

The National User Facility Organization (NUFO) - Year in Review -

Rene Bellwied (Wayne State University)
NUFO Chair

The **FUTURE** of America is the
RESEARCH of **TODAY**

Annual NUFO Meeting, BNL, June 7-9, 2010



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In the next 25 minutes..



NATIONAL
USER
FACILITY
ORGANIZATION

- Introduction to NUFO
 - Mission, Structure, Membership
- Specific issues of interest and activities in the past year
 - Industrial usage report follow-up (S. Strasser)
 - User and Facility statistics (S. Strasser, C. Knotts)
 - Foreign User Issues – DOE order 142.3. (S. White DePace)
 - User agreements (Judy Trimble)
 - User/administrator responsibilities (B. Johnson)
 - Education and outreach (tomorrow's workshop)
 - NUFO on the road
- Science legislation and funding (America Competes, ARRA)
- How to educate Washington without lobbying ?

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What is NUFO ?

- NUFO was founded in 1991 as a means for user administrators from national light sources (at the time) to better communicate and coordinate efforts.
- It has grown since then into the National User Facility Organization representing 27,000+ users from the 36 largest DOE and NSF funded facilities in the country
- NUFO is an organization which represents the interests of scientists who conduct research at U.S. national scientific user facilities as well as scientists from universities, laboratories, and industry who use facilities outside the U.S..

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NUFO Statistics

- Users from 500+ universities in all 50 states
- More than 7000 students receive higher degrees based on work at user facilities.
- 300+ national companies conduct research at national user facilities
- 500+ foreign research groups (universities, labs, and industry) work at our facilities

NUFO Facilities



Synchrotron Light Sources



High-Energy and Nuclear Physics



Neutron Sources



Nanoscale Science Research Centers

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*The NUFO
facilities:*

36 facilities

@

19 laboratories

Accelerator Test Facility (ATF)	BNL
Advanced Light Source (ALS)	LBNL
Advanced Photon Source (APS)	ANL
Advanced Test Reactor (ATR)	INL
Alternating Gradient Synchrotron (AGS)	BNL
Argonne Tandem Linac Accelerator System (ATLAS)	ANL
Atmospheric Radiation Measurement Climate Research (ACRF)	Global Network
Center for Advanced Microstructures and Devices (CAMD)	LSU
Center for Functional Nanomaterials (CFN)	BNL
Center for Integrated Nanotechnologies (CINT)	Sandia/LANL
Center for Nanophase Materials Sciences (CNMS)	ORNL
Center for Nanoscale Materials (CNM)	ANL
Cornell High Energy Synchrotron Source (CHESS)	Cornell
Fermilab	FERMI
High Flux Isotope Reactor (HFIR)	ORNL
High Temperature Materials Laboratory (HTML)	ORNL
Holifield Radioactive Ion Beam Facility (HRIBF)	ORNL
Large Hadron Collider (LHC)	CERN, Switzerland
Linac Coherent Light Source (LCLS)	Stanford
Los Alamos Neutron Science Center (LANSCE)	LANL
NASA Space Radiation Laboratory (NSRL)	BNL
National Astronomy and Ionosphere Center (NAIC)	Puerto Rico
National Center for Electron Microscopy (NCEM)	LBNL
National Energy Research Scientific Computing Center	LBNL
National Optical Astronomy Observatory (NOAO)	Tucson, AZ
National Radio Astronomy Observatory (NRAO)	Charlottesville, VA
National Superconducting Cyclotron Laboratory (NSCL)	East Lansing, MI
National Synchrotron Light Source (NSLS)	BNL
Particle Physics & Astrophysics	SLAC National Accelerator Laboratory
Relativistic Heavy Ion Collider (RHIC)	BNL
SLAC National Accelerator Laboratory	Stanford
Spallation Neutron Source (SNS)	ORNL
Stanford Synchrotron Radiation Light Source (SSRL)	Stanford
TANDEM	BNL
The Molecular Foundry	LBNL
Thomas Jefferson National Accelerator Facility (JLab)	JLAB

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Facility Membership

- Each User Facility that has representation of its users through a user group or a user executive committee is invited to participate in NUFO.
- These facilities are either national facilities or international facilities with a large U.S. representation (e.g. USLUO @ LHC)
- Certain applications decided on a case-by-case basis:
 - ESnet (Energy Sciences Network) – DOE-OS funded: ‘virtual facility’ serving scientists at over 40 facilities, but no user representation
 - Combustion Research Facility (CRF) at Sandia National Laboratories – DOE-OS funded: about 100 scientists but no user group

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Individual Membership

- The core constituency (voting members) is made up of one user administrator and one user executive committee chair per participating facility.
- Every interested party may become a general (non-voting) member.

