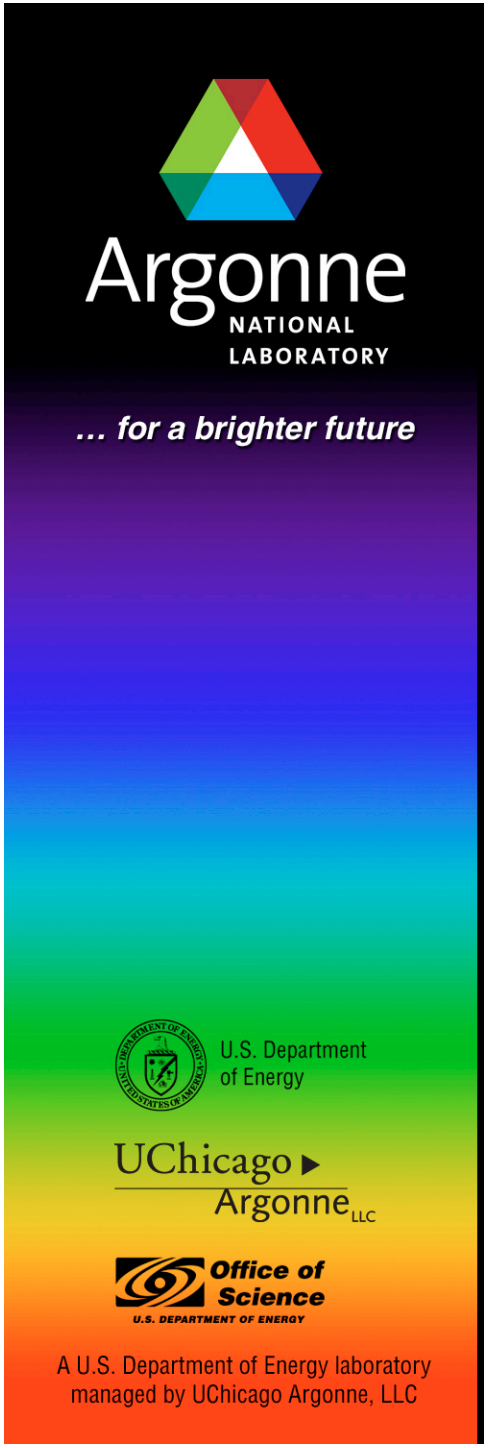


Scientific User Facilities at Argonne

Dennis Mills

Deputy Director, Advanced Photon Source

EPSCoR Annual Program Review and Workshop 2009

July 20-23, 2009

Brookhaven National Laboratory

Hyatt Hotel

Argonne National Laboratory

Basic Argonne Facts

Work force: 2,800 full-time employees

Number of PhDs: 750

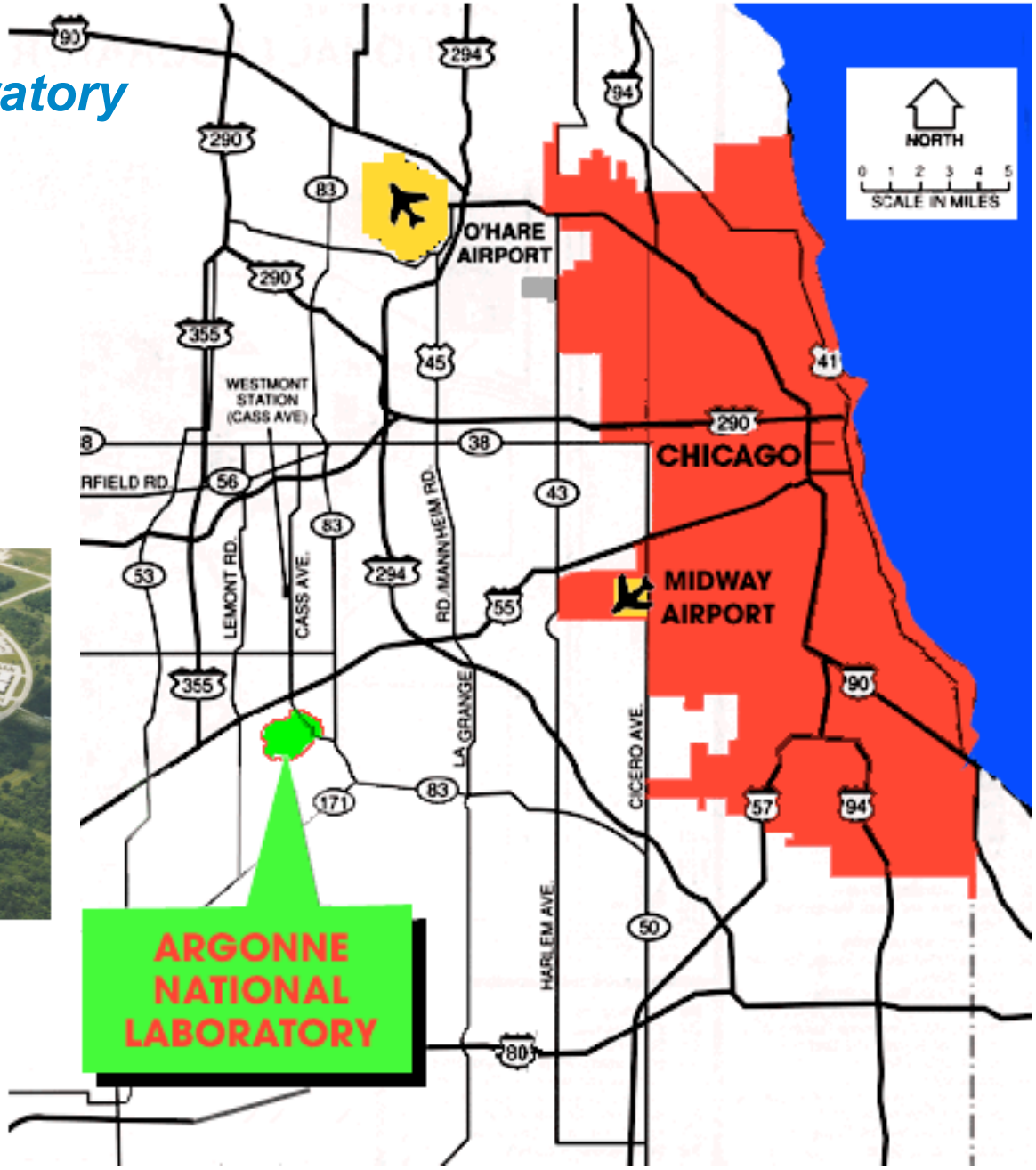
Annual operating budget: $530 million

Location: 1,500 wooded acres in the southeastern corner of DuPage County, near Lemont, Illinois.

Visitors: 50,000 people visit Argonne each year.

Web site: www.anl.gov

DU PAGE COUNTY CAMPUS — Argonne National Laboratory occupies a 1,500-acre wooded site in DuPage County, Illinois.



Areas of Expertise at ANL

Areas of Expertise

Argonne conducts R&D in three broad areas:

- **Basic science** seeks to understand how nature works. This research includes experimental and theoretical work in materials science, physics, chemistry, biology, high-energy physics, and mathematics and computer science, including highper formance computing.

