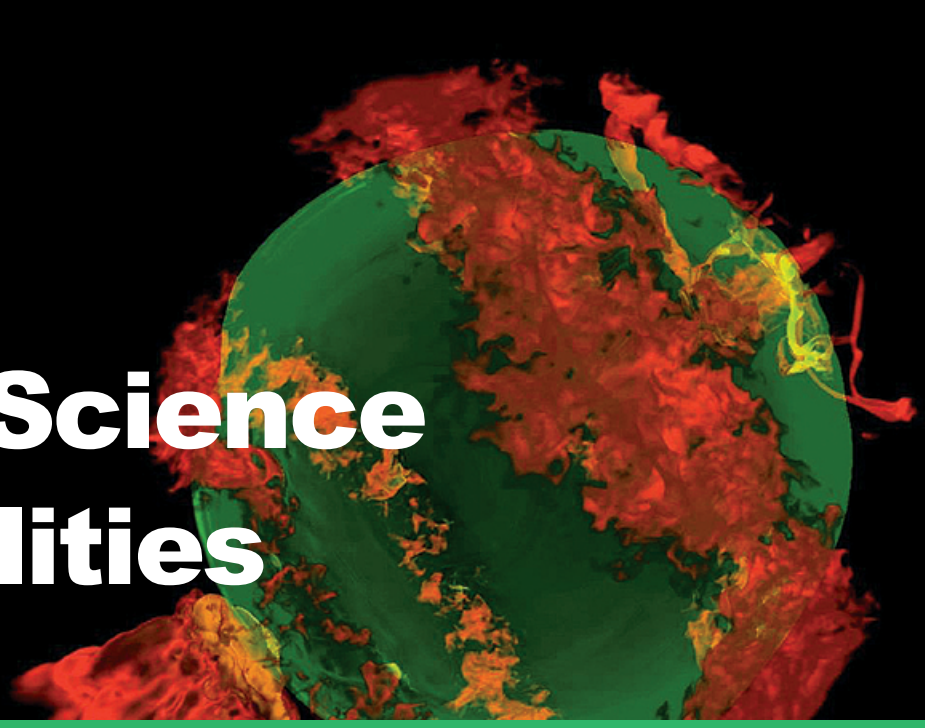
U.S. DEPARTMENT OF ENERGY | Office of Science



# Office of Science User Facilities

**Fiscal Year 2015**

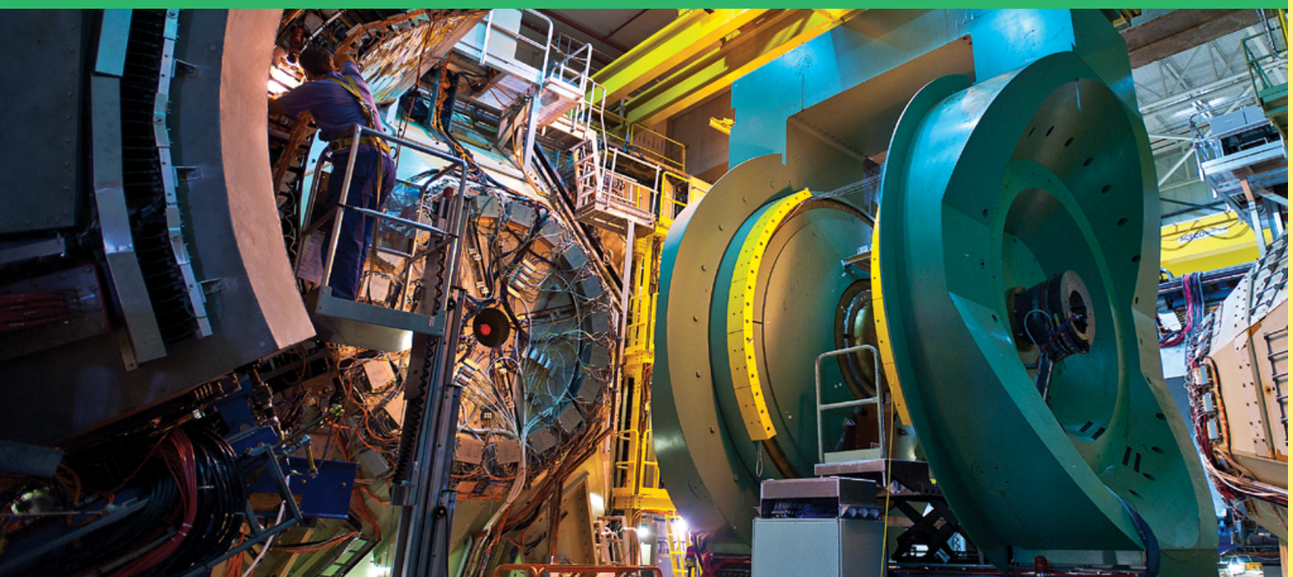


**Cover top**
Simulation of the gravitationally confined detonation model of Type Ia Supernovae created at the Argonne Leadership Computing Facility. *Credit George Jordan, Dean Townsley, Robert Fisher, Jim Truran, Don Lamb, Argonne National Laboratory*

**Above**
Researchers in the EVEREST visualization facility at the Oak Ridge Leadership Computing Facility. *Credit Oak Ridge National Laboratory*

**Cover bottom**
An aerial view of the National Synctrotron Light Source II at Brookhaven National Laboratory *Credit HDR Architecture, Inc. © 2014 Dan Schwalm/HDR*

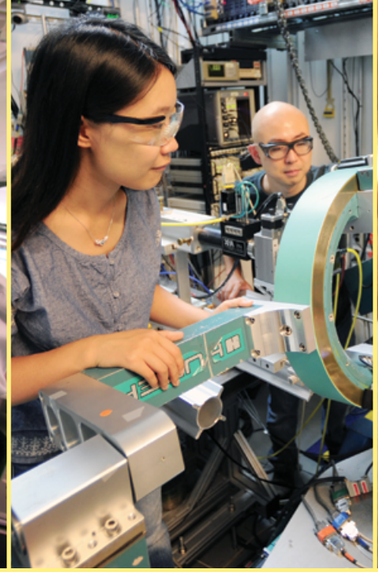
**Below**
The PHENIX particle detector at the Relativistic Heavy Ion Collider.
*Credit Brookhaven National Laboratory*





# The U.S. Department of Energy Office of Science provides the Nation's researchers with world-class scientific user facilities to propel the U.S. to the forefront of science and innovation.