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NUFO
Steering Committee
(12 members)

- **NUFO Chairs**
 - Rene Bellwied (Wayne State University) – Chair for 2010/2011
 - Brant Johnson (BNL-RHIC) – Past Chair for 2010/2011
 - **Toni Lanzirotti (BNL-NSLS) – Vice Chair for 2010/2011**
- **Co-Administrators**
 - Cathy Knotts (SLAC-SSRL) – Coordinator for 2010/2011
 - Susan White DePace (BNL) – Past Coordinator for 2010/2011
 - **Grace Webster (BNL-CFN) – Vice-Coordinator for 2010/2011**
- **Elected Members for 2010/2011**
 - **Susan Strasser (ANL-APS)**
 - **Al Ekkebus (ORNL-SNS)**
 - **Carla Vale (BNL-RHIC)**
- **Appointed members for 2010/2011**
 - **Simon Bare (UOP LLC)**
 - Two more members still to be appointed
- **Outgoing members – Thank you !!**
 - Kevin Pitts (UIUC)
 - Judy Trimble (ORNL)
 - Katherine Kantardjieff (California State)

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NUFO mission

- NUFO facilitates communication among users, user organizations, facility administrators, and other stakeholders.
- NUFO advocates the benefits and significance of research conducted at user facilities, as well as their operational needs.
- NUFO seeks to provide a unified message at the national level on issues of resources for science, economic competitiveness, and education for the next-generation scientific workforce.

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Administrative Mission Goals

- NUFO has become the hub for information on our national user facilities.

- We are here to ease the usage of user facilities and facilitate interactions through targeted efforts and collaborations on the administrative level
 - Optimizing industry usage
 - Optimizing foreign usage
 - Optimizing collaborative usage (university)
 - Optimizing quality of life at labs for researchers

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How Does NUFO
Facilitate Communication ?

<http://www.nufo.org>

- Website serves as a centralized resource for news & events
- Updates on facilities
- Links to facility and user scientific accomplishments
- Moderated list-servers for contacting user facility administrators and user representatives
- Meetings serve as a forum to raise awareness about issues and encourage interactions & networking