- **Applied science and engineering** help find practical solutions to society's problems. These programs focus primarily on energy resources, environmental management and national security.

- **Scientific user facilities** are large, national research facilities that would be too expensive for a single company or university to build and operate. An example is Argonne's billion-dollar Advanced Photon Source, where researchers from industry, universities and other laboratories around the world study medicine and biology, advanced materials, automotive technology, earth science, chemistry, and many other fields.

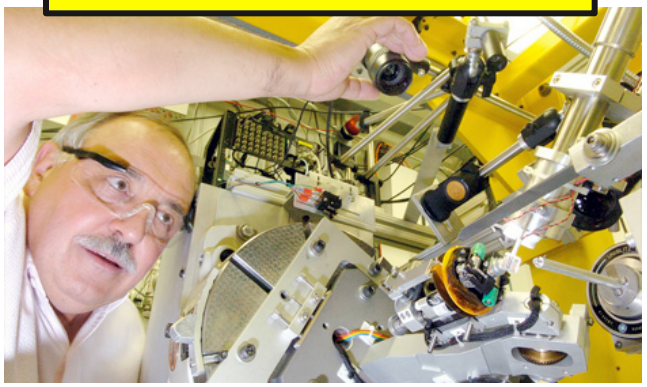
Educational Programs

Argonne's educational programs help inspire and develop the next generation of scientists and engineers through a wide range of hands-on educational programs for faculty and students from K-12 through the Ph.D. level. Each year, more than 3,500 students and faculty members participate in Argonne educational programs.