# A user facility is a federally sponsored research facility available for external use to advance scientific or technical knowledge under the following conditions:



**Left** The Genetix QPIX colony picker at the Joint Genome Institute. *Credit Roy Kaltschmidt, Lawrence Berkeley National Laboratory*
**Center** Advanced Photon Source users with a 6-circle diffractometer at Argonne National Laboratory. *Credit R. Fenner, Argonne National Laboratory*
**Right** Silicon wafers inspection at the Stanford Synchrotron Radiation Lightsource. *Credit SLAC National Accelerator Laboratory*

## Open

The facility is open to all interested potential users without regard to nationality or institutional affiliation.

## Accessible

The facility provides resources sufficient for users to conduct work safely and efficiently.

## Competitive

Allocation of facility resources is determined by merit review of the proposed work.

## Unique

The facility capability does not compete with an available private sector capability.

## Free

User fees are not charged for non-proprietary work if the user intends to publish the research results in the open literature. Full cost recovery is required for proprietary work.

## Collaborative

The facility supports a formal user organization to represent the users and facilitate sharing of information, forming collaborations, and organizing research efforts among users.

# The Office of Science manages its research and user facilities portfolio through six core program offices.

## Facility stewardship

The program office is responsible for cradle-to-grave support and stewardship of the facility, from conceptualization and design, to construction and operations, to termination and decommissioning. In the conceptualization phase, the scientific user community plays a major role in articulating the scientific justification for the facility and in determining the most impactful facility capabilities. The Office of Science utilizes project management best practices. Facility operations are funded through congressional appropriations directly to the program office. The facility depends on no other source of funds for core operations.

## Core program offices

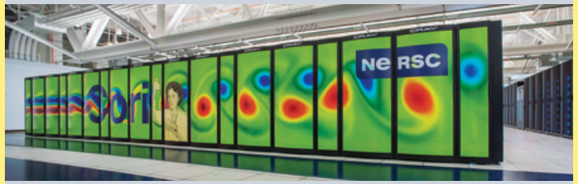
**ASCR** Advanced Scientific Computing Research
**BES** Basic Energy Sciences
**BER** Biological and Environmental Research
**FES** Fusion Energy Sciences
**HEP** High Energy Physics
**NP** Nuclear Physics

## ASCR


**ALCF** Argonne Leadership Computing Facility
**990 Users** Argonne National Laboratory

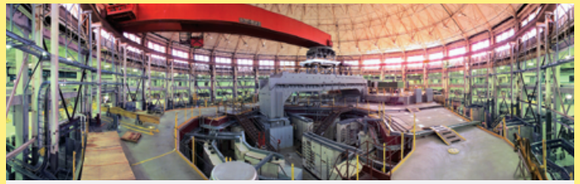

**OLCF** Oak Ridge Leadership Computing Facility
**1,107 Users** Oak Ridge National Laboratory

**ESnet** Energy Sciences Network
**48 Users** Lawrence Berkeley National Laboratory




**NERSC** National Energy Research Scientific Computing Center
**6,332 Users** Lawrence Berkeley National Laboratory

## BES light sources



**ALS** Advanced Light Source
**2,560 Users** Lawrence Berkeley National Laboratory

**APS** Advanced Photon Source
**5,331 Users** Argonne National Laboratory

**LCLS** Linac Coherent Light Source
**837 Users** SLAC National Accelerator Laboratory

**SSRL** Stanford Synchrotron Radiation Lightsource
**1,626 Users** SLAC National Accelerator Laboratory

**NSLS II** National Synchrotron Light Source II
**110 Users** Brookhaven National Laboratory

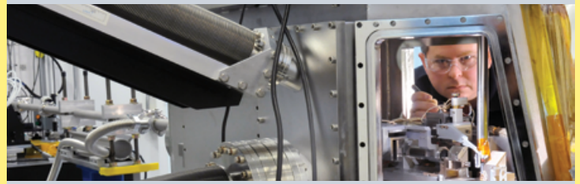
**Note** The National Synchrotron Light Source II (NSLS II) commenced operations on March 19, 2015.

## **BES** nanocenters

**CFN** Center for Functional Nanomaterials
**493 Users** Brookhaven National Laboratory

**CINT** Center for Integrated Nanotechnologies
**513 Users** Los Alamos and Sandia National Laboratories

**CNMS** Center for Nanophase Materials Sciences
**575 Users** Oak Ridge National Laboratory



**CNM** Center for Nanoscale Materials
**529 Users** Argonne National Laboratory

**TMF** The Molecular Foundry
**677 Users** Lawrence Berkeley National Laboratory

## **BES** neutron sources

**HFIR** High Flux Isotope Reactor
**491 Users** Oak Ridge National Laboratory

**SNS** Spallation Neutron Source
**843 Users** Oak Ridge National Laboratory

## BER

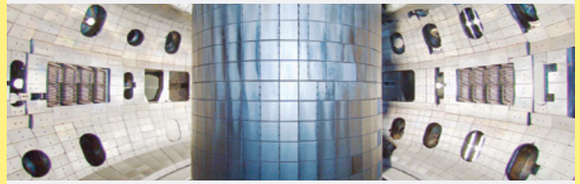
**ARM** Atmospheric Radiation Measurement Climate
**1,121 Users** Research Facility, Global Network

**EMSL** Environmental Molecular Sciences Laboratory
**713 Users** Pacific Northwest National Laboratory

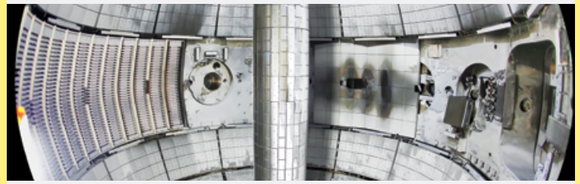
**JGI** Joint Genome Institute
**957 Users** Lawrence Berkeley National Laboratory

