Brookhaven National Laboratory

U.S. DEPARTMENT of ENERGY

Welcome to NSLS-II

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NSLS-II

NSLS-II is a **DOE Office of Science user facility** that provides **high-brightness synchrotron radiation** from the far infrared (down to 0.1 meV) to the hard X-ray regime (>100 keV), enabling **high-impact science** across disciplines through world-leading **capabilities and expertise.**

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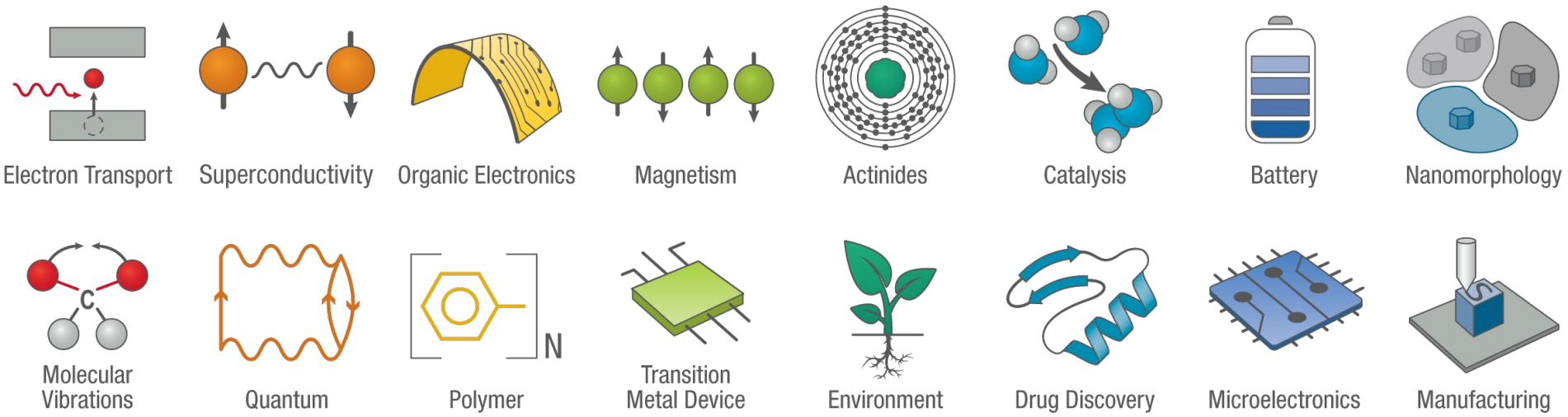
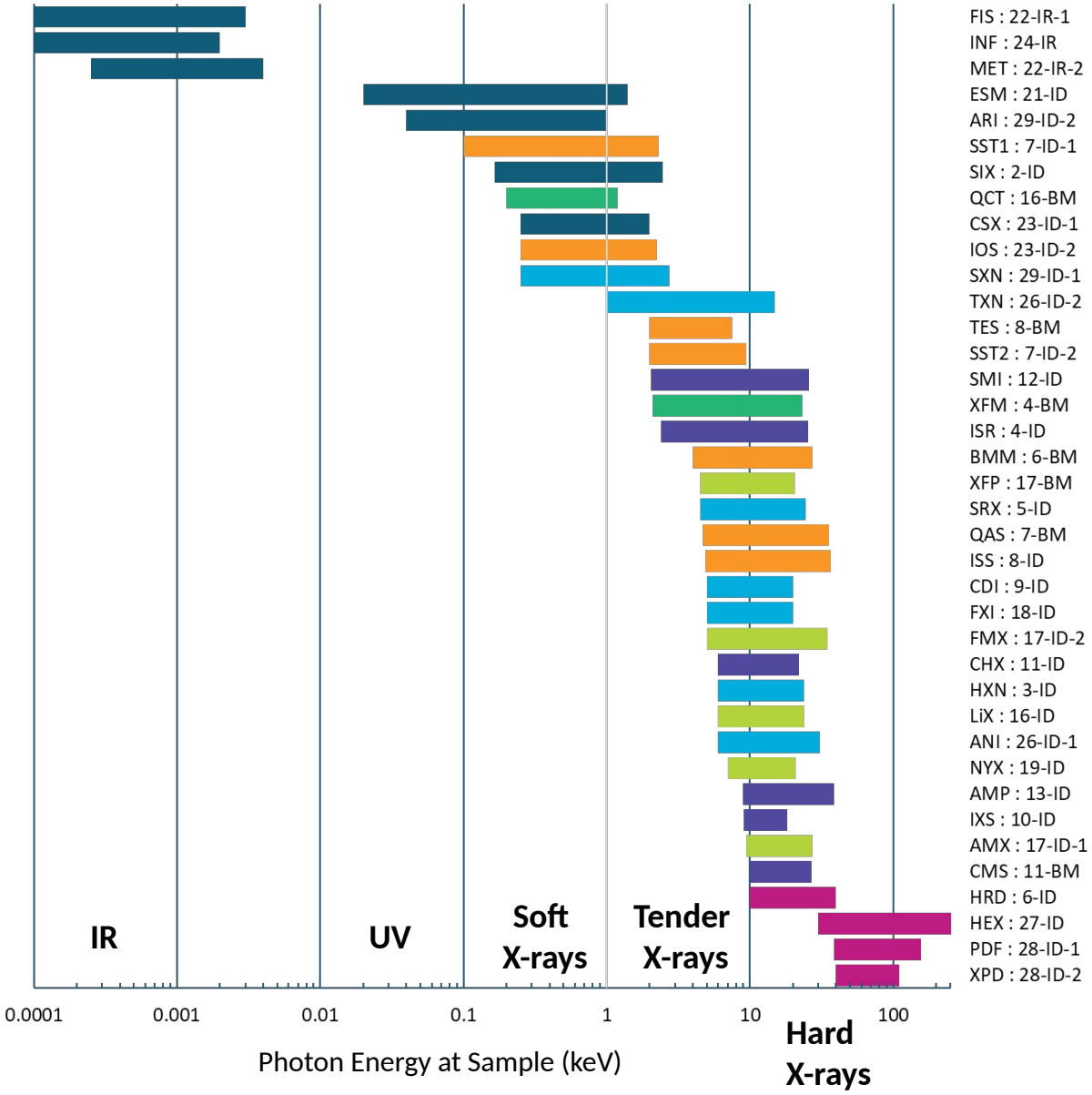
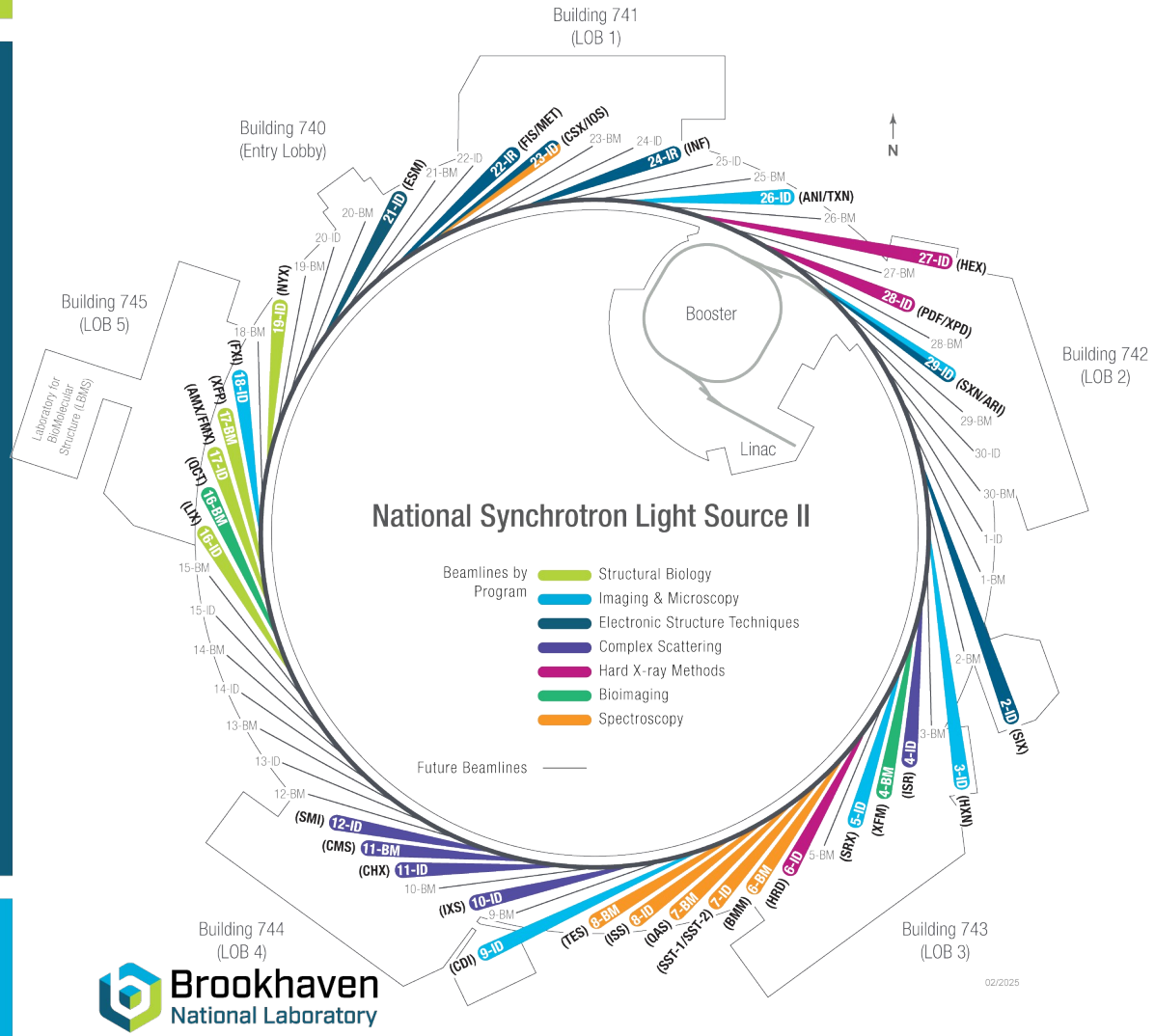