User Facilities at Argonne

- Funded by DOE Biology and Environmental Research (BER)
  - ***Structural Biology Center (SBC)***
  - ***Atmospheric Radiation Measurement Climate Research Facility***

SBC beamline at the APS



ARM mobile ocean facility

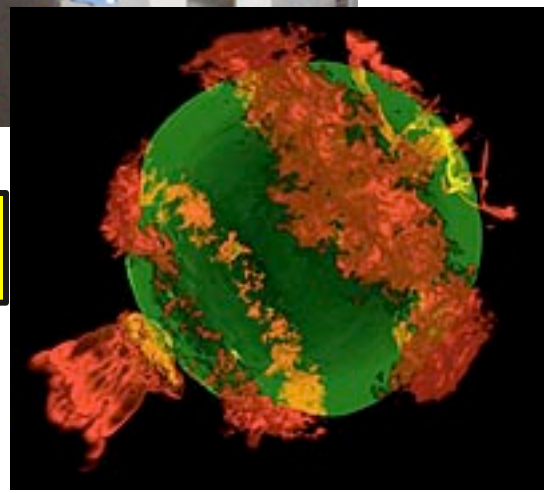
Fragment Mass Analyzer at ATLAS

- Funded by DOE Nuclear Physics (NP)
  - ***Argonne Tandem Linear Accelerator System (ATLAS)***

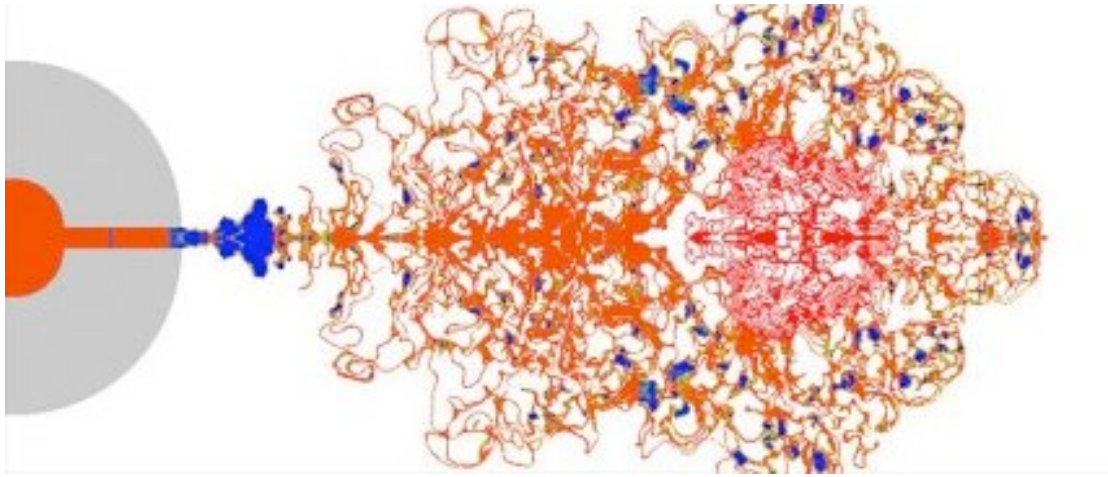
User Facilities at Argonne

- Funded by DOE Advanced Scientific Computing Research (ASCR)
  - ***Argonne Leadership Computing Facilities (ALCF)***