## FES

**C-Mod** Alcator C-Mod
**224 Users** Massachusetts Institute of Technology



**DIII-D** DIII-D National Fusion Facility
**557 Users** General Atomics



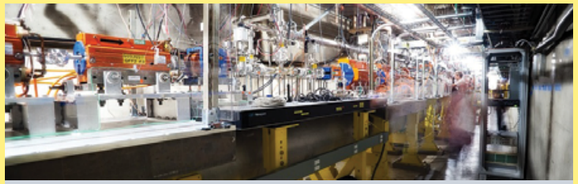
**NSTX-U** National Spherical Torus Experiment Upgrade
**356 Users** Princeton Plasma Physics Laboratory

## HEP

**ATF** Accelerator Test Facility
**75 Users** Brookhaven National Laboratory

**Note** The Accelerator Test Facility (ATF) was formally designated as a scientific user facility in fiscal year 2015.

*HEP cont.*



**FACET** Facility for Advanced Accelerator Experimental Tests
**148 Users** SLAC National Accelerator Laboratory

**Fermilab AC** Fermilab Accelerator Complex
**1,924 Users** Fermilab National Accelerator Laboratory

## NP

**ATLAS** Argonne Tandem Linac Accelerator System
**392 Users** Argonne National Laboratory

**CEBAF** Continuous Electron Beam Accelerator Facility
**1,510 Users** Thomas Jefferson National Accelerator Facility

**RHIC** Relativistic Heavy Ion Collider
**1,015 Users** Brookhaven National Laboratory

**Above**
A research scientist at the Center for Nanophase Materials Sciences.
*Credit Oak Ridge National Laboratory*

**Below**
A postdoctoral researcher working on the Superconducting Solenoid magnet at the Continuous Electron Beam Accelerator Facility. *Credit Thomas Jefferson National Accelerator Facility.*

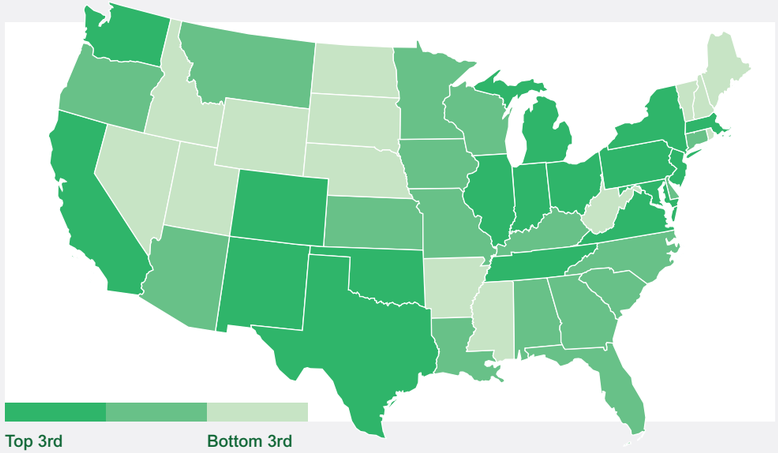




# Data collected for Fiscal Year 2015 reveal an interconnected and diverse research enterprise.

# The 32,056 users span all 50 states, the District of Columbia, Puerto Rico and the U.S. Virgin Islands, and 68 countries on six continents.