NSLS-II Beamlines and Programs



- Spectroscopy
- Imaging & Microscopy
- Complex Scattering
- Hard X-Ray Methods
- Electronic Structure
- Structural Biology
- Bioimaging

NSLS-II Accelerator and Beamlines



NSLS-II Accelerator Parameters

- Storage Ring Energy 3.0 GeV
- Circumference 792 m
- Beam Current 400 – 500 mA
- Horizontal Emittance ~0.75 nm-rad
- Vertical Emittance ~30 pm-rad
- Pulse Lengths 2.7-4.3mm, 10-15ps

NSLS-II Beamline Portfolio

- 29 beamlines currently operating (capacity for 58)
- 21 beamlines funded and operated by DOE BES
- 3 beamlines supported by NIH and BER
- 5 beamlines constructed and operated with partner funding (NIST, Case Western Reserve University, New York Structural Biology Center)

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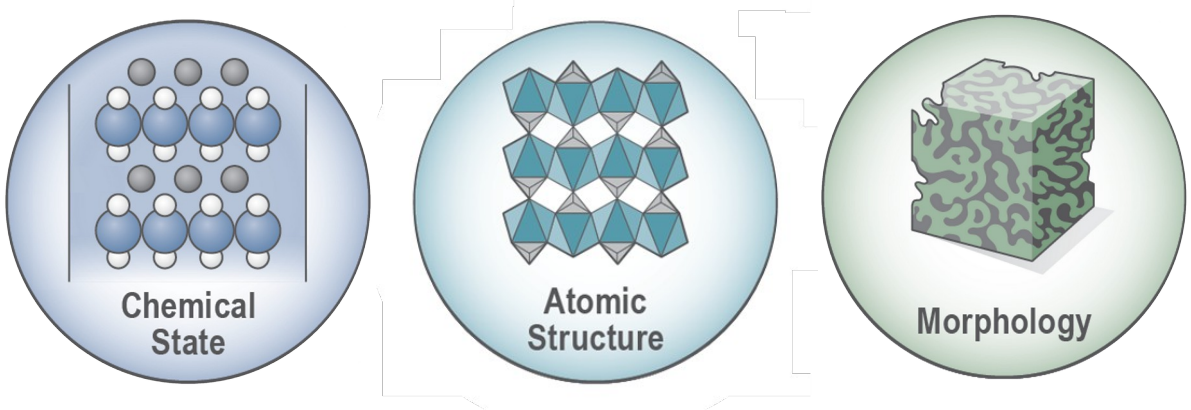
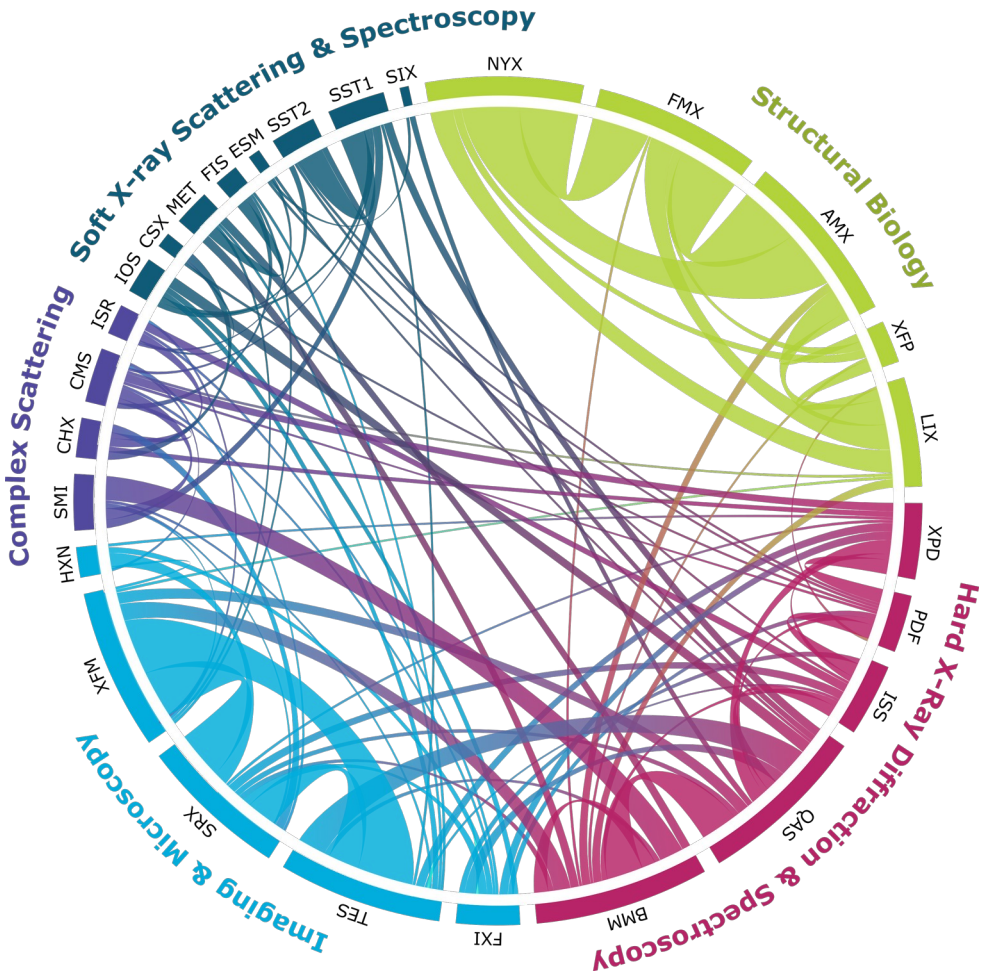
Multimodal Experiments at NSLS-II