The Blue Gene/P has a peak-performance of 557 trillion calculations per second



Visualization of an exploding supernova created with the IBM Blue Gene/P

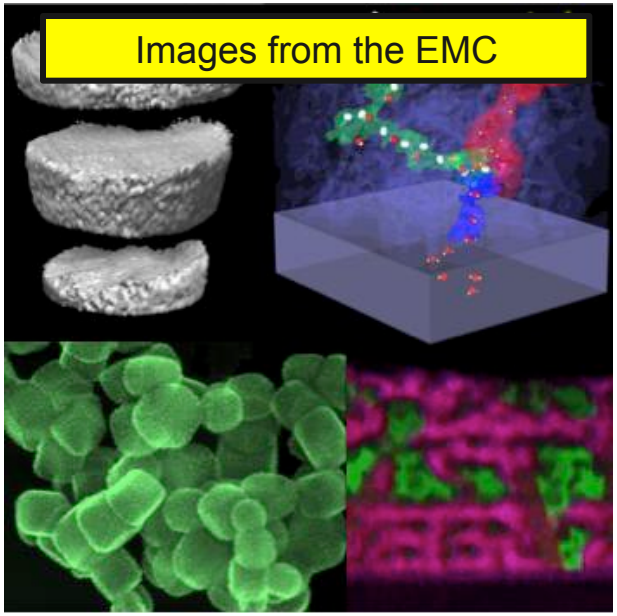


Simulation of injection spray dynamics

- Funded by DOT
  - ***Transportation Research and Analysis Center***

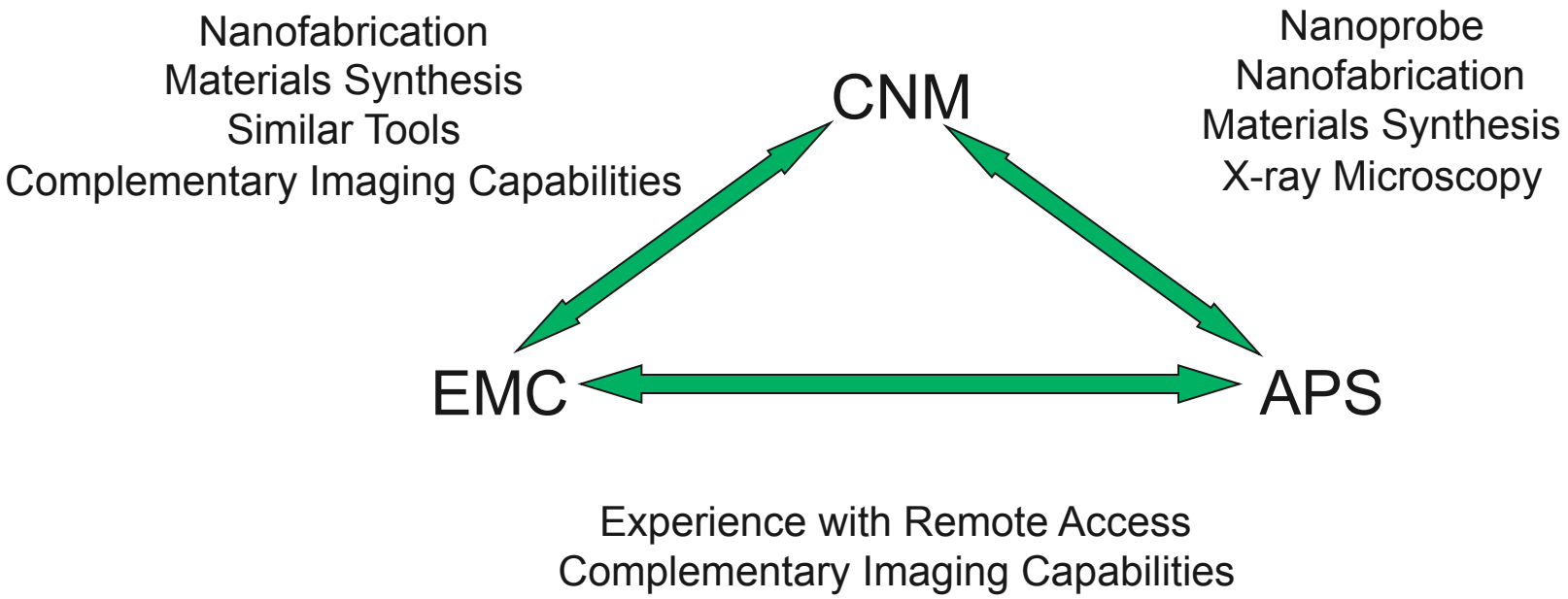
User Facilities at Argonne

- Funded by DOE Basic Energy Sciences (BES):
  - ***Electron Microscopy Center (EMC)***
  - ***Center for Nanoscale Materials (CNM)***
  - ***Advanced Photon Source (APS)***



Synergies

- Technical Synergies within BES-supported facilities



- Together, these three user facilities provide access to the broadest suite of characterization methods possible.

Center for Nanoscale Materials

- Research at the CNM centers around six scientific areas:
  - Electronic & Magnetic Materials & Devices
  - NanoBio Interfaces
  - Nanofabrication & Devices
  - Nanophotonics
  - Theory & Modeling
  - X-Ray Microscopy
- Other CNM facilities and capabilities include:
  - Materials Synthesis
  - Nanofabrication Research
  - Proximal Probes
  - Computational Nanoscience
  - Theme-specific capabilities

The nanoprobe provides X-ray fluorescence, X-ray diffraction, coherent diffraction, and transmission imaging with hard X-rays at a spatial resolution of 30 nm or better.

