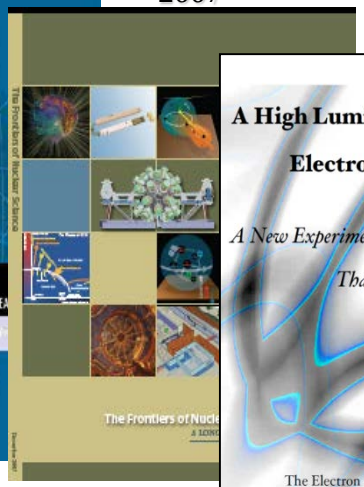
A strong community emphasis on the urgent need for a machine to illuminate the dynamical basis of hadron structure in terms of the fundamental quark and gluon fields has been a persistent message for almost two decades

2002



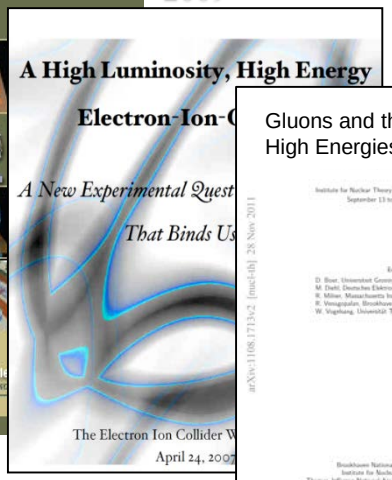
"…essential accelerator and detector R&D [for EIC] should be given very high priority in the short term."

2007



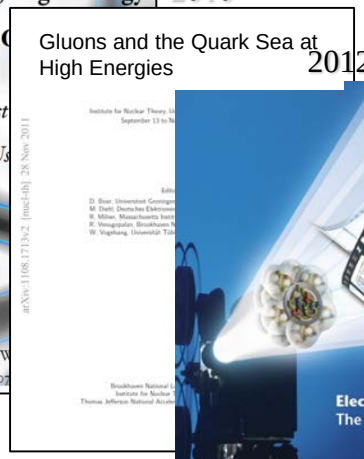
"We recommend the allocation of resources …to lay the foundation for a polarized Electron-Ion Collider…"

2009

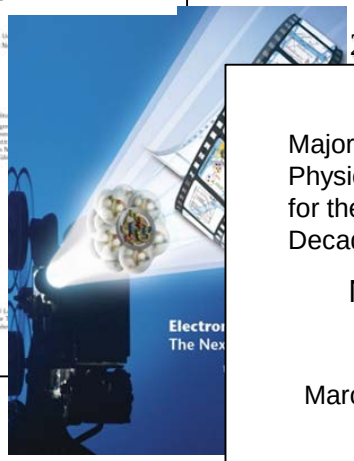


"..a new dedicated facility will be essential for answering some of the most central questions."

2010



2012



"The quantitative study of matter in this new regime [where abundant gluons dominate] requires a new experimental facility: an Electron Ion Collider.."

2013

Major Nuclear Physics Facilities for the Next Decade

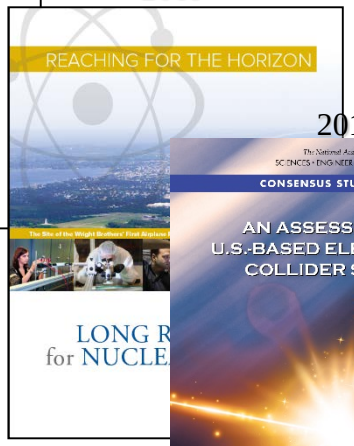
NSAC

March 14, 2013

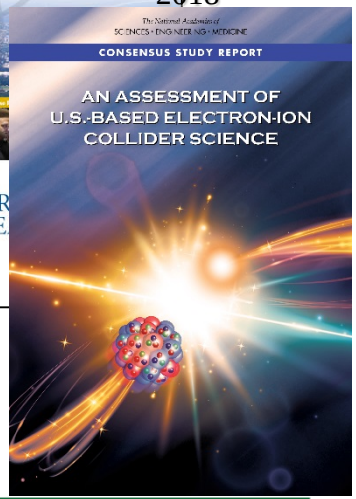
Electron-Ion Collider..*absolutely central* to the nuclear science program of the next decade.

"a high-energy high-luminosity polarized EIC [is] the highest priority for new facility construction following the completion of FRIB."