NSLS-II enables multimodal experiments combining spectroscopy, scattering and imaging techniques provide complementary and detailed **information on complex systems and processes.**

Spectroscopy **Diffraction** **Imaging**





Lines connect beamlines that carry out multimodal experiments. The thickness of the lines is the number of proposals that ran on the 2 beamlines.

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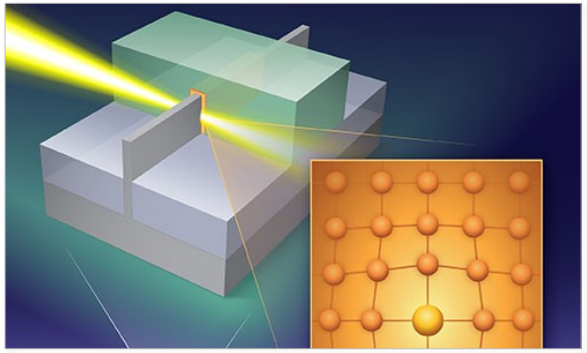
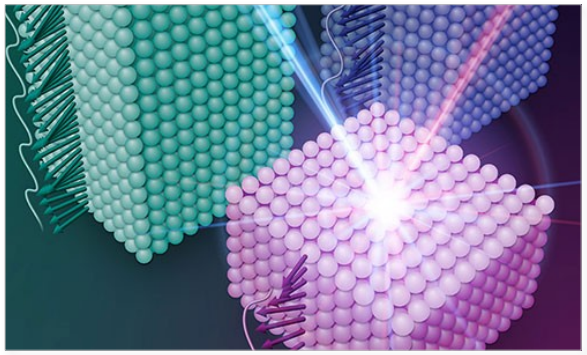
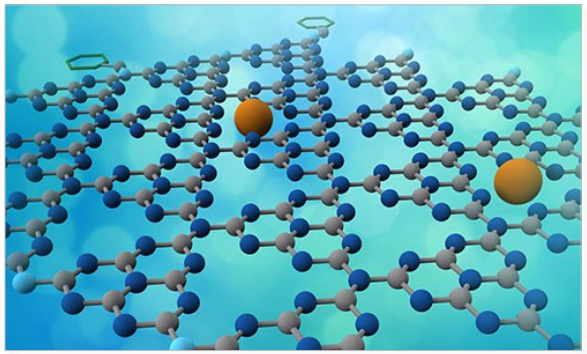
Science at NSLS-II



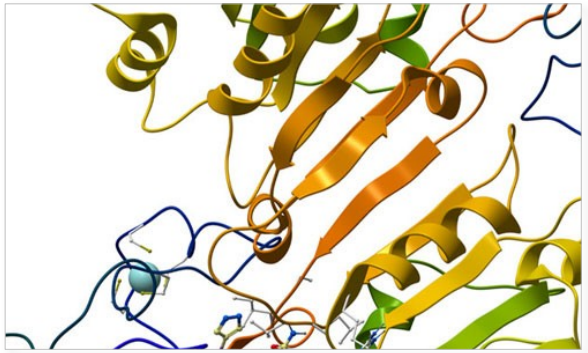
Materials Science and Materials Processing



