Argonne Accelerator Facilities and Infrastructure

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Midwest Launch of Accelerator Stewardship Test Facility Pilot Program

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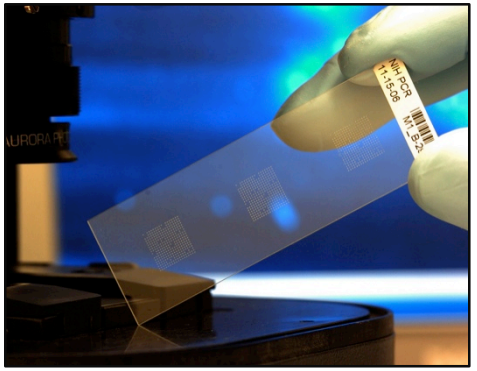
Argonne's mission: To provide science-based solutions to pressing global challenges

Through discovery and transformational research…

World-leading hard x-ray sciences & sources	Discovery science for energy	Leadership computing and computational ecosystem	Fundamental physics and accelerator capabilities	Materials & systems engineering solutions

..and through use-inspired science and engineering

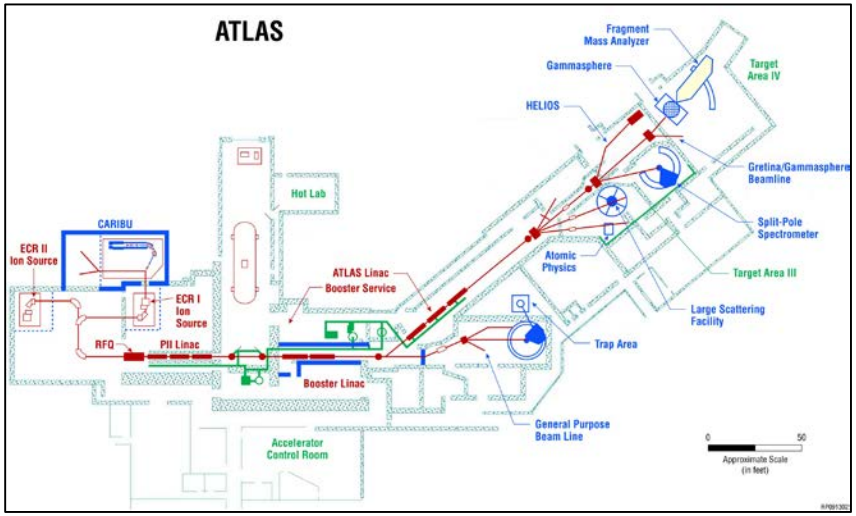
Energy Storage	Sustainable Transportation	Nuclear Energy	Environmental Genomics	National Security