## Number of users by state



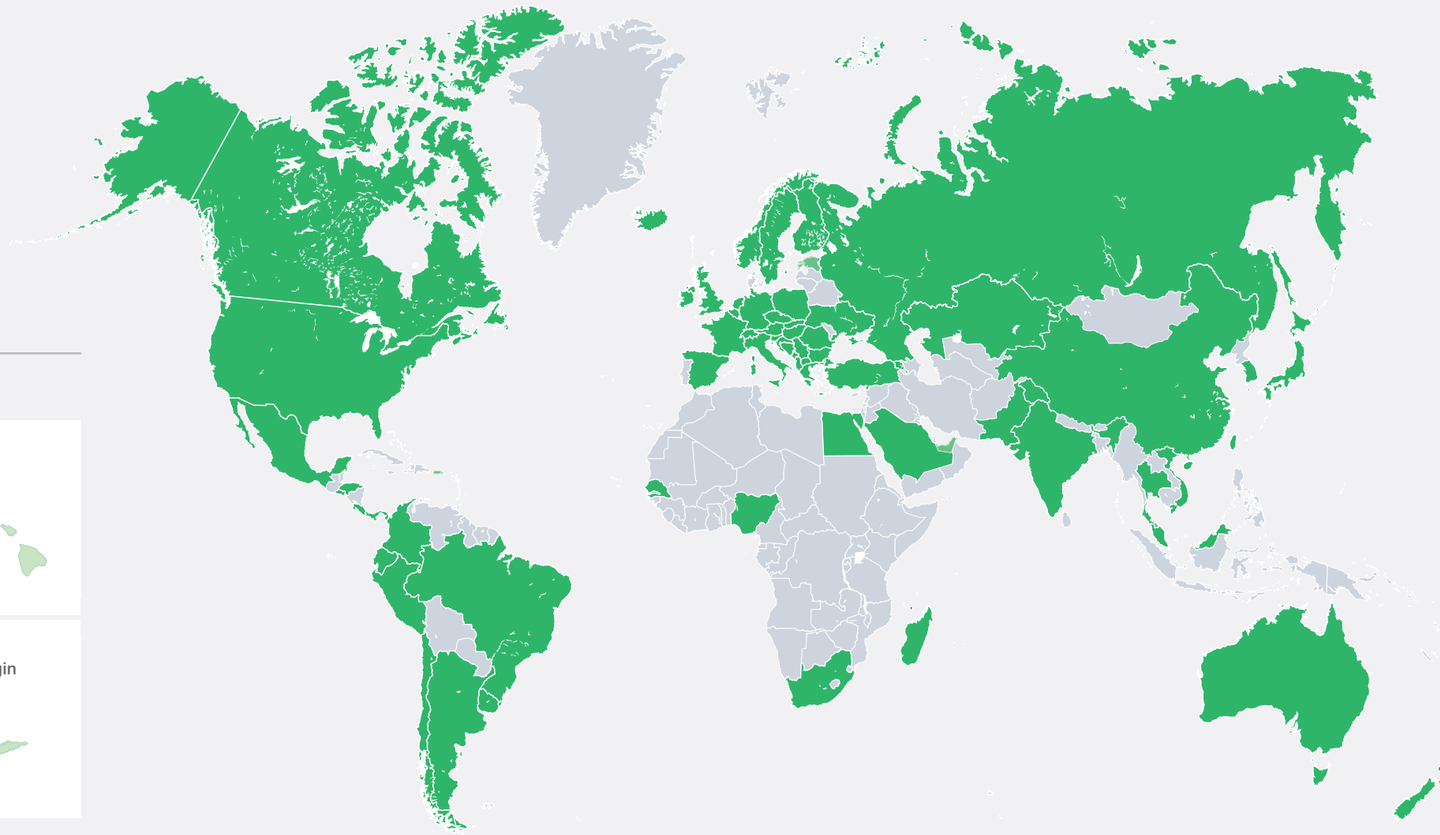

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Alabama | 118 | Illinois | 2,984 | Nebraska | 58 | South Dakota | 35 |
| Alaska | 14 | Indiana | 463 | Nevada | 81 | Tennessee | 1,762 |
| Arizona | 186 | Iowa | 247 | New Hampshire | 75 | Texas | 723 |
| Arkansas | 26 | Kansas | 87 | New Jersey | 699 | Utah | 144 |
| California | 6,774 | Kentucky | 88 | New Mexico | 827 | Vermont | 10 |
| Colorado | 554 | Louisiana | 130 | New York | 1,929 | Virginia | 737 |
| Connecticut | 334 | Maine | 18 | North Carolina | 418 | Washington | 890 |
| Delaware | 101 | Maryland | 476 | North Dakota | 24 | West Virginia | 23 |
| District of Columbia | 235 | Massachusetts | 990 | Ohio | 439 | Wisconsin | 372 |
| Florida | 325 | Michigan | 534 | Oklahoma | 530 | Wyoming | 22 |
| Georgia | 296 | Minnesota | 258 | Oregon | 184 | U.S. Territories | 31 |
| Hawaii | 32 | Mississippi | 52 | Pennsylvania | 645 | | |
| Idaho | 31 | Missouri | 179 | Rhode Island | 62 | | |
| | | Montana | 38 | South Carolina | 138 | | |

### Quickfact

**80%**

of users come from U.S. institutions

## International users



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Africa** | **24** | **Europe** | **3,501** | Greece | 19 | **N. America** | **26,559** |
| South Africa | 20 | United Kingdom | 746 | Slovakia | 11 | United States | 25,993 |
| Nigeria | 2 | Germany | 682 | Ukraine | 11 | Canada | 515 |
| Madagascar | 1 | France | 427 | Slovenia | 10 | Mexico | 48 |
| Senegal | 1 | Italy | 316 | Croatia | 7 | Panama | 1 |
| | | Switzerland | 221 | Cyprus | 6 | Honduras | 1 |
| **Asia** | **1,636** | Sweden | 137 | Romania | 5 | Costa Rica | 1 |
| China | 713 | Denmark | 110 | Bulgaria | 4 | | |
| Japan | 356 | Czech Republic | 82 | Iceland | 2 | **S. America** | **210** |
| South Korea | 281 | Poland | 73 | Serbia | 2 | Brazil | 145 |
| Russia | 193 | Netherlands | 57 | Estonia | 1 | Chile | 36 |
| India | 175 | Finland | 46 | | | Argentina | 13 |
| Taiwan | 57 | Norway | 43 | **Middle East** | **108** | Peru | 7 |
| Singapore | 35 | Austria | 34 | **N. Africa** | | Colombia | 5 |
| Hong Kong | 7 | Hungary | 32 | Israel | 82 | Ecuador | 3 |
| Thailand | 4 | Portugal | 25 | Saudi Arabia | 14 | Uruguay | 1 |
| Pakistan | 3 | Armenia | 24 | Egypt | 7 | | |
| Kazakhstan | 2 | Ireland | 23 | United Arab Emirates | 3 | **Oceania** | **156** |
| Malaysia | 2 | Belgium | 22 | Qatar | 2 | Australia | 138 |
| Viet Nam | 1 | Turkey | 12 | | | New Zealand | 18 |