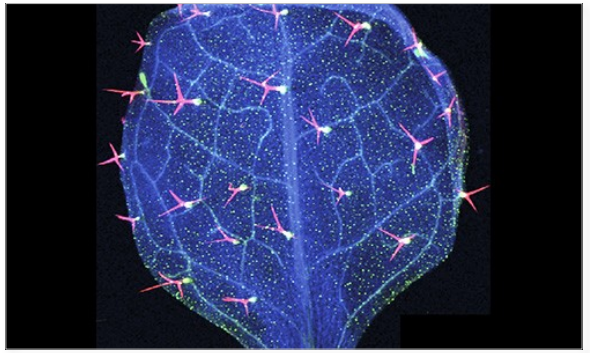
Condensed Matter Physics



Chemical Transformations and Catalysis

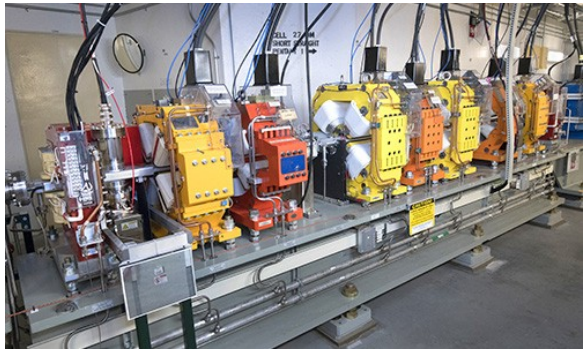


Life and Biosciences



Earth and Planetary Sciences

Accelerator Science



Data Science

NSLS-II | BY THE NUMBERS

FY 2025

Together, we shine light on the world's most challenging problems

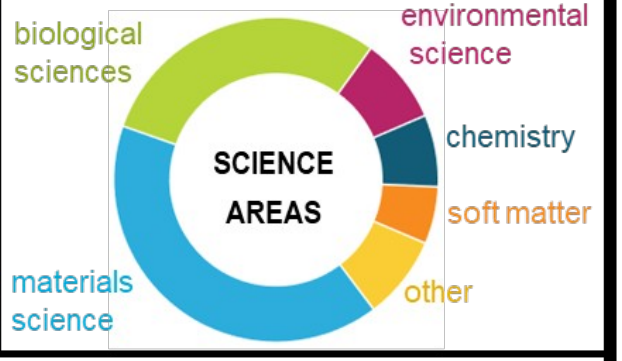
2,330 unique users:
- 351 institutions
- 214 universities
- 35 companies
- 46 states
- 24 countries

>8900 user visits

29 beamlines
- 20 partner users
- 5 partner beamlines

739 papers published
- 56% in high-impact journals
- >133,000 citations of NSLS-II papers

RESEARCH COVERING:
- 41% materials science
- 29% biological sciences
- 9% environmental science
- 7% chemistry
- 6% soft matter
- 8% other