2015



2018



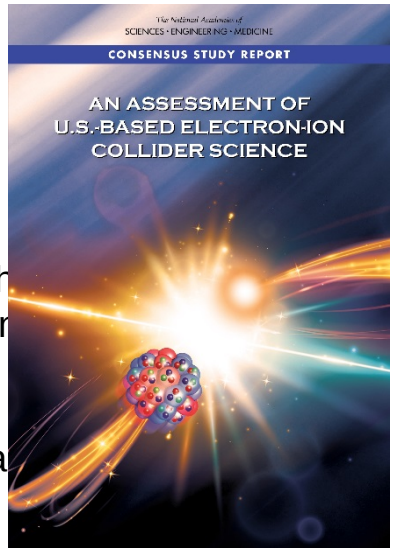
NAS Assessment of a U.S. Based Electron-Ion Collider

Finding 1: An EIC can uniquely address three profound questions about nucleons—neutrons and protons—and how they are assembled to form the nuclei of atoms:

How does the mass of the nucleon arise?

How does the spin of the nucleon arise?

What are the emergent properties of dense systems of gluons?



Finding 2: These three high-priority science questions can be answered by an EIC with polarized beams of electrons and ions, with sufficiently high luminosity and sufficient, ar variable, center-of-mass energy.

As a result of the comprehensive survey the committee made of existing and planned a both nuclear and particle physics around the world, it finds that

Finding 3: An EIC would be a unique facility in the world and would maintain U.S. leadership in nuclear physics.

An EIC would be the only high-energy collider planned for construction in the United States. Its high design luminosity and highly polarized beams would push the frontiers of accelerator science and technology. For these reasons, the committee finds that

Finding 4: An EIC would maintain U.S. leadership in the accelerator science and technology of colliders and help to maintain scientific leadership more broadly.

Working towards CD0, OPC Funding of $1.5M Requested in FY2020

FY 2020 Priority Research Initiatives

Dollars in Thousands

Research Initiative	ASCR	BES	BER	FES	HEP	NP	Total
Machine Learning / Artificial Intelligence	36,000	10,000	3,000	7,000	15,000		**71,000**
Biosecurity			20,000				**20,000**
Quantum Information Science	51,161	52,503	12,000	7,520	38,308	7,000	**168,492**
Exascale Computing	463,735	26,000	10,000				**499,735**
Microelectronics		25,000					**25,000**
Isotope Development and Production for Research and Applications						47,500	**47,500**
U.S. Fusion Program Acceleration				4,000			**4,000**
Total	**550,896**	**113,503**	**45,000**	**18,520**	**53,308**	**54,500**	**835,727**

Exascale Computing

- EOP Priority
- Cuts across SC research programs
- Exascale funded in FY 2018 ($413.5M) and FY 2019 ($513.7M)
- FY 2020 SC request is $499.7M
- Future of Exascale Computing Project (ECP) being studied by ASCAC

Machine Learning / Artificial Intelligence

- Executive Office of the President (EOP) Priority
  - Major U.S. Government initiative is in planning stage
- Cuts across SC programs
  - ASCR, BES, BER, FES, and HEP
- Cuts across many DOE programs
  - OE, EE, FE, NE, NNSA
- Cuts across multiple U.S. Government Agencies, including NIH, DoD, and VA
- FY 2020 SC request - $71M
  - patterned after the Exascale Computing Project

Quantum Information Science

- EOP and Legislative Priority
  - National Quantum Initiative Act Public Law 115-368
- Cuts across all SC research programs, including DOE Isotope Program
- Cuts across several other DOE programs
  - OE and NNSA
- QIS funded in FY 2018 ($62M) and FY 2019 ($123M)
- FY 2020 proposal would focus on establishment of at least one DOE quantum center, budget request - $168.5M

Early FY 2018 NP QIS/QC Awards

Lead Insititution	PI	Title	Description
University of Washington	Martin Savage	Nuclear Physics Pre-Pilot Program in Quantum Computing	to support pre-pilot research activities that will begin to bring Quantum Computing (QC) and Quantum Information Science (QIS) expertise into the nuclear theory community, including starting to address scientific applications of importance for nuclear physics research. This pre-pilot proposal will organize the nuclear theory community at the national level in order to address Grand Challenge problems in nuclear physics through the use of QC and QIS.
MIT	Joseph Formaggio	Investigating Natural Radioactivity in Superconducting Qubits	to measure the impact of background radioactivity on qubit coherence times. MIT will be responsible for simulation of radiation transport models and development of calibration sources to be deployed in various qubit measurements. MIT will also coordinate this effort with Prof. William Oliver (MIT and Lincoln Labs). PNNL will be responsible for radioassay of materials using their calibrated measurement stations.
ANL	Ian Cloet	Quantum Simulators for Nuclear Physics: Theory	to support a postdoctoral fellow to work on the proposal for Quantum Simulations for Nuclear Physics. This pilot effort will begin to develop the expertise and knowledge that builds toward a QCD simulations on Quantum Computers and Analog Quantum Simulators.
ANL	Valentine Novosad	Superconducting Quantum Detectors for Nuclear Physics and QIS	to work on the proposal for Superconducting Quantum Detectors for Nuclear Physics and QIS.
LLNL	Stephan Frederich	Thorium 229mTh	to study of the feasibility of suppressing the internal conversion transition of 229mTh by implanting it in high band gap materials such as MgF2

FY 2018 Awards Made Through Annual Solicitation

NSAC Assessment of the QIS Role of Nuclear Science is Ongoing

In some ways QIS/QC is not new to Nuclear Physics…

That said, the dramatic strengthening of this emphasis by the nation motivates a fresh look at the unique roles nuclear physics can and should play.