### Quickfact

**6,276**

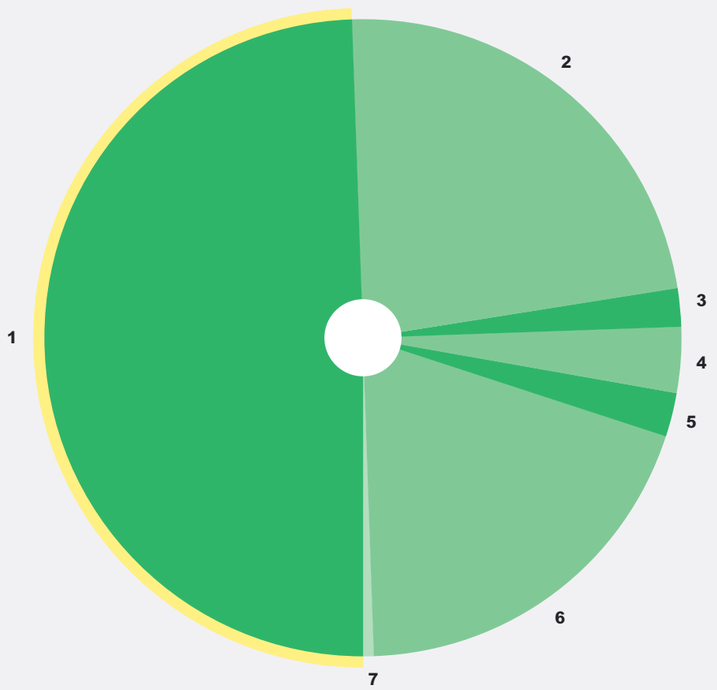
users from international institutions

**1,312**

international institutions

# Users span the full spectrum of R&D institutions and career stages.

## Number of users by institution type



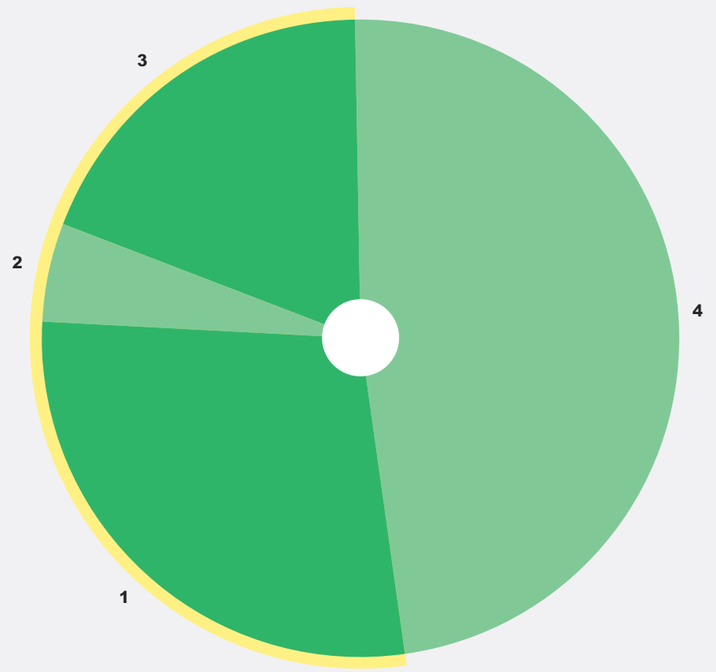

| | | |
|---|---|---|
| 1 | U.S. Academia | 16,012 |
| 2 | DOE National Laboratory | 7,441 |
| 3 | Other U.S. Federal | 571 |
| 4 | U.S. For-Profit | 1,095 |
| 5 | U.S. Not-for-Profit Research or Charitable Organization | 761 |
| 6 | International | 6,207 |
| 7 | Other | 165 |

### Quickfact

**50%**

of users come from U.S. Academia

## Number of users by employment level



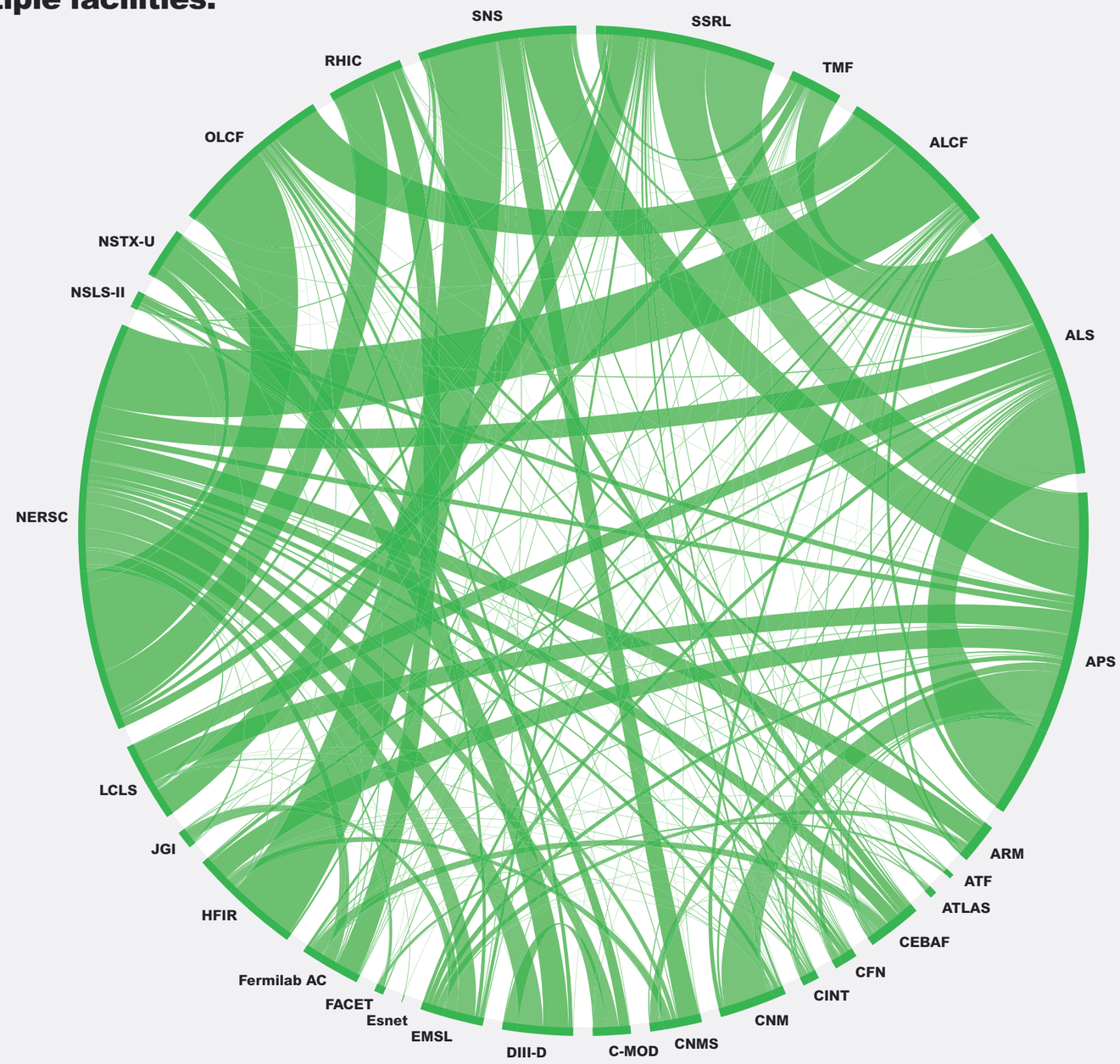

| | | |
|---|---|---|
| 1 | Graduate Students | 6,586 |
| 2 | Undergraduate Students | 1,165 |
| 3 | Postdoctoral Research Associates | 4,408 |
| 4 | Faculty or Research Scientists | 11,203 |

### Quickfact

**52%**

of users are students or postdocs

# Each facility provides a unique scientific toolset. Users enhance their research by leveraging capabilities at multiple facilities.