Electron Microscopy Center

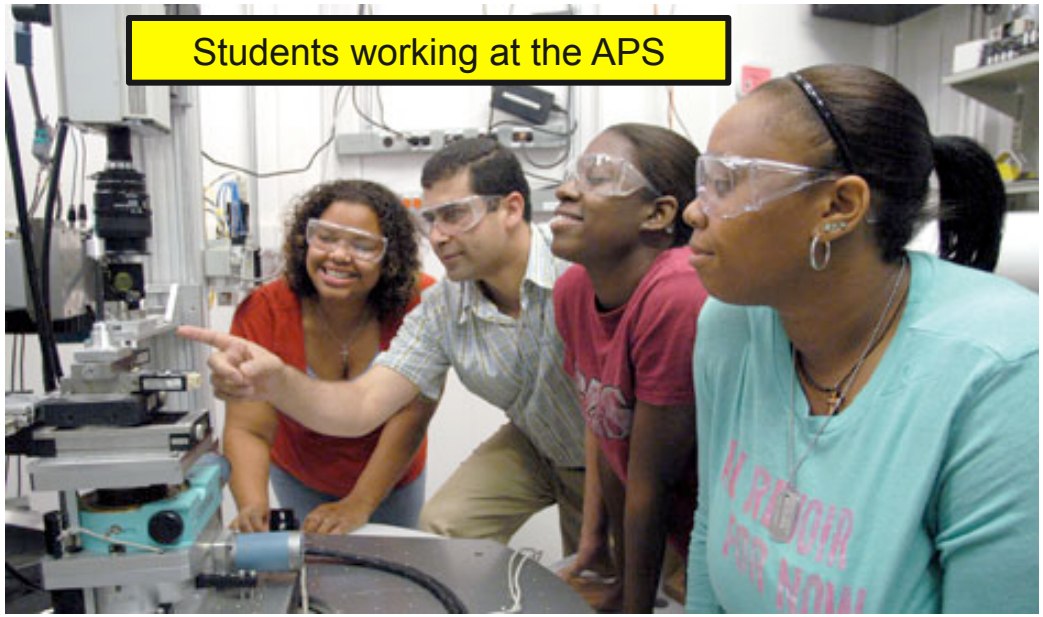
- The Electron Microscopy Center (EMC) for Materials Research develops and maintains unique capabilities for electron beam characterization and applies those capabilities to solve materials problems

- The EMC maintains a leading international role in:
  - In situ studies
  - Ion beam modification
  - Study of superconductors, ferroelectrics and interfaces
  - Instrument design

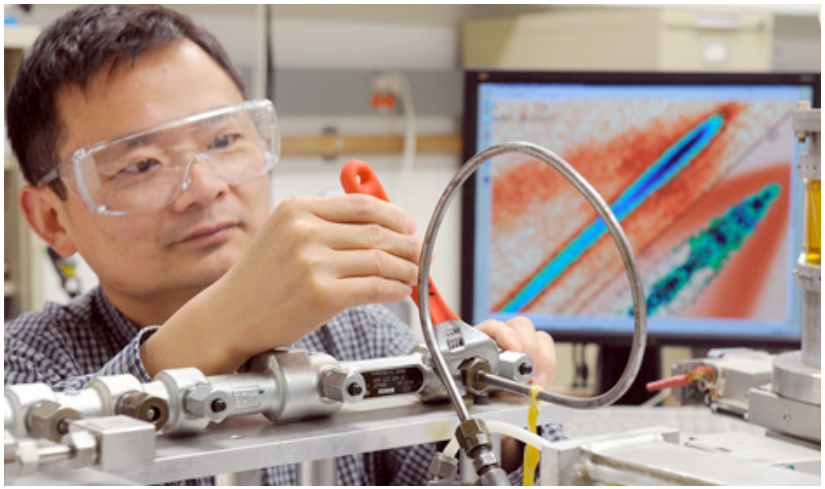
Construction of the Sub-Angstrom Microscopy and Microanalysis (SAMM) Facility for the EMC

Advanced Photon Source

- The Advanced Photon Source (APS) provides this nation's (in fact, this hemisphere's) most brilliant x-ray beams for research in almost all scientific disciplines.



Students working at the APS



Researcher studying fuel sprays from automobile injectors at the APS

- At the APS, researchers work on:
  - Energy related problems
  - Development of new pharmaceuticals
  - Understanding fuel combustion
  - Basic (physics, chemistry, biology….) sciences
  - Applied (materials, engineering,..) sciences
  - Environmental problems

Questions???