Fractions based on number of users

>2800 proposals submitted
>1100 proposals run

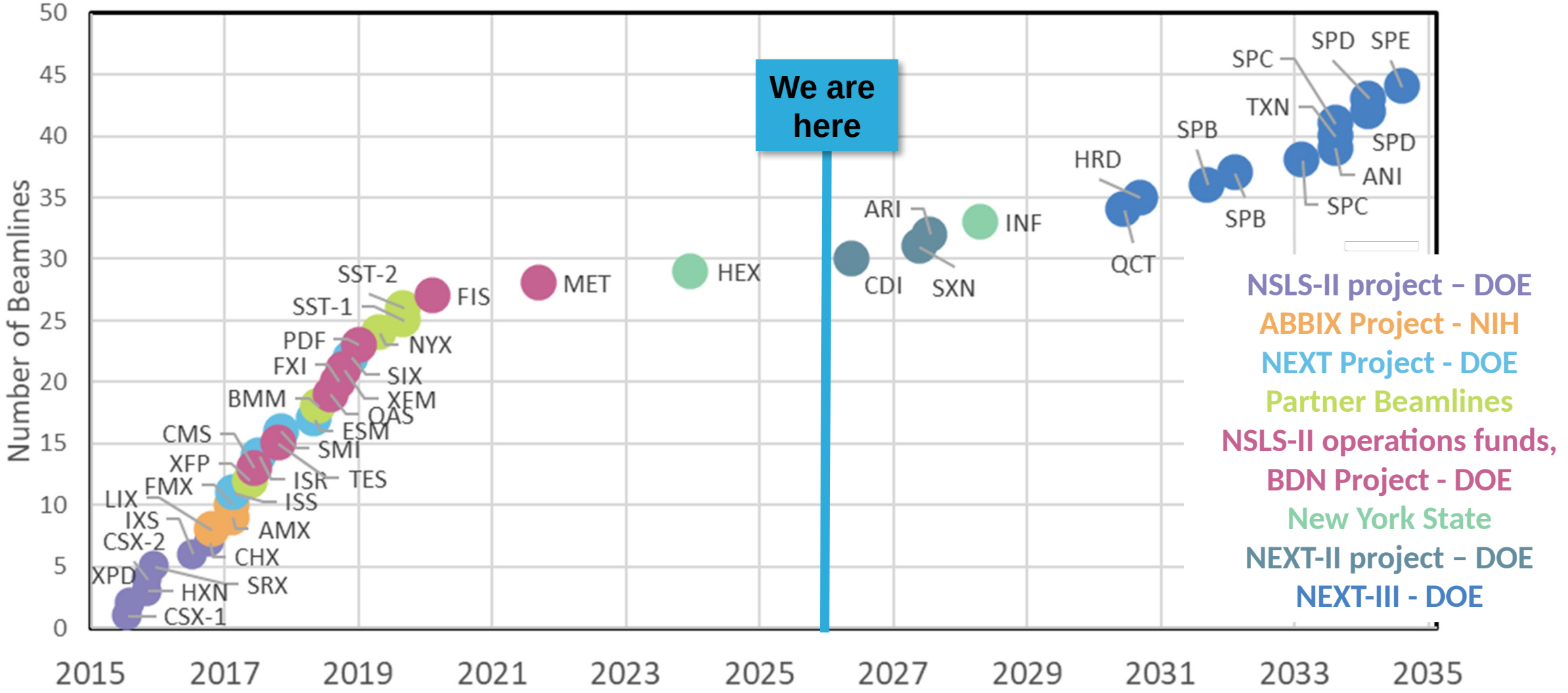
~227,000 hours of beam time requested
~98,000 hours of beam time used
2.3x beam time oversubscription rate

97.6% accelerator reliability

$181.1 M spent
- $151.6 M (BES-SUF)
- $29.5 M (other)

19 conferences, workshops, training courses hosted

NSLS-II Beamline Build Out



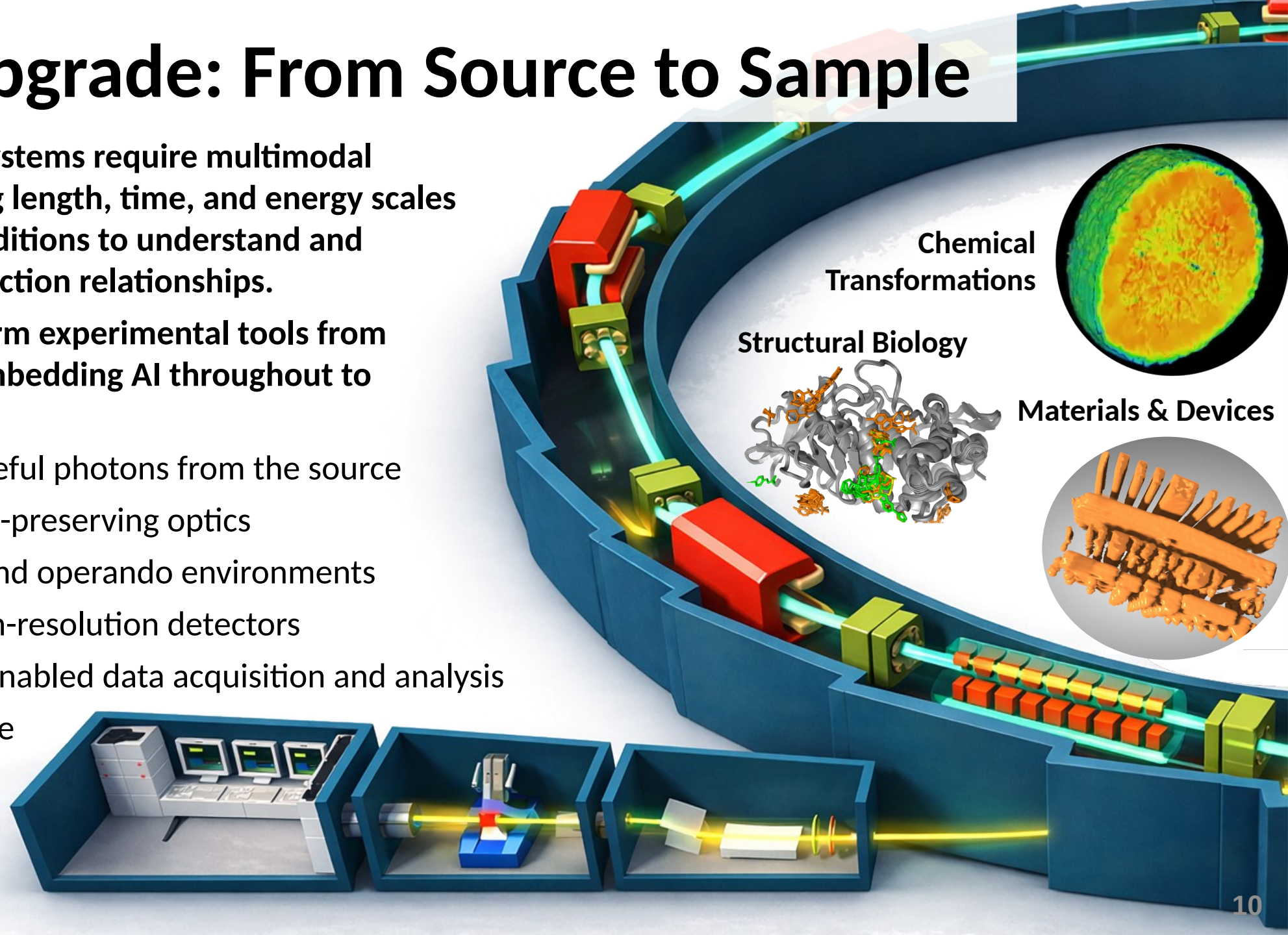
Partner Beamlines are funded and operated by NIST (SST-1, SST-2, BMM),
Case Western Reserve University (XFP), and the New York Structural Biology Center (NYX).