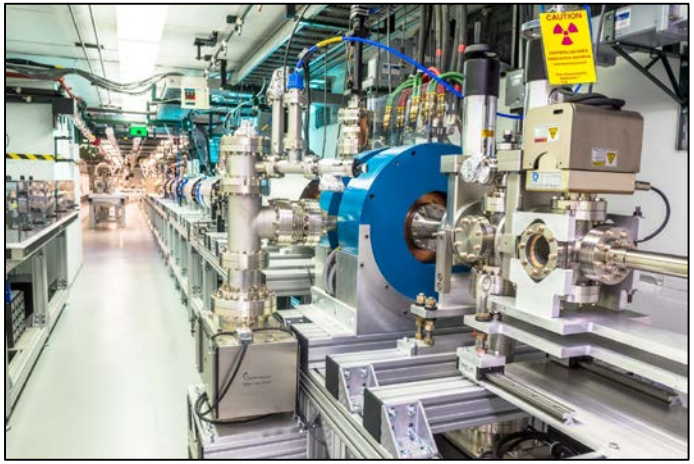
Accelerators at Argonne

Scientific User Facilities and R&D Centers

Advanced Photon Source



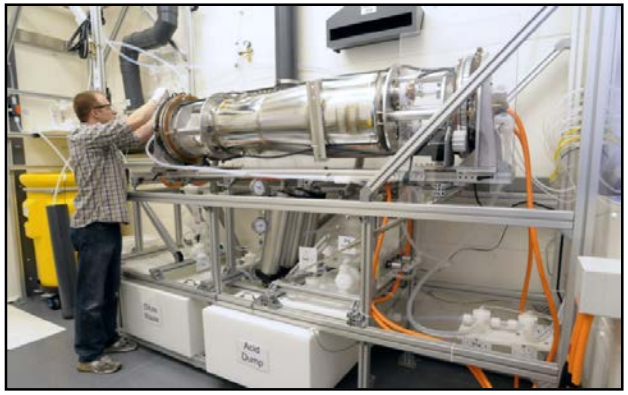
Argonne Tandem Linear Accelerator System

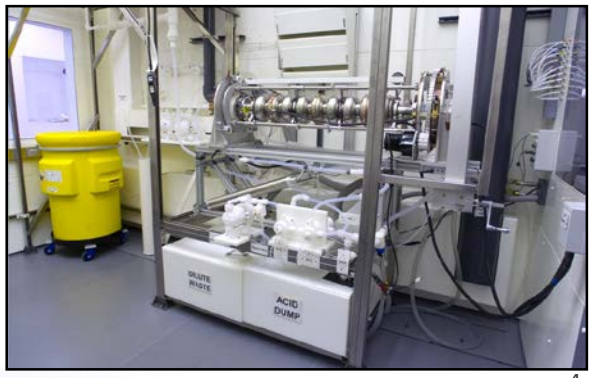


Argonne Wakefield Accelerator

Argonne Capabilities: Superconducting RF

- Superconducting technology provides efficient particle acceleration for:
  - Compact electron sources
  - Free electron lasers
  - Proton, ion, and electron accelerators.
- Advantages: Continuous beams, potential for high power efficiency
- Argonne – home to first SC particle accelerator for projectiles other than electrons
  - Operates suite of state-of-the-art facilities for SRF systems
- Superconducting Cavity Surface Processing Facility, jointly operated by Argonne and Fermilab
  - >300 electropolishing and chemical polishing procedures, >1000 separate cavity high-pressure rinsing operations completed on multiple superconducting cavity geometries
  - Include low-frequency quarter-wave, half-wave, spoke and elliptical cavities from 650 MHz to 1.5 GHz





Argonne Capabilities: Magnet Testing and Production

Argonne is a leader in permanent magnet and superconducting insertion device design/construction

- Insertion Device Measurement System
  - Hall probe and coil measurement capability for point-by-point field maps of undulators or electromagnets, first and second field integrals, and integrated multipole moments
  - Helmholtz coil measurement system for measuring magnetic moment of permanent magnet materials
- Multipole Magnet Measurement System
  - Rotating coil and Hall probe mapping systems for measuring field quality and multipole content of accelerator magnets
- Cryogenic Testing Capability
  - Liquid helium test dewars
  - Two cryocooler-cooled cryostats
- Superconducting Magnet Coil Winding System

Argonne Capabilities: RF Test Stand Facilities

- Particle acceleration is powered by radiofrequency power systems:
  - RF generators, pulsed power sources, control systems, input coupler systems, etc.
- Argonne offers diverse suite of RF power system development and testing capabilities:
  - 352 MHz RF systems, including 1 MW continuous-wave systems
  - S-band RF systems for electron linear accelerators (continuous wave and pulsed)
  - 2 MW DC high-voltage resistive load
  - 150-kV Marx high-voltage pulse generation