RECENT NEWS

Benchmarking: First Aid to Users

Benchmarking: Publications

Benchmarking: Proposal Call Closure

NUFO Thank You Letter to Steve Chu – April 2, 2010

NUFO on the Road

Industrial Usage Report

UPCOMING EVENTS

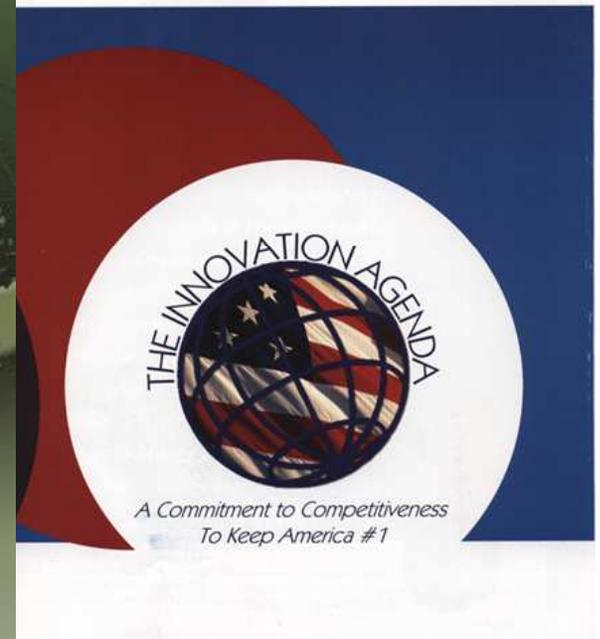
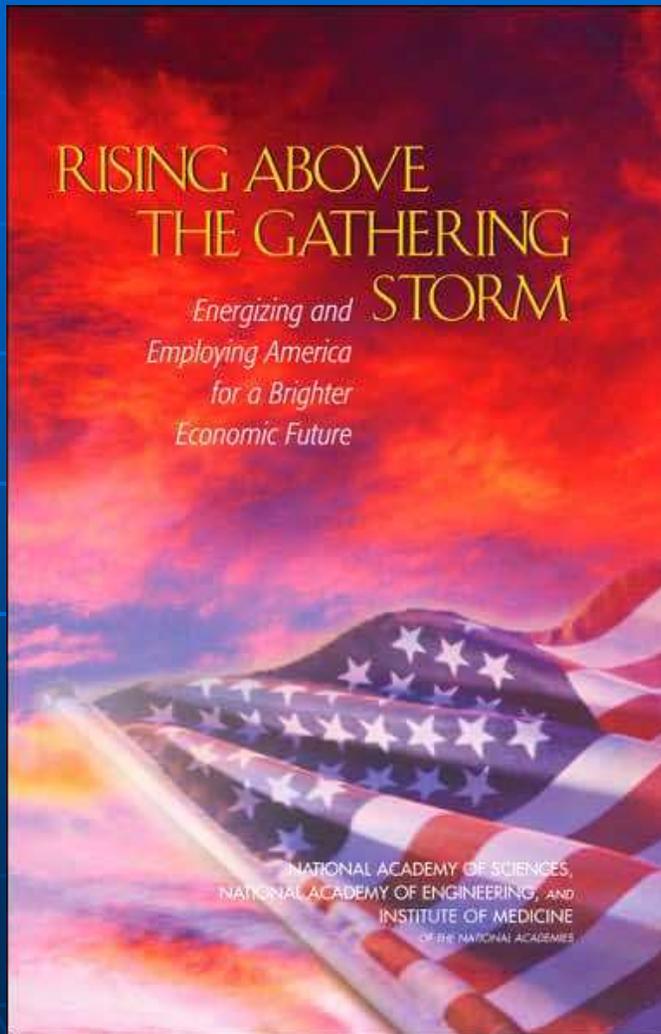
2010 NUFO Annual Meeting

NUFO MEMBERSHIP

- General Members
- User Administrators
- User Representatives

Home
News
Charter
Membership
Facilities
Fact Sheets
Photos
Meetings
Scientific Accomplishments
NUFO Reports
User Administration
NUFO Administration
Outreach
Contact

NUFO in the context of science legislation (an update)



REMARKS BY PRESIDENT OBAMA AT THE NATIONAL ACADEMY OF SCIENCES ANNUAL MEETING - *April 27, 2009*

“...So I'm here today to set this goal: We will **devote more than 3 percent of our GDP to research and development**. We will not just meet, but we will exceed the level achieved at the height of the space race, through policies that invest in basic and applied research, create new incentives for private innovation, promote breakthroughs in energy and medicine, and improve education in math and science.”

“So we **double the budget of key agencies**, including the National Science Foundation, a primary source of funding for academic research; and the National Institute of Standards and Technology, which supports a wide range of pursuits from improving health information technology to measuring carbon pollution, from -- from testing "smart grid" designs to developing advanced manufacturing processes.”

“And **my budget doubles funding for the Department of Energy's Office of Science, which builds and operates accelerators, colliders, supercomputers, high-energy light sources, and facilities for making nano-materials** -- because we know that a nation's potential for scientific discovery is defined by the tools that it makes available to its researchers.”

American Competitiveness Initiative

- Doubles over 10 years aggregate funding for DOE Science, NSF and NIST Core
- Makes R&E tax credit permanent
- Strengthens K-12 math & science education
- Supports comprehensive immigration reform

“America COMPETES Act”, H.R. 2272 (2007)

