
# *Argonne: Helping to Make the World a Better Place*

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*Washington Foreign Press Center Tour*
*U.S. Department of State*
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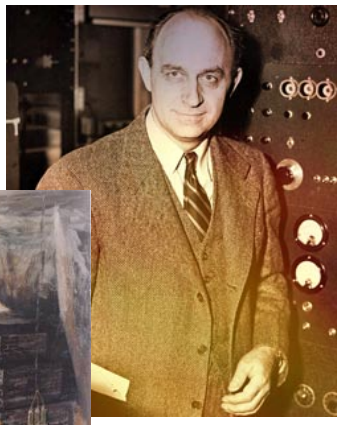
## *Argonne is a Direct Linear Descendent of Enrico Fermi's Metallurgical Laboratory*



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Argonne is a direct linear descendent of the University of Chicago's Metallurgical Lab.

Dec. 2, 1942 – Enrico Fermi and a group of 50 scientists, engineers and grad students produced Chicago Pile 1, the world's first nuclear reactor.

In February 1943, CP-1 was moved to the Argonne Forest section of the Cook County Forest Preserve.

That "Argonne Lab" grew into what is today Argonne National Laboratory


Founded in 1943

Designated a national laboratory in 1946

Managed by UChicago Argonne, LLC for the U.S. Department of Energy

About 2,800 employees, including more than 700 Ph.D.s, and 5,000+ facility users

About $500M budget

1,500-acre, wooded site in DuPage County, Illinois

Broad R&D portfolio

Argonne is a place where scientists and engineers come together to open up new possibilities for the future.

Argonne conducts world-class R&D in support of four core missions:

1. To serve DOE & national security
2. To advance the frontiers of knowledge
3. To create and operate scientific user facilities
4. To provide innovative and effective tools and solutions for energy and environmental challenges to national and global well-being

(Updated May. 2008)

## *Technology and Design for Advanced Nuclear Reactors*

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Argonne developed, designed and tested the prototypes of most of the world's nuclear reactor types:

- Research reactors
- Light-water reactors
- Boiling-water reactors
- Pressurized-water reactors
- Fast reactors
- Early design work on the Nautilus submarine reactor

Nuclear energy is the only large-scale electricity-generating technology that does not emit greenhouse gases

Argonne is the only research center in the United States with the existing capabilities to design advanced nuclear reactors

The emphasis of our recent work has been on
- Treatment of spent nuclear fuel to recover actinides for use as fuel in advanced reactor systems
- Encapsulate fission products in durable waste forms for storage in a geologic repository.

Argonne's research on treating spent nuclear fuel centers on the development of commercially viable technologies that
- Produce a high-quality waste product,
- Can be scaled up to treat fuel from future commercial nuclear power plants,
- Integrate seamlessly with other fuel processing steps and facilities, and
- Are economic.


Main topic — Research at Argonne's Transportation Technology R&D Center

This slide illustrates the wide range of our transportation research.
Can't possibly cover it all, but will tell you about highlights, major components.

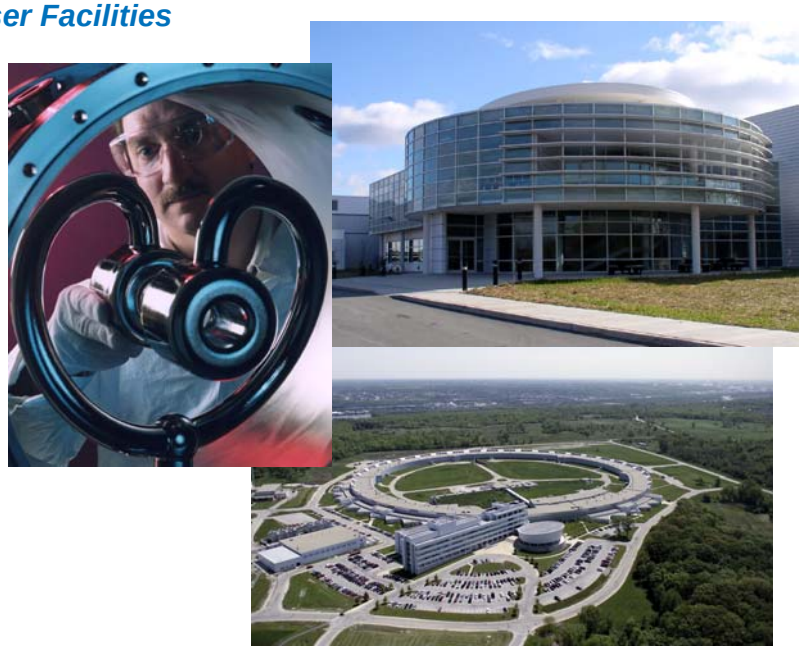
All these programs illustrate how a single multidisciplinary laboratory like Argonne can integrate its many research groups, programs and facilities to help solve important scientific and technological problems that affect everyone.