Test Stand Console

1 MW Klystron

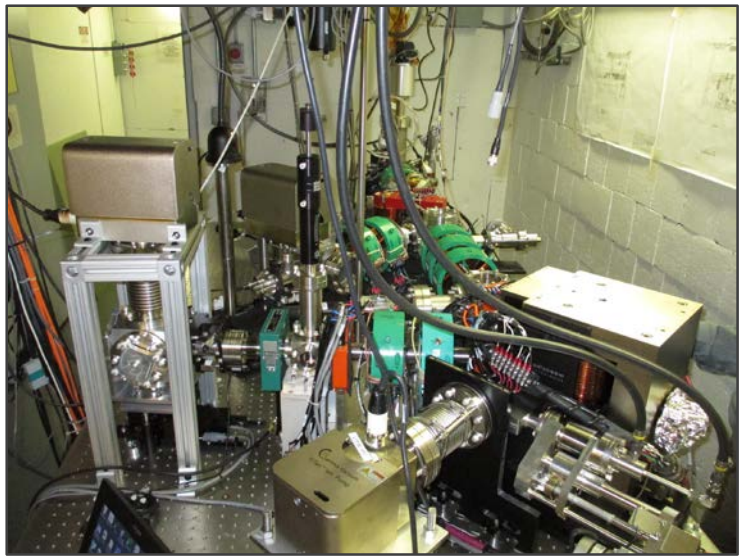
1 MW RF Load

S-band klystron/ modulator

Argonne Capabilities: Particle Beams

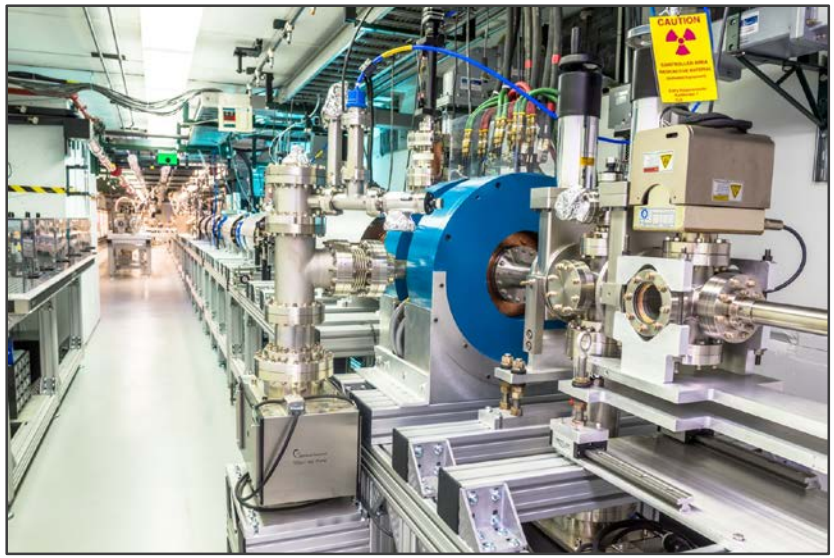
Access to particle beams – an important resource for a wide range of applications

- Argonne operates facilities that produce a wide variety of particle beam types, intensities and energies
  - Electrons from low to high energy (3 MeV to 650 MeV)