NSLS-II Upgrade: From Source to Sample

Complex, dynamic systems require multimodal approaches spanning length, time, and energy scales under operando conditions to understand and control structure-function relationships.

NSLS-IIU will transform experimental tools from source to sample, embedding AI throughout to accelerate discovery.

- 100× increase in useful photons from the source
- Efficient, coherence-preserving optics
- Real-world in situ and operando environments
- High-efficiency, high-resolution detectors
- 10–100× faster AI-enabled data acquisition and analysis
- Autonomous sample synthesis and processing



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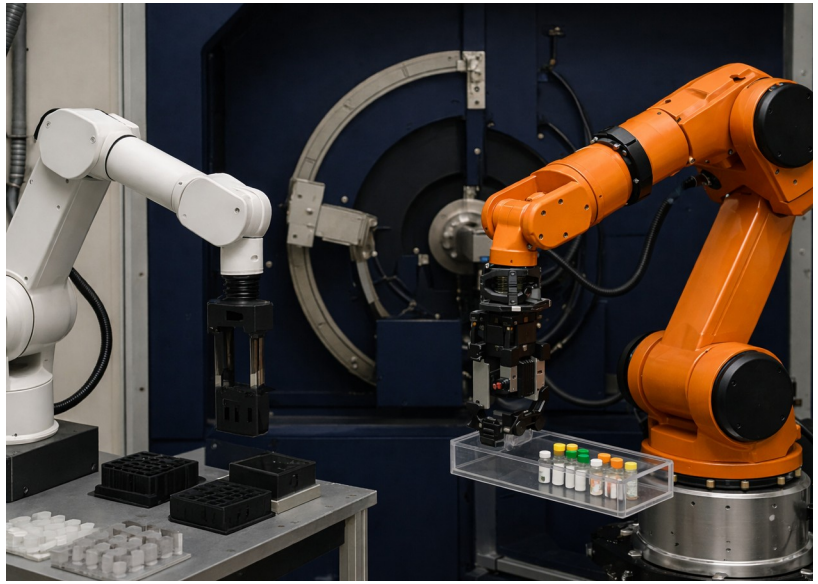
A Typical User Experiment at NSLS-II in the Near Future

A user team develops thousands of samples.



The samples and synthesis platform are autonomously integrated into one or more high throughput X-ray experiments at NSLS-II.

Users and staff collaborate with AI to run experiments, analyze data, and select promising candidates for further R&D.

Discoveries are made, results are disseminated, science and technology advances.