- Seven-Year Research Doubling

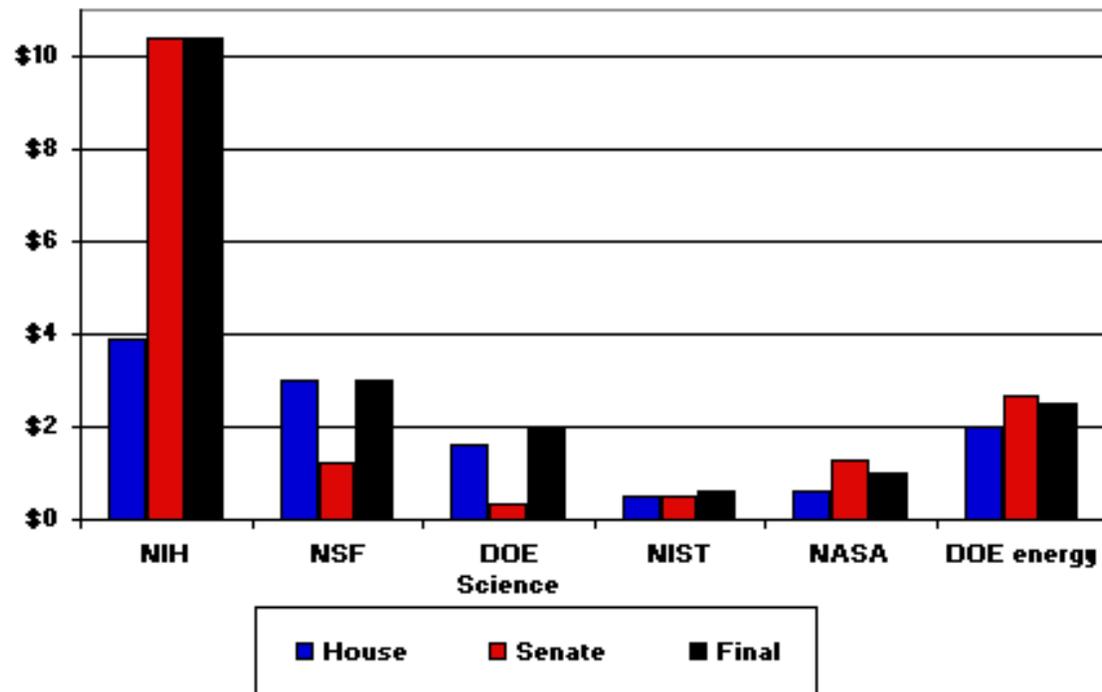
Good will, even signed into law, followed by broad consensus (2007) does not automatically lead to success (FY 2008)

America COMPETES re-authorization in 2010

- Passed the House in its 3rd try this past week (262-150, slightly bi-partisan)
- Will be debated by the Senate prior to the July 4th recess.
- Re-authorization bill on the table would be valid for five years (three year version was discussed as a compromise in the House).
- **Minority concerns:**
 - \$24 Billion bill in 2007, \$64 Billion bill in 2010 (H.R. 5116)
 - \$8 Billion above the 10-year doubling path for NSF, DOE-SC and NIST (in addition to \$5 Billion ARRA funds for these agencies)
- **Passage in the Senate is necessary to re-authorize the bill this year.**

ARRA (American Recovery and Reinvestment Act) i.e. Stimulus

**2009 Supplemental Recovery Funding for R&D
(House, Senate, and Final bills)
(budget authority in billions of dollars)**