APS Injector Test Stand

- For thermionic and photocathode testing
- 3-6 MeV beam energy

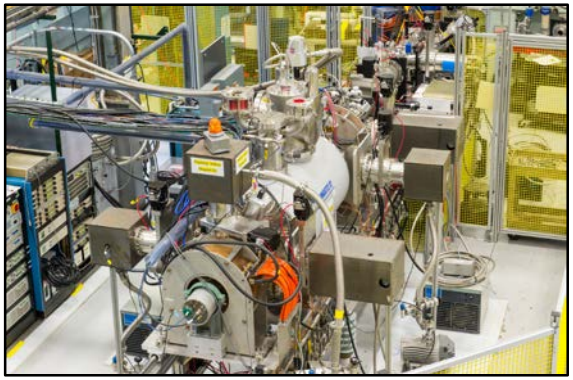


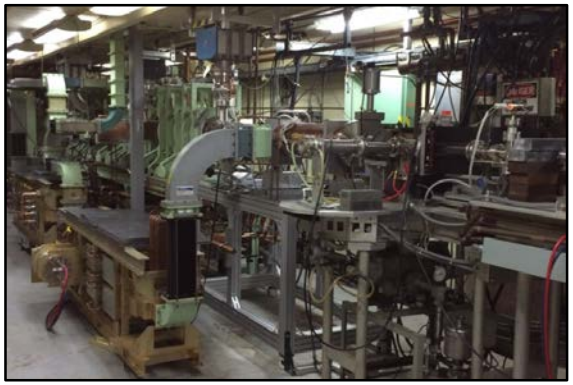
Argonne Wakefield Accelerator

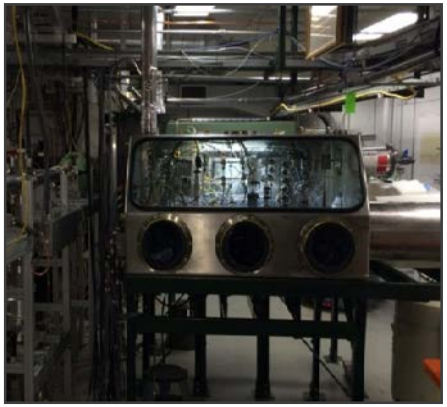
- World's two highest-charge RF photoinjectors (drive and witness)
- Both capable of 100 nC per bunch
- Drive bunch creates 1.3 GHz trains with total charge ~1000 nC in various formats

Argonne Capabilities: Particle Beams

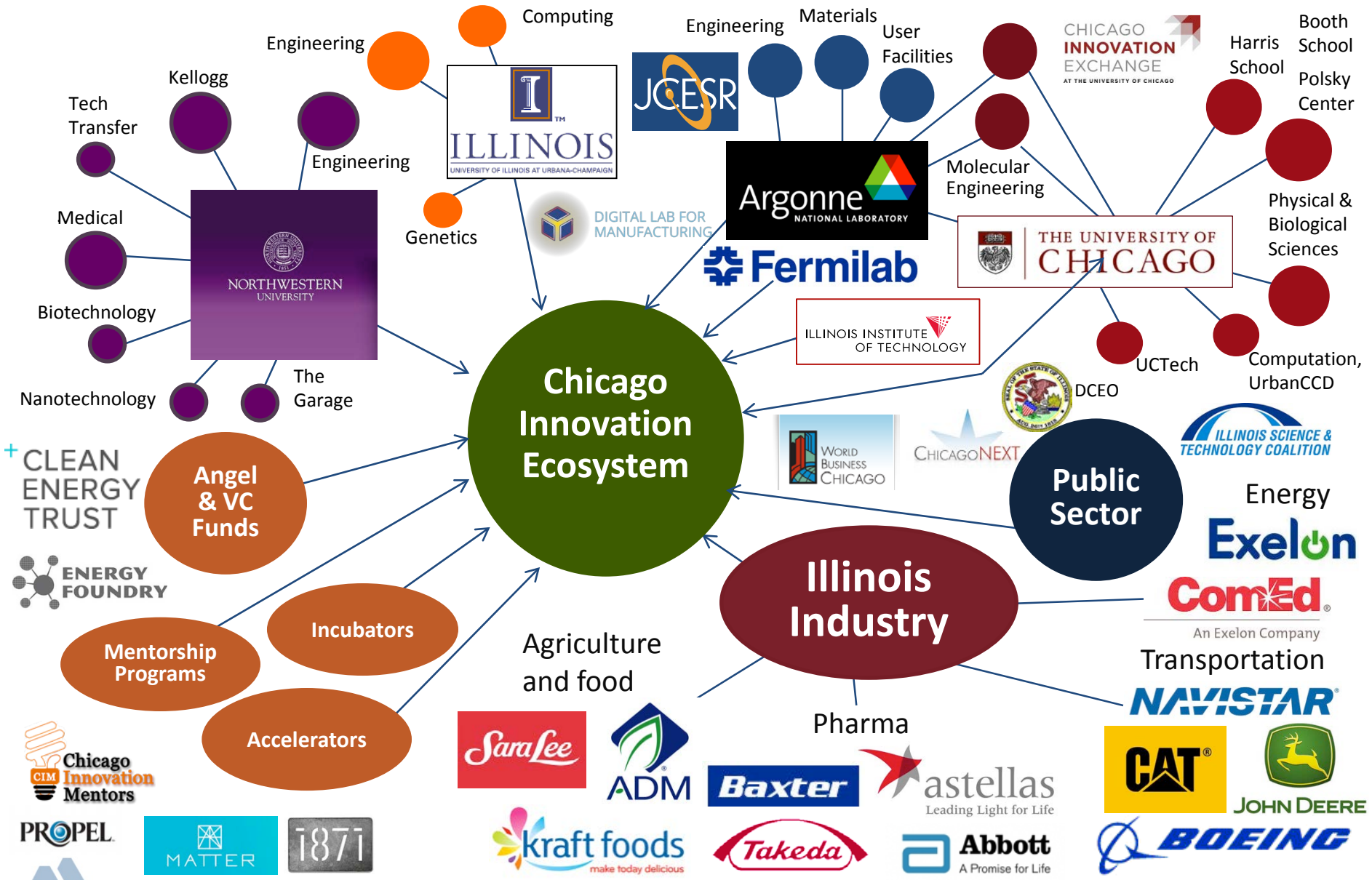
- ATLAS stable ion sources and charge breeders for rare isotope beams.
  - Electron Cyclotron Resonance (ECR) Ion sources; can produce any ion, from hydrogen to uranium.
  - One ECR is used as a charge breeder for singly-charged rare isotopes extracted from californium fission source.
  - A charge breeder based on Electron Beam Ion Source (EBIS) has been developed
- 55 MeV Electron Linac Facility
  - Energy 20-55 MeV; 1 mA maximum current, delivered to multiple target stations
  - Production of medical isotopes: i.e. Mo-99, Cu-67, etc.
  - Radiation chemistry; Radiation damage studies.
  - Facility includes hotcells and gloveboxes for radiochemistry processing
- 3 MeV electron Van de Graaff
  - Used to study radiation chemistry, radiation-induced defects in solids and radiation stability of equipment and components