Transportation R&D is one of the fastest growing programs at Argonne
Supports DOE's goal to develop new automotive technologies that are more fuel efficient and less polluting.

Argonne's transportation research includes
- Advanced batteries and fuel cells
- Alternate-fuel vehicles, including ethanol and hydrogen, as well as hybrid vehicles and diesel engines
- Modeling and testing of systems and components for advanced vehicles
- Student competitions that
  - Help develop innovative ideas for automotive design, and
  - Encourage and advance the education of the next generation of automotive engineers and designers

Argonne works closely with major automotive manufactures.
- USCAR – United States Council for Automotive Research, an umbrella organization for collaborative research among Ford, General Motors and DaimlerChrysler
- Test vehicles, components and designs for other manufacturers, such as Honda and Toyota.

## User Facilities



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Argonne National Laboratory designs, builds and operates national scientific user facilities for the benefit of researchers from industry, academia and government laboratories. These one-of-a-kind facilities attract great minds from all over the nation to solve the society's complex scientific problems.

Argonne operates three major national user facilities for the U.S. Department of Energy's Office of Basic Energy Sciences:

- Advanced Photon Source
- Center for Nanoscale Materials
- Argonne Tandem-Linac Accelerator System

Each year, these three facilities attract more than 5,000 researchers from government, industrial and academic organizations.

(Updated May 2008)

## *Advanced Photon Source*

www.aps.anl.gov

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The Advanced Photon Source provides the most brilliant beams of X-rays for research in the Western Hemisphere

Nation's largest scientific user facility.

A scientific user facility is a specialized facility that scientists from all over the nation or world use for research they can't purchase in the private sector or find on a university campus.

Scientists from all over the world use the Advanced Photon source to conduct experiments in materials science, chemistry, biology, life science, earth and environmental science, physics and many other scientific disciplines.

50 beamlines in operation

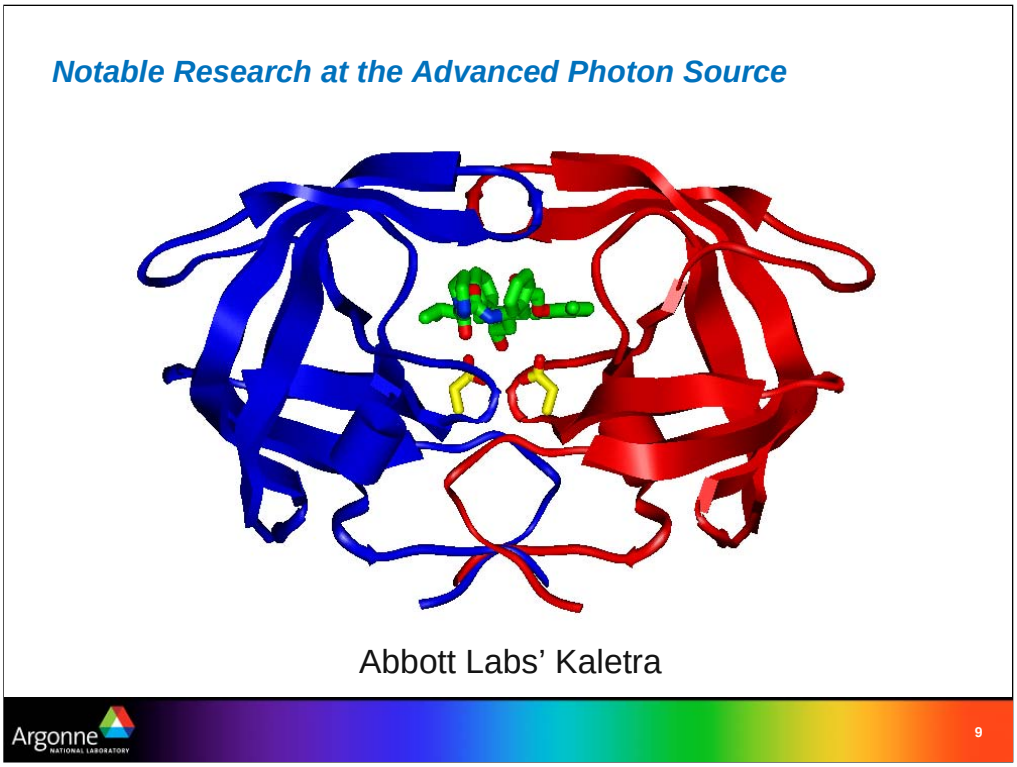
Nearly 3,500 users per year

Operates year-round, 5,000 hours/year

(Updated May 2008)


More than 90 companies and the nation's most prestigious research universities perform experiments at the Advanced Photon Source.