## User crossover among facilities

The width of the ribbon connecting two facilities corresponds to the number of users who utilized both of those facilities in FY 2015.

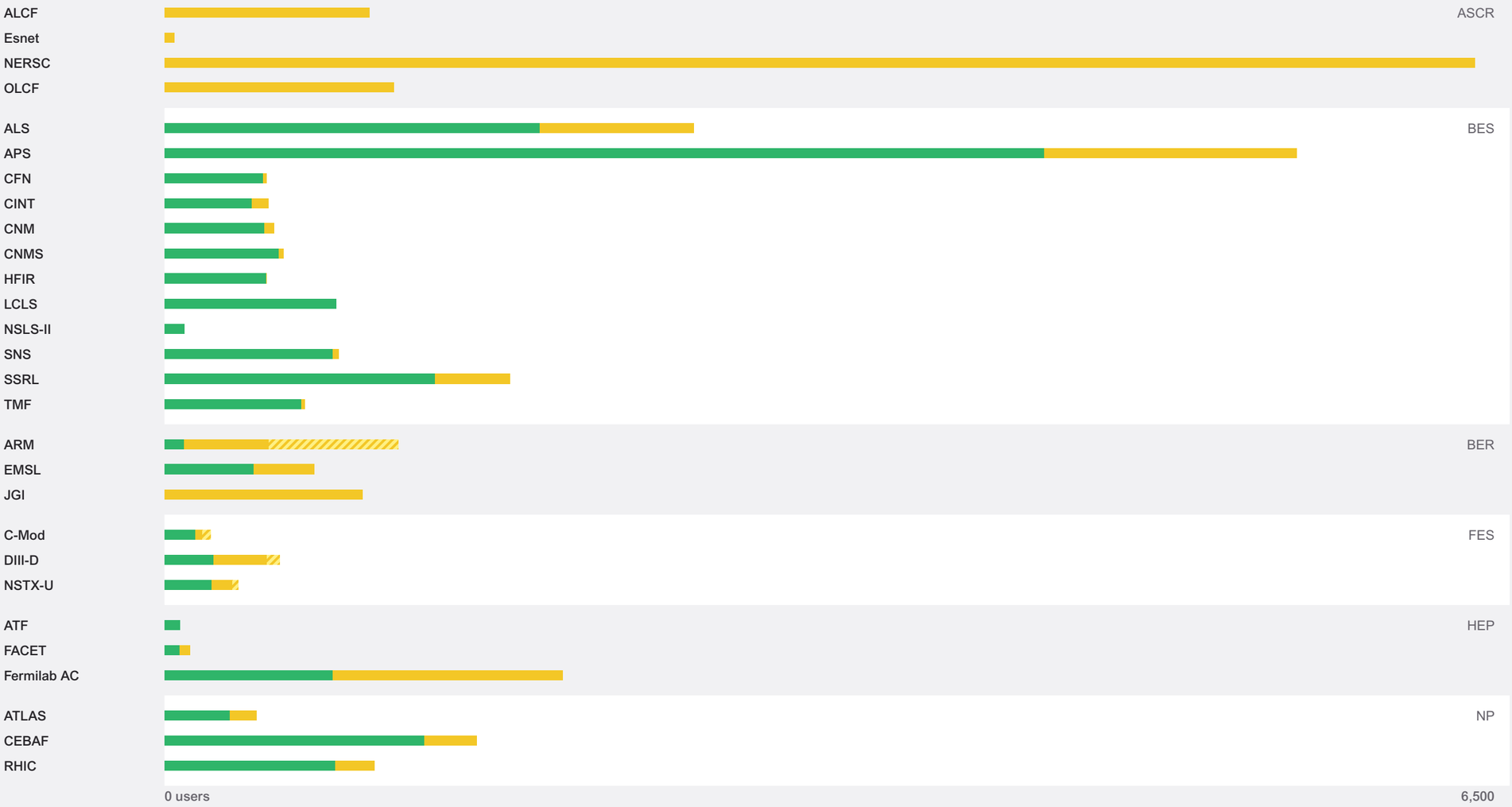
Quickfact

**3,000+**

users performed research at two or more facilities in FY 2015

# Users access a wide variety of research resources at the facilities. The majority of users come in person on site and many thousands more access resources and curated data remotely.

## Users by facility




**On-Site user**
physically present at the facility

**Remote user**
remotely accesses the facility

**Data user**
remotely accesses data from an electronic archive supported by the facility

## Quickfact

**52%**
on-site users

**46%**
remote users

**02%**
data users

**Many industrial and federal entities use Office of Science user facilities to advance their research and development goals.**

Industrial institutions

297 **U.S. For-Profit Institutions**

155 **U.S. Small Businesses**

55 **Global and U.S. Fortune 500**

3M
ABB
Abbvie
Amgen
Apple
Applied Materials
AstraZeneca
BASF
Boeing
BP
Caterpillar
Chevron
Cisco Systems
Colgate-Palmolive
Corning
Cummins
Dow Chemical
DuPont
Eli Lilly
Exxon Mobil
Ford Motor
General Electric
General Motors
Gilead Sciences
GlaxoSmithKline
HP
Honeywell Int.
IBM
Intel
Johnson & Johnson
L-3 Communications
Lockheed Martin
Merck
Micron Technology
Monsanto
NEC
Northrop Grumman
Novartis
Pfizer
POSCO
PPG Industries
Procter & Gamble
Robert Bosch
SAIC
Samsung Electronics
Sanofi
SABIC
Schlumberger
Siemens
Sinopec Group
Southern
Total
Toyota Motor
United Technologies
Western Digital