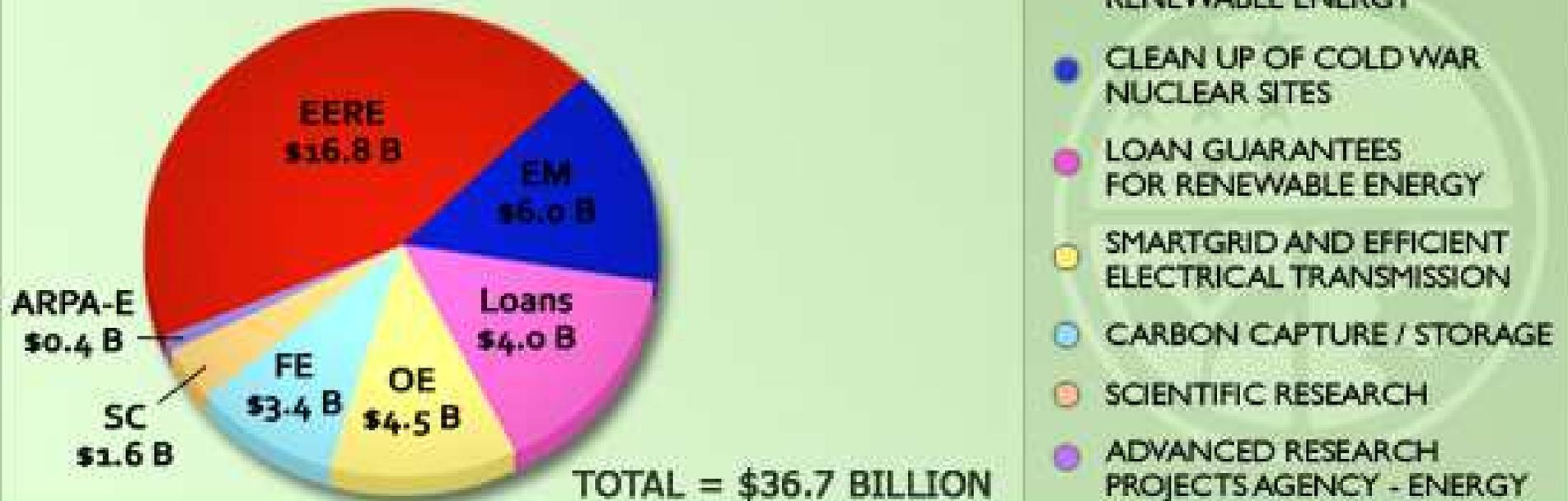


Source: AAAS analysis of R&D in House, Senate, and Final stimulus appropriations bills (HR 1). FEB. '09 © 2009 AAAS



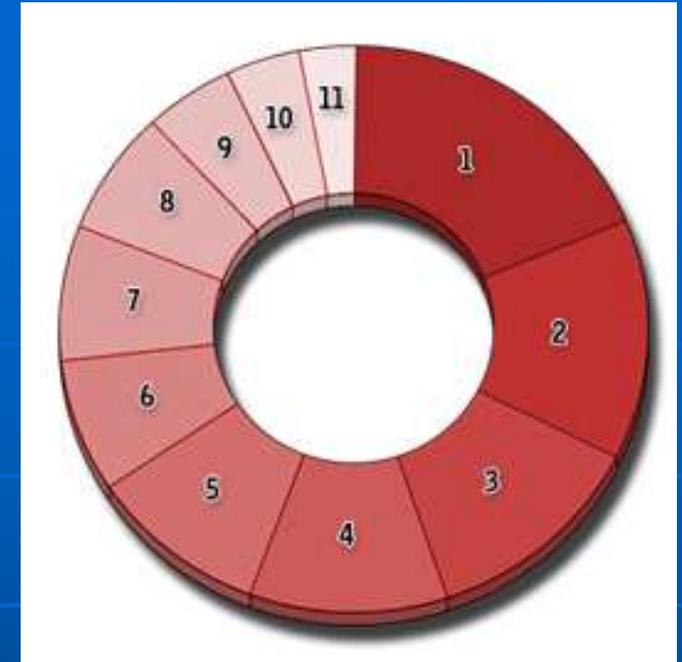
ARRA at the DOE

DOE RECOVERY ACT FUNDING



- DOE receives \$2 Billion for scientific innovation:
 - \$1.6 Billion for science research
 - \$0.4 Billion for ARPA-E

Scientific Innovation at DOE through ARRA (\$2 Billion)



- 1) \$400 million for Advanced Research (ARPA-E)
- 2) \$277 million for Energy Frontier Research Centers
- 3) \$247 million for Basic Energy Services
- 4) \$216 million for High Energy Physics
- 5) \$198 million for Science Laboratories Infrastructure
- 6) \$155 million for Biological and Environmental Research
- 7) \$154 million for Advanced Scientific Computing Research
- 8) \$143 million for Nuclear Physics
- 9) \$97 million for Energy Sciences Fellowships + Early Career Awards
- 10) \$83 million for Fusion Energy Sciences
- 11) \$58 million for Small Business Innovation Research