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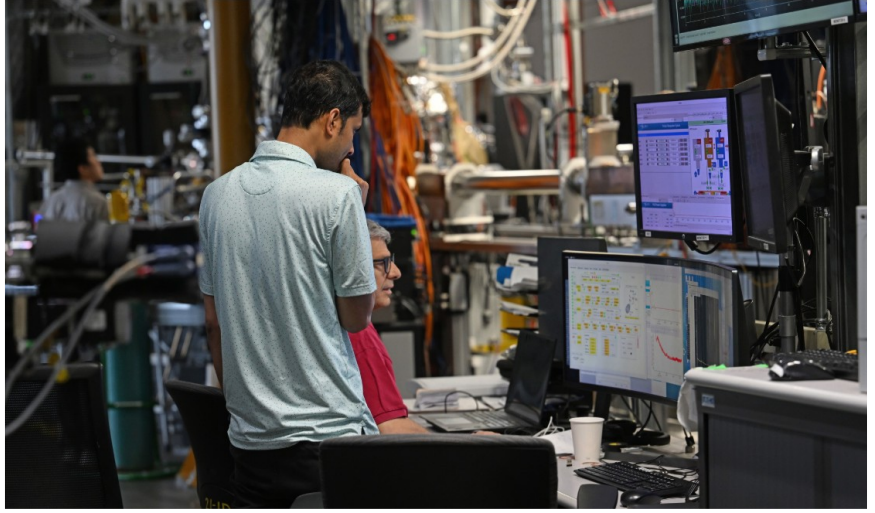
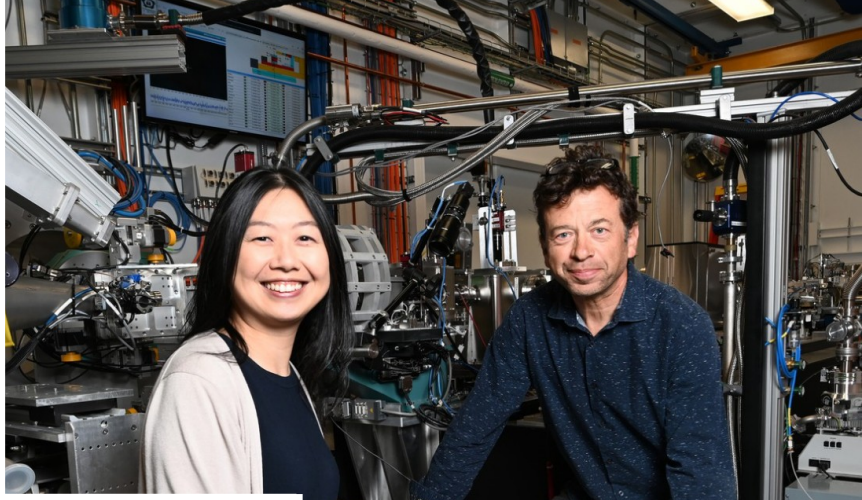

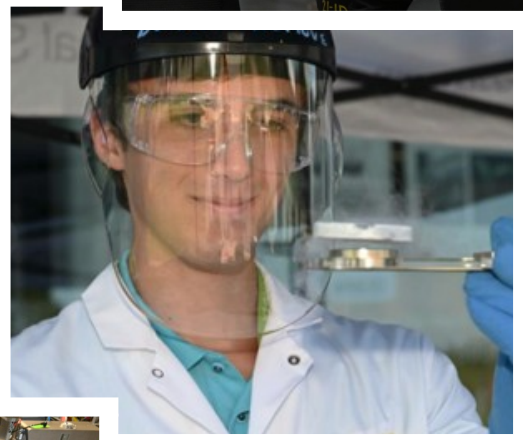
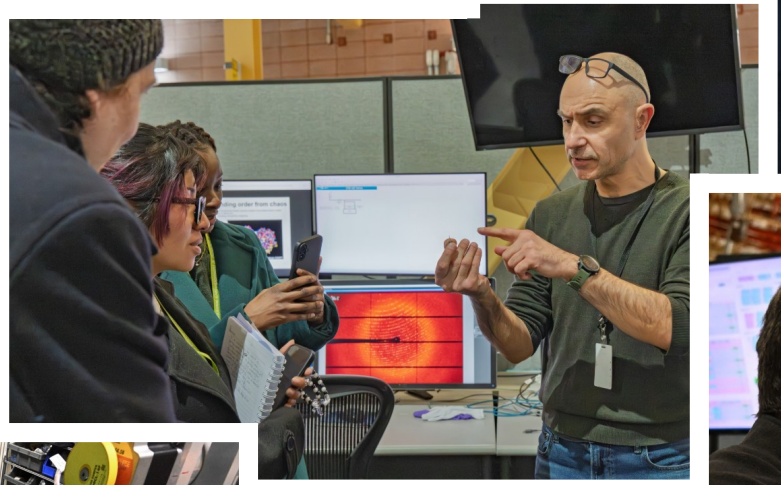


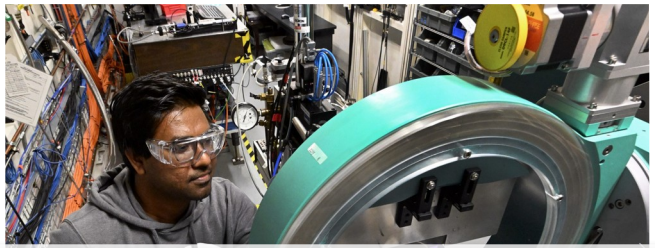


NSLS-II Motto: *Together, we shine light on the world's most challenging scientific problems.*