Federal support of user projects

**Department of Energy**
5,574 projects

**National Science Foundation**
1,783 projects

**National Institutes of Health**
1,182 projects

**Department of Defense**
371 projects

**National Aeronautics and Space Administration**
174 projects

**Department of Agriculture**
45 projects

Other federal sponsors

Environmental Protection Agency
Department of Transportation
United States Geological Survey
Department of Homeland Security
Department of Education
Department of State
National Institute of Standards and Technology
National Oceanic and Atmospheric Administration
Centers for Disease Control and Prevention
Nuclear Regulatory Commission

Quickfact

**5,688**
projects supported by a non-DOE source

**1,120**
U.S. industrial users

## For more information

Download the report and view an interactive map of user projects at

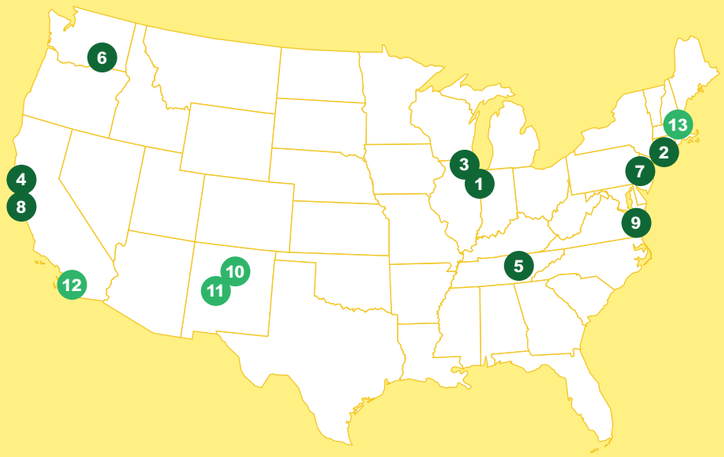
**science.energy.gov/user-facilities**

## Credits

All the images on the user facility spread are courtesy of the host institution

Design: Sandbox Studio, Chicago

## User facility locations




- Office of Science laboratories
- Other host institutions

1 Argonne National Laboratory
Argonne, Illinois

2 Brookhaven National Laboratory
Upton, New York

3 Fermi National Accelerator Laboratory
Batavia, Illinois

4 Lawrence Berkeley National Laboratory
Berkeley, California

5 Oak Ridge National Laboratory
Oak Ridge, Tennessee

6 Pacific Northwest National Laboratory
Richland, Washington

7 Princeton Plasma Physics Laboratory
Princeton, New Jersey

8 SLAC National Accelerator Laboratory
Menlo Park, California

9 Thomas Jefferson National Accelerator Facility
Newport News, Virginia

10 Los Alamos National Laboratory
Los Alamos, New Mexico

11 Sandia National Laboratories
Albuquerque, New Mexico

12 General Atomics
San Diego, California

13 Massachusetts Institute of Technology
Cambridge, Massachusetts

— Atmospheric Radiation Measurement Climate Research Facility
global network (multiple sites)

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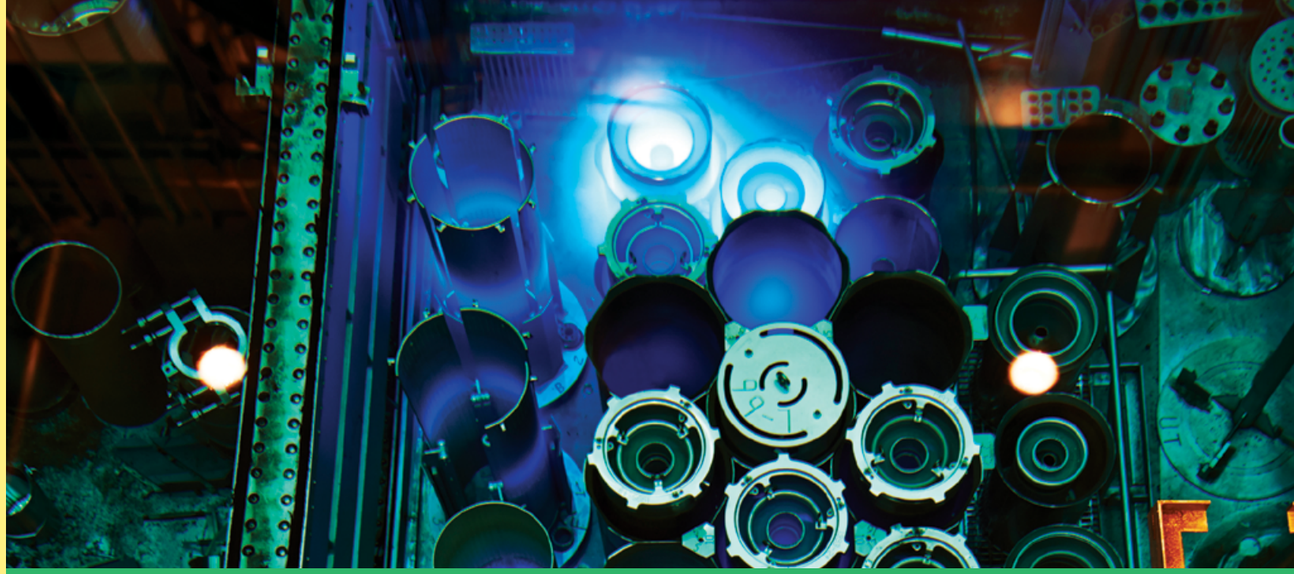
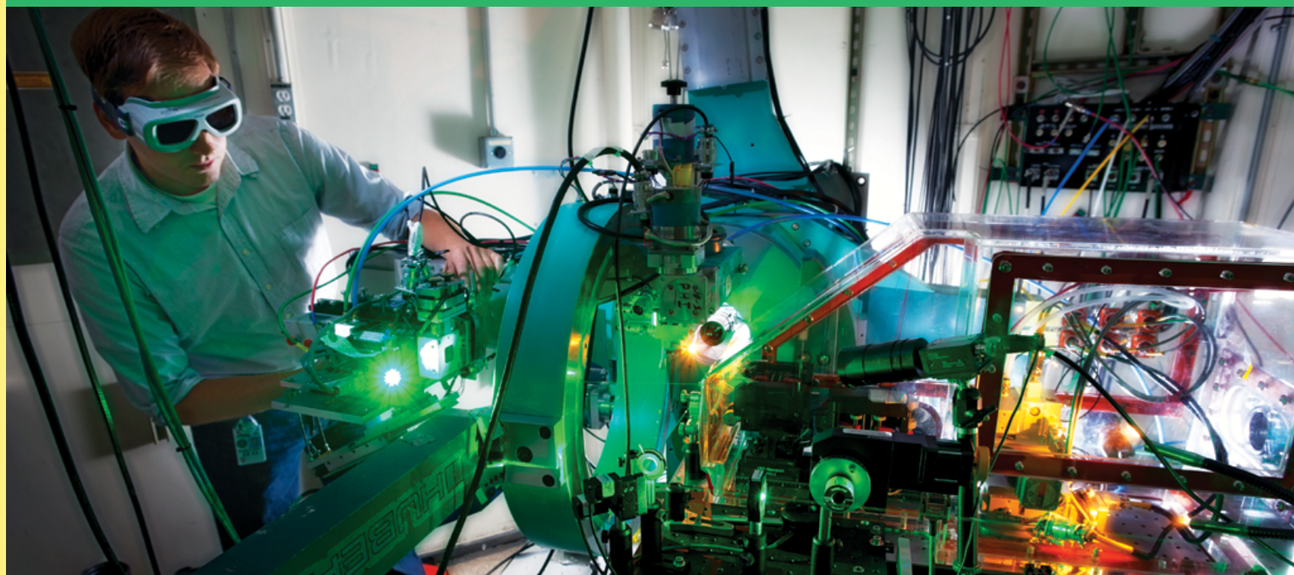