ARRA @ DOE

another breakdown

- \$330 million for operations and equipment at Office of Science major scientific user facilities
- \$277 million for Energy Frontier Research Centers
- \$150 million for ongoing construction on NSLS-II
- \$125 million for needed infrastructure improvements across nine DOE labs
- \$123 million for major construction, modernization, and needed decommissioning at ORNL, LBNL, BNL
- \$90 million for other core research
- \$69 million to create a national scale, prototype 100-gigabit per second data network
- \$65 million for construction of the 12 GeV Upgrade of CEBAF

Scientific Innovation at DOE through Early Career Awards

- Award Competition announced in June 2009 (total funds: \$85 Million)
- 2,200 letters of intent received in August 2009
- 1,750 proposals received in September 2009
- 69 awards announced in January 2010 totaling \$85 Million:
 - 26 awards in Basic Energy Sciences
 - 14 awards in High Energy Physics
 - 8 awards in Nuclear Physics
 - 8 awards in Biology and Environmental Sciences
 - 7 awards in Advanced Scientific Computing
 - 6 awards in Fusion Energy Sciences

ARRA at the NSF

- NSF received \$3 Billion
(50% boost to \$6.5 Billion 2009 budget)
- \$2.5 Billion allocated within one year:
 - 4,599 research based projects added (80% of the projects had been submitted prior to stimulus)
 - Educational awards added
 - Facility improvements added
 - \$354 Million added for laboratories and research vessels
 - Only \$131 Million spent in the first year

FY11 Presidential Budget stays on course

NSF: \$7.4 Billion (8% increase)

DOE-OS: \$5.1 Billion (6.1% increase)

NIST Core: \$0.7 Billion (18.2% increase)

The fine line between education, outreach, advocacy and lobbying

- NUFO intends to educate and inform the public and lawmakers on scientific achievements and science education performed by the national facilities. It is committed to promote the economic competitiveness and the gain in fundamental knowledge based on our facilities.
- NUFO will NOT advocate future science projects or lobby for science funding in its interactions with Washington.

Other Science Advocacy Groups

- **AAAS:** American Association for the Advancement of Science
- **ASTRA:** Alliance for Science Technology and Research in America
- **The Science Coalition**
- **SETWG:** Science, Engineering and Technology Working Group
- **AAU, APS, ACS, ASME, ASA, AMS**
- **TFAI:** Task Force on the Future of American Innovation

TFAI: TASK FORCE on the FUTURE of AMERICAN INNOVATION



The Task Force on American Innovation, a coalition of businesses, trade associations, scientific societies, and higher education, was founded in 2004 to advocate greater federal investments for basic research in the physical sciences and engineering. The Task Force urges strong, sustained increases for research budgets at the National Science Foundation, Department of Energy Office of Science, National Institute of Standards and Technology, and Department of Defense.

www.futureofinnovation.org



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How does NUFO
facilitate outreach?

- It provides a unified voice and message to support science in the U.S.
- It helps in providing you material that lets you be pro-active in supporting science:

OUTREACH

- Facility Fact Sheets
- Scientific Accomplishments
- NUFO Brochure
- Outreach Activities
- Guidelines for Outreach Meetings
- Outreach Contacts

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NUFO Exhibition at Congress

- **Plan:** poster exhibition with brief welcome notes from NUFO chair and several invited speakers.

- **Layout:**
 - Four pillar posters
 - One poster and representative from each NUFO facility
 - Map of U.S. highlighting all user facilities and all participating universities (in all 50 states !).

- **Purpose:**
 - Educate lawmakers and interested parties on scientific achievements, education programs, economic competitiveness, and fundamental knowledge (tax dollars at work).

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NUFO Exhibition at Congress

- Originally planned for October 2009
- NUFO could not secure funding through the NUFO facilities since some facilities considered the exhibition a lobbying effort after the DOE-BES office cautioned them.
- After many deliberations with the DOE-OS, the House Ethics Committee, the House Science & Technology Committee, APS and several Laboratory Legal Counsels we still try to achieve a common understanding of whether such an exhibition can be conducted by NUFO and funded through the facilities.
- Most legal counsels and ethics committee agreed that this is not a lobbying effort and that it can be funded through laboratory funds.
- Now planned for the fall of 2010

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A first step:
NUFO on the Road

■ Recent stops:

- APS/AAPT Meeting in Washington D.C. in February 2010
- APS Meeting in Portland, OR in March 2010



