Building a Digital Archive of the National Synchrotron Light Source (NSLS)

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Courtesy Brookhaven National Laboratory
From NSLS...

- One of 4 DOE-supported synchrotron facilities
- 2 electron storage rings that produce synchrotron light
- 59 beamlines operate simultaneously
- Operates 24/7, 10 months per year
- Running today
- 2,400 users every year
- Users typically stay 2-4 days in on-site housing

X-Ray
2.8 GeV
300 mA

VUV-IR
0.8 GeV
1.0 A
Biomineral Imaging

X12C: protein crystallography, ferritin structure and iron release
X14A: surface diffraction, minerals at organic templates
Difference, microstructure and nanoindentation of bone.
Powder diffraction, microbial synthesis of magnetites
X15: diffraction enhanced imaging
X17B1: high-energy diffraction, kinetics of CaCO₃ scale formation
X18A: diffraction, CaCO₃ precipitation
X19A: XAFS, fish otolith
X20A: microbeam diffraction, abalone nacre interface
X21A: microbeam diffraction, mollusk shell organics
X26A: microbeam, mollusk shell organics
X27C: SAXS/WAXS
collagen/mineral structure
U10B: Infrared microspectroscopy, bone/tissue imaging
X22A, X22B: reflectivity and diffraction, mineralization of films

Courtesy Brookhaven National Laboratory
NSLS Users

Users' field of research breakdown:

- life sciences: 42 percent
- materials science: 29 percent
- geosciences and ecology: 13 percent
- chemical sciences: 5 percent
- optical/nuclear/general physics: 5 percent
- applied sciences and engineering: 3 percent
- unknown: 3 percent

Geographical user distribution:

- New York only: 33 percent
- Northeast (not New York): 33 percent
- Non-northeast: 20 percent
- Foreign: 14 percent

Users by affiliation:

- academic: 72 percent
- BNL employees: 10 percent
- industry/corporate: 7 percent
- other labs and affiliations: 6 percent
- DOE employees (non-BNL): 2 percent
- Federal agencies (non-DOE): 2 percent

Beamtime used by field of research:

- materials science: 39 percent
- life sciences: 22 percent
- environmental and geosciences: 11 percent
- applied sciences and engineering: 10 percent
- other: 6 percent
- optical/nuclear/general physics: 5 percent
- chemical sciences: 4 percent

Courtesy Brookhaven National Laboratory
Distinctive Features of New Big Science Research

1. Integration of industrial presence from beginning
2. Scope and complexity of interdisciplinary networks
3. Proliferation of subfacilities
4. Formation of knowledge
5. Research Culture
Investigating the Research Ecosystem

- Operational history
- Administrative History
- Functional History
- Publication History
- Discovery History
- Disciplinary History
science.energy.gov/user-facilities/user-statistics/

Credit:

DOE Office of Science visualization using Maptive, powered by Google Maps APIs.
New Big Science Research Features

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Courtesy Sandia National Laboratory
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6. Krinsky Effect

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6. Krinsky Effect
7. Regulation
8. Formation of Knowledge
Challenges of the New Big Science
For Managers/Researchers

• Intellectual Property
• Timely Access
• Presenting the Political Case
• Presenting the Scientific Case
Challenges of the New Big Science
For Historians

• What research was carried out at each port, with what instruments, associated with what work at other ports?
• How long did each research program last?
• How was it funded?
• With what industrial/academic/other collaborators?
• With what applications?
• Associated prizes, grants, publications, patents, educational programs (high school and summer school programs, undergraduate and graduate theses served, Westinghouse awards), etc.
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