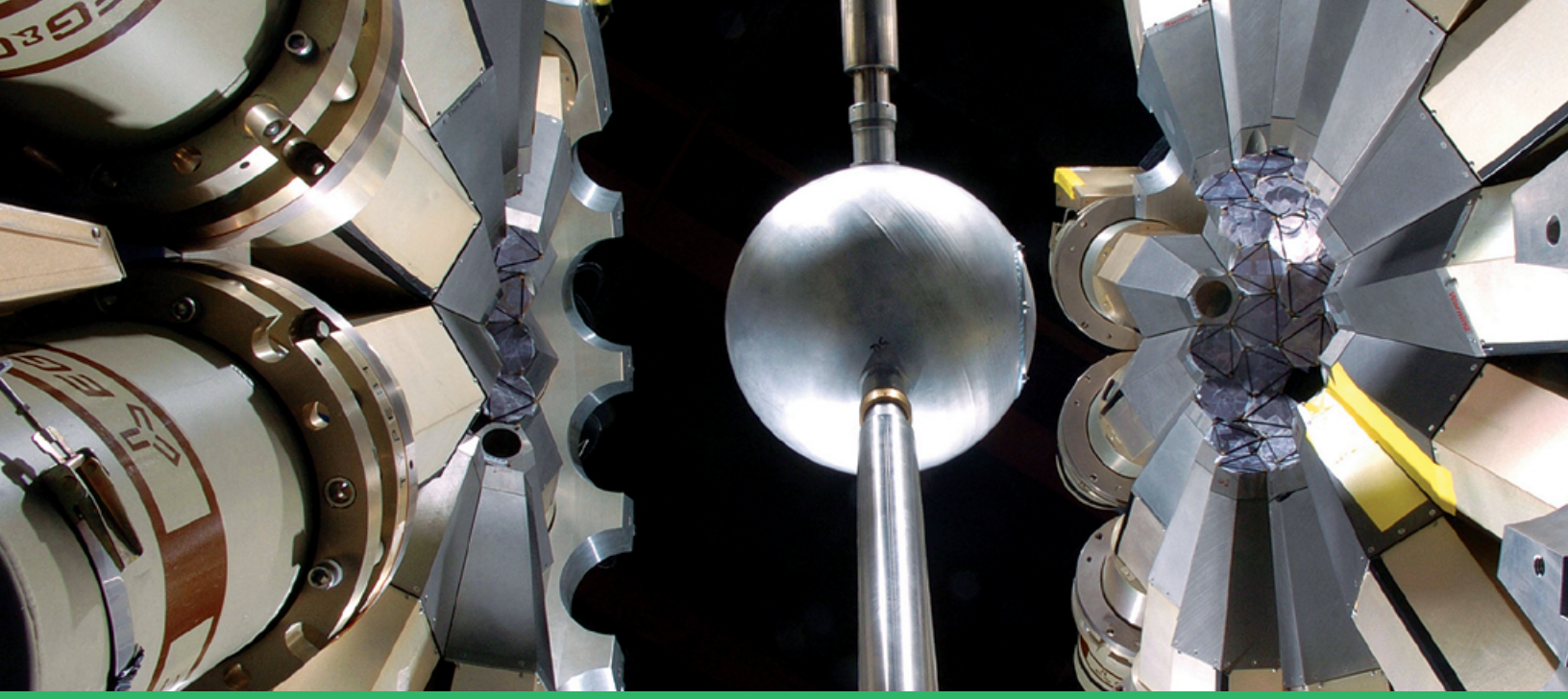
**Above**
The Cherenkov radiation glow in the reactor pool of the High Flux Isotope Reactor from stored fuel elements.
*Credit Enrico Sacchetti, Oak Ridge National Laboratory*

**Back cover top**
The Gammasphere at the Argonne Tandem Linac Accelerator System, the world's most powerful spectrometer for nuclear structure research.
*Credit Argonne National Laboratory*

**Below**
A graduate student researcher at a beam line at the Stanford Synchrotron Radiation Lightsource.
*Credit SLAC National Accelerator Laboratory*

**Back cover bottom**
Simulation of the distribution of water vapor in the climate system produced at the Oak Ridge Leadership Computing Facility
*Credit Oak Ridge National Laboratory*





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