■ Next stop:

- USA Science and Engineering Festival, Washington D.C., October 2010

NUFO pillar posters

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Promoter of Economic Competitiveness



Partnerships between U.S. Industry and National User Facilities

- Facilitate conduct and advancement of R&D using the capabilities of our facilities
- Enable elucidation, discovery and innovation through collaborative, sponsored, and cooperative research

Recent Developments

Energy efficiency and renewable energy

- Advanced combustion engines and vehicle technologies
- Advanced battery, catalyst and lightweight materials

Pharmaceutical

- Structures of gene products in whole genome sequences
- Drug discovery efforts based on structural mapping (e.g. HIV, Hepatitis C, and Insulin receptors)

Nanomaterials

- Development of nano-filters for drug delivery and diagnostics
- New chemical and biological sensors based on nano-photonics

Semi conductor and sensor development

- New techniques and materials in medical imaging
- New materials and smaller scales in semi-conductors



Office of Science
U.S. DEPARTMENT OF ENERGY

National Science Foundation
WHERE DISCOVERIES BEGIN

NATIONAL INSTITUTES OF HEALTH



The FUTURE of America is the RESEARCH of TODAY

Birthplace of Fundamental Knowledge



From the most elementary building blocks of nature to the most complex structures in living organisms, the research at national user facilities has contributed significantly to unlocking the mysteries of life, health and the universe.

Scientists at User Facilities:

- Have probed all elements of the sub-structure of visible matter in the universe, from heavy quarks to neutrinos.
- Are on the verge of discovering the sources of dark matter, dark energy, and the generators of mass in the universe.
- Are mapping out the forces responsible for the interactions between subatomic particles and, at other end of scale, are understanding the cosmological evolution of our universe.
- Have solved the structure of the ribosome, which is responsible for producing the thousands of proteins required for living cells.
- Are beginning to understand high-temperature superconductors, materials that conduct electricity with zero resistance.
- Are studying materials at the nanoscale - on the order of billionths of a meter - revealing different chemical and electronic properties than those found in bulk materials.
- Conduct experiments to understand detailed atomic-level structure-function relationships in working catalysts.
- Conduct research at high temperature and pressure to simulate conditions in the Earth's mantle, shedding new light on the phase transition thought to be responsible for a seismic discontinuity observed above the Earth's core-mantle boundary.
- Are understanding the fate of pollutants and toxins in the environment.

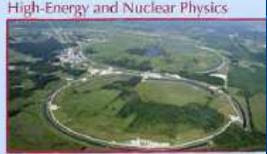
Synchrotron Light Sources



Neutron Sources



High-Energy and Nuclear Physics



Nanoscale Science Research Centers



Office of Science
U.S. DEPARTMENT OF ENERGY

National Science Foundation
WHERE DISCOVERIES BEGIN

NATIONAL INSTITUTES OF HEALTH



NUFO pillar posters

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Cradle of Science Education



NATIONAL USER FACILITY ORGANIZATION

Laying the Foundation of our Technical and Economical Future

- More than 12,000 researchers (approximately 40%) at our user facilities are students or postdoctoral research associates
- More than 7100 of our users are graduate students whose advanced degrees will be based wholly or in part on work conducted at our facilities
- Many of our user facilities offer summer programs for high-school teachers and/or students at various degree levels




- Students and Post-docs trained at user facilities move on to professional careers in academia, industry, and service fields, including aerospace, pharmaceuticals, medicine, transportation, and energy.



education






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Home of Scientific Achievements



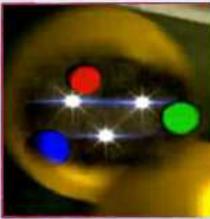
NATIONAL USER FACILITY ORGANIZATION

National User Facility Research, Staff Members, and Users Are Recognized in National and International awards:



- Nobel Prizes
- E.O. Lawrence Awards
- R&D Magazine's R&D 100 Awards
- Gorden Bell Prize
- Technology Review's Top Young Innovators
- Presidential Early Career Award for Scientists and Engineers
- Professional Society Awards and Fellows