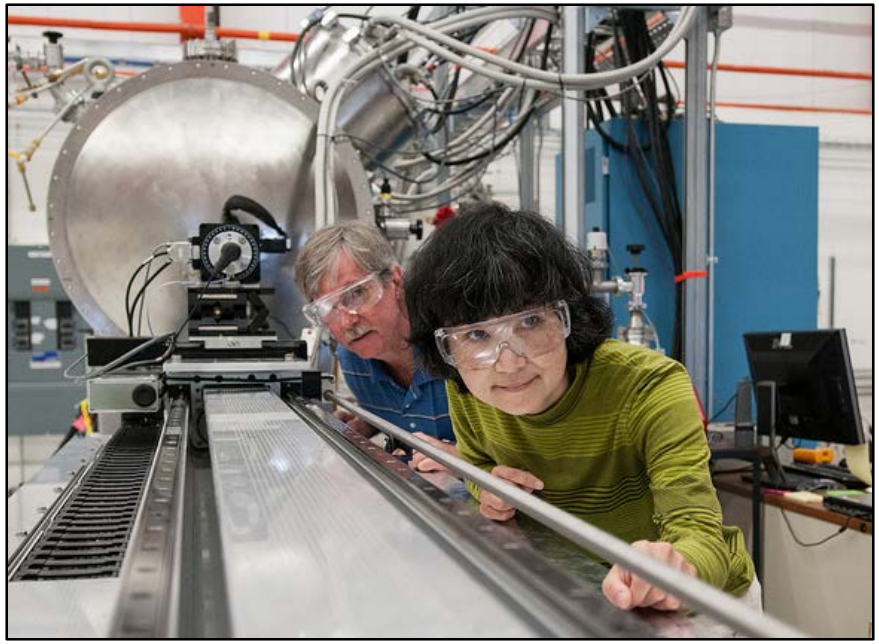




Argonne: Key part of regional innovation ecosystem



Working with you is central to our mission of discovery



- Argonne's mission-driven R&D is directed toward development of new technologies, new products, new systems and even new industries
- Our exceptional research infrastructure is matched by our world-class staff – and we are committed to successful collaborations with partners in industry

Our track record of industrial innovation and partnership is impressive:

- 73 R&D 100 Awards
- 35-40 new patents and 25 new licenses each year
- Hundreds of industrial users from across the nation

We look forward to opening our doors, expanding our partnerships, and exploring new opportunities to work with you to develop exciting, productive and innovative accelerator applications and technologies