Decades of accumulated intellectual capital, extensive experience in interdisciplinary research, considerable technical infrastructure at labs and universities, and a long history of international leadership in collaborative research have positioned the DOE Office of Nuclear Physics and the NSF nuclear physics research programs to engage in QIS relevant research. However, QIS is newly emergent as a priority area for Research & Development (R&D) investment in nuclear science. Furthermore, private sector R&D investment in QIS, as well as investment by other Federal agencies, has been ongoing for some time. NSAC is therefore requested, in the context of Federal and private sector research efforts already underway, to articulate the unique role nuclear science research, aligned with the DOE and NSF nuclear physics programs, can and should play in Quantum Information Science. While unique, this role should nevertheless align broadly with the goals outlined in the national strategy for QIS[1].

[1] https://www.whitehouse.gov/wp-content/uploads/2018/09/National-Strategic-Overview-for-Quantum-Information-Science.pdf

The FY2019 NP QIS FOA Has Been Released

U. S. Department of Energy Office of Science Nuclear Physics (NP)

Quantum Horizons: QIS Research and Innovation for Nuclear Science

A new initiative to identify, prioritize, and coordinate emerging opportunities in both fundamental research and applied challenges at the interface of Nuclear Physics and QIST. NP's Quantum Horizon's program emphasizes the science first approach and is guided by NP community research workshops: "Opportunities for Nuclear Physics & Quantum Information Science" and "Quantum Computing for Theoretical Nuclear Physics" and the "National Strategic Overview for Quantum Information Science", the Interagency Working Group on Quantum Information Science and the Exploration of the Quantum Landscape meetings of the Nuclear Science Advisory Committee

Plan is to Conduct Peer Review and Award $6.8M in FY2019

https://science.energy.gov/~/media/grants/pdf/foas/2019/SC_FOA_0002210.pdf

Inter-Agency FOA on Nuclear Data is Also Out

DEPARTMENT OF ENERGY
OFFICE OF SCIENCE, NUCLEAR PHYSICS
OFFICE OF SCIENCE, NUCLEAR PHYSICS, ISOTOPES PROGRAM
OFFICE OF NUCLEAR ENERGY
NATIONAL NUCLEAR SECURITY ADMINISTRATION, OFFICE OF DEFENSE NUCLEAR NONPROLIFERATION R&D

….Accordingly, the purpose of the research program associated with this FOA is to support new activities (*e.g.* experiments, infrastructure, models, and so forth) that will provide new nuclear data or related predictions where needed in areas in which the existing data is inadequate or does not exist, and insure that the new data is transferred to the appropriate nuclear databases in a timely manner.

Technical/Scientific Program Contacts:

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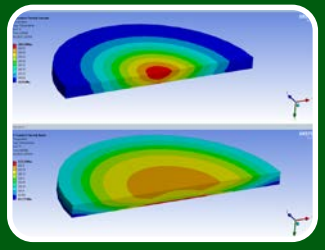
DOE Isotope Program Mission

Produce and/or distribute radioactive and stable isotopes that are in short supply; includes by-products, surplus materials and related isotope services

Maintain the infrastructure required to produce and supply priority isotope products and related service



Conduct R&D on new and improved isotope production and processing techniques which can make available priority isotopes for research and application. Develop workforce.

OMB moved Isotope Program from Office of Nuclear Energy to NP in FY 2009 Passback

National Isotopes Strategy

- DOE Priority
- Possible Legislative Priority
- Impacts other Agencies (DoD, NIH, HHS, ODNI, DHS, FBI, NIST, NSF, DOT, BLM, and NASA)
- Cuts across SC, IN, NE, and NNSA
- Provides research, technology, production capacity, and radiochemical processing for strategic stable & radioactive isotopes
- FY 2020 SC request is $47.5M

Stable Isotope Production Facility (SIPF) and SIPRC

- The upcoming FY 2020 Request will be the last year of support ($1.5M) for the SIPF MIE, which directly supports the DOE Isotope Program mission, upgrading domestic capability that has been lacking since 1998.
  - Renewed enrichment capability will benefit nuclear and physical sciences, industrial manufacturing, homeland security, and medicine.
  - Nurtures U.S. expertise in centrifuge technology and isotope enrichment that could be useful for a variety of peaceful-use activities.
  - Addresses U.S. demands for high priority isotopes needed for suite of activities: neutrinoless double beta decay, dark matter experiments, target material for Mo-99 production.
  - Help mitigate U.S. foreign dependence on stable isotope enrichment.