Quark-gluon plasma created from heavy ion collisions is nearly perfect liquid



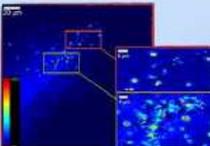
Bicontinuous Double Gyroid Hybrid Solar Cell may be alternative to expensive silicon-based cell technologies



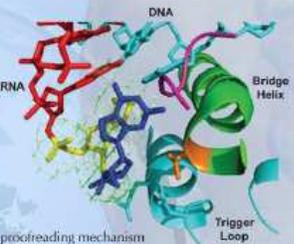
Cryogenics technology used for testing NASA's next space telescope components



Mercury methylation imaged in the rhizosphere of wetland plants indicates this is a source of the toxin in the San Francisco Bay



RNA proofreading mechanism revealed in high-throughput analysis of protein structures:



Rare single top quark discovered confirming important parameters of particle physics



FTO Glass

DNA

RNA

Bridge Helix

Trigger Loop






The NUFO brochure

NUFO Purpose

- To represent the interests of all users who conduct research at U.S. national scientific user facilities and those of scientists from U.S. universities, laboratories, and industry who use facilities outside the United States.
- To facilitate communication among users, user organizations, facility administrators, and other stakeholders to discuss the benefits and significance of research conducted at our facilities.

NUFO Users

- Include approximately 7,000 students whose B.S., M.S., and Ph.D. degrees will be based, in part, on work conducted at national user facilities.
- Come from 500 universities in all 50 states.
- Work for more than 350 companies that conduct research at national user facilities.

For more information please visit: <http://www.nufo.org>

NUFO Facilities



Synchrotron Light Sources



High-Energy and Nuclear Physics



Neutron Sources



Nanoscale Science Research Centers

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Cradle of Science Education

Approximately 40% of the users at our facilities are graduate students and post-doctoral research associates—individuals who will be our next-generation of scientists and engineers and the foundation of our technical and economic future.



Summer students in fingerprint lab



Student crew at PHENIX detector

Birthplace of Fundamental Knowledge

From the largest high-energy accelerators to the highest intensity light sources, our national user facilities house the world's most innovative and advanced technologies, which provide substantial new insights into the world and the universe around us.



Discovery of liquid phase prior to matter formation in universe



Researchers study Alzheimer's brain tissue with a microfocus synchrotron X-ray beam

Home of Scientific Achievements

National user facilities were home to experiments that resulted in 23 Nobel Prizes from 1939 until today.



Ray Davis, Physics, 2002, for pioneering contributions to astrophysics, in particular for the detection of cosmic neutrinos



Sam Ting, Physics, 1976, for pioneering work in the discovery of a heavy particle of a new kind

Promoter of Economic Competitiveness

Industry performs many experiments at national facilities. The results from these experiments lead to key discoveries that increase scientific knowledge, advance new technologies, and stimulate the economic growth of the United States.



Checking silicone wafers for minute impurities



Blue Gene computer

What Can You Do For NUFO?

- Update the NUFO contact information for your facility as these change (new UEC elections)
- Provide updated copies of your facility's fact sheet and links to most recent scientific accomplishments
- Develop short 'talking points' and 'elevator talks' summarizing your research and why it is important in lay terms (establish an archive of highlights)
- Inform NUFO when you learn about new policies or practices that may impact or be of interest to users or facilities
- **Respond to NUFO calls for information or action**
- **Participate in NUFO meetings, outreach and education activities**
- **Become an individual advocate for science, get involved**

What Can NUFO Do For You?

Educational Outreach:

- Educating the public and lawmakers on user facilities and science in general, will be a strong and continuing effort in NUFO.
- Highlighting the effort of the science community through exhibitions, visits and web-based outreach (e.g. YouTube videos, tweets, blogs, etc.) is a priority.
- It is a big advantage that NUFO is a bottoms-up users group, not a lobbying group. And it provides resources that are useful to many to contribute to the greater goal.

User and administrative interests:

- NUFO will continue to provide surveys, metrics and reports on issues that are relevant to users and administrators
- NUFO will represent you at the National level in discussions relevant to users (e.g. DOE order 142.3)
- Each annual meeting will feature a dedicated workshop or symposium (e.g. 2009 Industrial Usage, 2010 Educational Outreach. Please attend the 2011 meeting at SLAC.