You probably recognize every one of these logos.




Notable research at the Advanced Photon Source

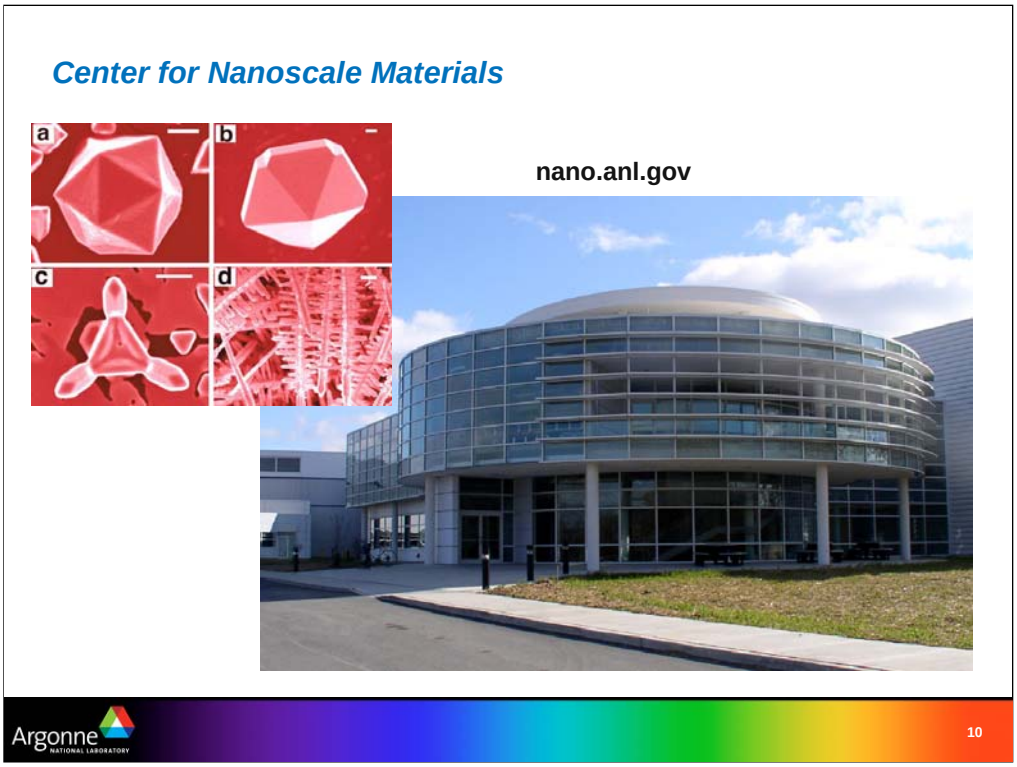
Structural studies of a portion of the HIV virus helped Abbott Labs develop Kaletra, a world-leading drug to fight AIDS

Kaletra is currently the most prescribed drug in its class for AIDS therapy.

Abbott researchers knew that creating an effective anti-HIV drug requires precise design: The drug must be highly target-specific so that it impacts only the point where the drug can be most effective. Also important are the lock-and-key requirements for drug designers. The news drug's molecular structure must lock tightly to the particular structure of the target molecule, while being flexible enough to accommodate changes in that structure. Using the powerful X-rays at the Advanced Photon Source, researchers found the points of attack of the HIV protease inhibitors, biochemical agents that stop HIV from making new copies of itself by blocking the last step in the process, when the virus attempts to replicate.

The image shows a ribbon diagram of a 99-amino acid protein from the HIV virus called HIV protease. Two identical polymer chains of the protein have a crystallographic 2-fold symmetry relationship, and are represented by blue and red ribbons. The drug molecule, Kaletra®, shown in green, is an organic compound that fits inside of the protein and "plugs a hole" that the virus needs to replicate. Two amino acids of high importance in drug binding to the protein are shown in yellow.

(Updated May 2008)




**Center for Nanoscale Materials**

The centerpiece for Argonne's nano-materials research is the Center for Nanoscale Materials

DOE user facility sited at Argonne to foster collaboration between academia, industry and other government laboratories

Nanomaterials possess features only one-billionth of a meter in size

About 70,000 times smaller than the width of a human hair.

Materials display new properties and behaviors – magnetism, conductivity, strength, etc.

Distinctions blur among traditional scientific disciplines – chemistry, physics, biology, materials science

Coming nanorevolution will create new materials, industries and technologies:
Energy — New materials that efficiently harvest light for energy generation.
Medicine — Biosensors to monitor blood sugar levels and inject insulin directly into the blood stream.
Information technology — New ways to manipulate photons and electrons that could lead to a whole new class of information storage and processing devices based on electron spin.
Homeland security — Sensors for the real-time detection of bio-warfare agents, such as anthrax.