The next major step towards reliable U.S. supplies at scale is SIPRC at ORNL. TEC funding of $5M is requested in FY2020 as part of the National Isotope Strategy

SIPF responds to Nuclear Science Advisory Committee – Isotopes (NSACI):

- 2009 Recommendation: “Construct and operate an electromagnetic isotope separator facility for stable and long-lived radioactive isotopes.”
- 2015 Long Range Plan: “We recommend completion and the establishment of effective, full intensity operations of the stable isotope separation capability at ORNL.”

The SC microsite on Diversity, Equity & Inclusion now posted on the SC website.

The direct link is:

https://science.energy.gov/sc-2/research-and-conduct-policies/diversity-equity-and-inclusion/

"The DOE Office of Science (SC) is fully committed to fostering safe, diverse, equitable, and inclusive work, research, and funding environments that value mutual respect and personal integrity. Effective stewardship and promotion of diverse and inclusive workplaces that value and celebrate a diversity of people, ideas, cultures, and educational backgrounds is foundational to delivering on the SC mission. The scientific community engaged in SC-sponsored activities is expected to be respectful, ethical, and professional.

The DOE SC does not tolerate discrimination or harassment of any kind, including sexual or non-sexual harassment, bullying, intimidation, violence, threats of violence, retaliation, or other disruptive behavior in the federal workplace, including DOE field site offices, or at national laboratories, scientific user facilities, academic institutions, other institutions that we fund, or other locations where activities that we support are carried out…"

Harassment

Harassment of any kind, including sexual and non-sexual harassment, bullying, intimidation, violence, threats of violence, retaliation, or other disruptive behavior is not tolerated in the federal workplace, including Department of Energy (DOE) site offices, or at DOE national laboratories, scientific user facilities, academic institutions, other institutions receiving Office of Science funding, or at locations where activities are funded by the DOE Office of Science.

Harassment includes any unwelcome conduct or reprisal (verbal, written, or physical) that is based on an individual's race, color, sex (including pregnancy, gender identity, and sexual orientation), religion, national origin, age, disability (physical or mental), genetic information, or participation in protected equal employment opportunity (EEO) activities including reporting allegations of harassment or providing information related to harassment allegations.

Harassing behaviors include any unwelcome conduct that: (1) has the purpose or effect of unreasonably interfering with an employee's work performance; (2) creates an intimidating, hostile, or offensive work environment; or (3) affects an employee's employment opportunities or compensation.

Sexual harassment is any unwelcome behavior of a sexual nature including, but not limited to, unwelcome sexual advances, requests for sexual favors (i.e., sexual coercion, including quid pro quo), physical conduct of a sexual nature, or other similar behavior. Sexual harassment also includes verbal and nonverbal behaviors that convey hostility, objectification, exclusion, or second-class status about members of a particular gender (e.g., gender harassment) (NAS 2018). Sexual harassment, like non-sexual harassment, is not always obvious and often subtle.

The Outlook Today

- The U.S. has unquestioned world leadership in experimental QCD research. CEBAF and RHIC are both unique and at the “top of their game” with compelling “must-do” science in progress or about to start. Long term, the future of QCD science is pointing to the need for an electron-ion collider.

- There is a wealth of science opportunity near term at ATLAS, and longer term at FRIB which will be world leading. NP is beginning to position the low energy experimental community to take full advantage of FRIB. The Theory Alliance (and support for theory in general) is also crucial.

- A very high priority for the NP community is U.S. leadership in the science of neutrino-less double beta decay.

  - A specific challenge will be ensuring essential R&D for candidate technologies is completed in the next 2-3 years prior to a down-select for a ton-scale experiment

- Research and production efforts to meet the Nation’s need for isotopes in short supply are being strengthened; re-establishing U.S. capability for stable isotopes will be a major advance and will help address community concerns in this area documented in the 2009 and 2015 NSAC-I Strategic Plans

General Outlook

- The experience with FY18 and FY19 budgets has required readiness for big swings in the budget. FY2020 may be similar.
- We need to stay focused and continue to deliver important outcomes for the nation.
- Delivering exciting discoveries, important scientific knowledge, technological advances, and workforce training is what we do.
- We need to keep up the good work!

A Long Tradition of Partnership and Stewardship

There has been a long tradition in Nuclear Science of effective partnership between the community and the agencies in charting compelling scientific visions for the future of nuclear science.

Key factors:

1) Informed scientific knowledge as the basis for recommendations and next steps
2) Mutual respect among scientific sub-disciplines
3) Commitment to the greater good of nuclear science as a discipline
4) Meticulously level playing field leading to respect for process and outcomes
5) Deep appreciation for the wisdom of Ben Franklin