(Updated May 2008)

## *Argonne Leadership Computing Facility*

- 556-teraflops (556 and 12 zeros)
- One of world's fastest
- Climate change
- Supernovas
- Operated for DOE's Office of Science


IBM BlueGene/P supercomputer

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**Argonne Leadership Computing Facility**

Operated for DOE's Office of Science to give leading scientists access to world-class computation resources and a dedicated team of computational scientists and engineers to support their research efforts.

ALCF is home to the Blue Gene/P, which can carry out 445 trillion calculations – or 445 teraflops ("flops" is short for floating-point operations) – every second.

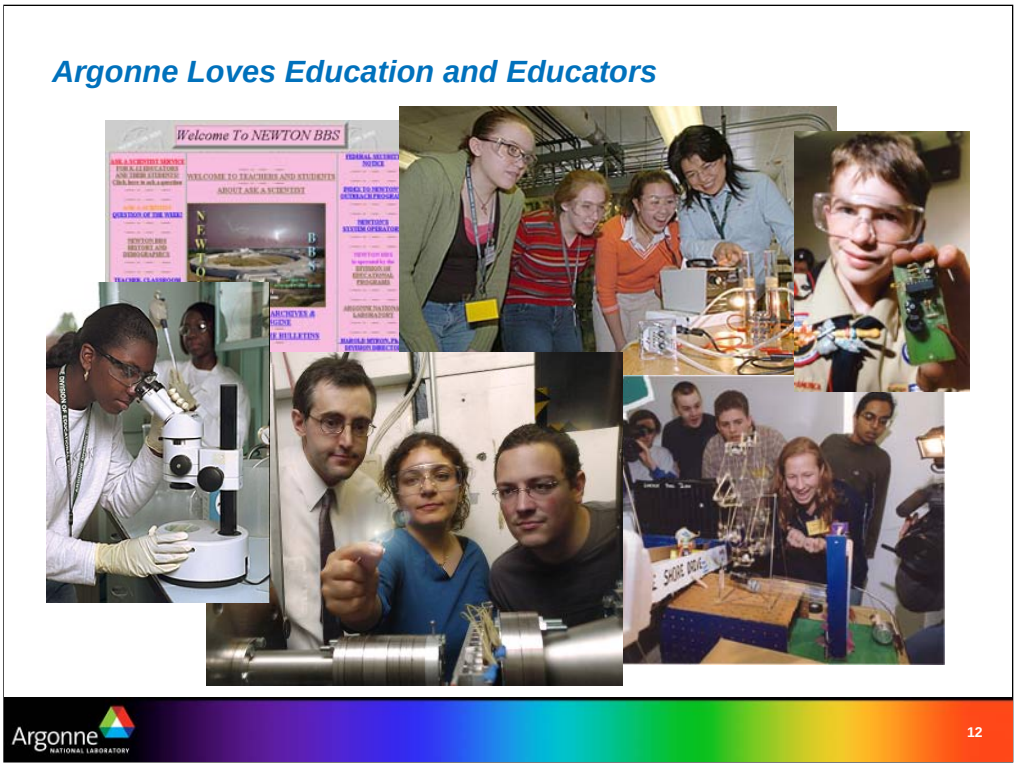
- If all six billion people on Earth tried to work as fast as this supercomputer, each person would need to do more than 70,000 additions or multiplications per second to keep up with it.

Upgrade later in 2008 will increase capability to 556 teraflops.

ALCF spans a spectrum of scientific disciplines. Current projects will allow researchers to:

- Understand the molecular basis of Parkinson's disease
- Assess the impact of climate change on forest ecology
- Study type Ia supernovae
- Design the next generation of reduced-emissions jet engines
- Gain insight into dangerous heart rhythm disorders
- Understand cell membrane processes in bio fuels and toxic organic waste clean up
- Study how water interacts with the surfaces of various materials

(April 2008)




**Argonne loves education and educators**

Argonne as an organization strongly supports education … and has strongly benefited from our associations with educational organizations.

As a research organization, our success depends on a staff of highly educated people.

Many Argonne researchers are educators themselves, holding joint positions of the faculty of the University of Chicago and other universities.

They work regularly with graduate students in their research

One measure of the high value that Argonne employees place on education is that over the years dozens of Argonne employees have held positions on local education boards. They want to ensure that their children receive the best education possible at the K through 12 level.

And over the years, Argonne has maintained the largest educational program of any Department of Energy Office of Science laboratory.

(Updated Feb. 2007)

## *Argonne National Laboratory*

- **Where scientists and engineers come together to open up new possibilities for the future.**
- **Helping to make the world a better place**

**Thank you!**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