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eBERlight – a Virtual CAT for the Biological and Environmental Research Community

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STRUCTURAL BIOLOGY CENTER TRANSITIONING TO eBERlight

Current status

- SBC is funded by DOE Biological and Environmental Research
- Operates 2 MX beamlines (19-ID, 19-BM) for the general user community

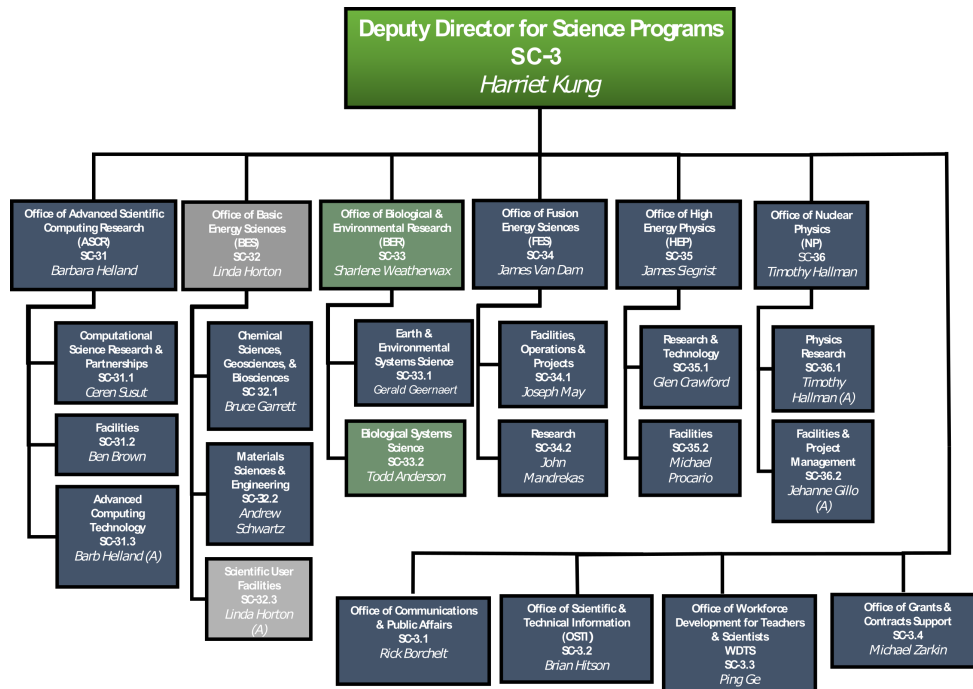
Need for change

- BER community needs access to other techniques
- APS-U brings new opportunities
- 19-ID will host In Situ Nanoprobe

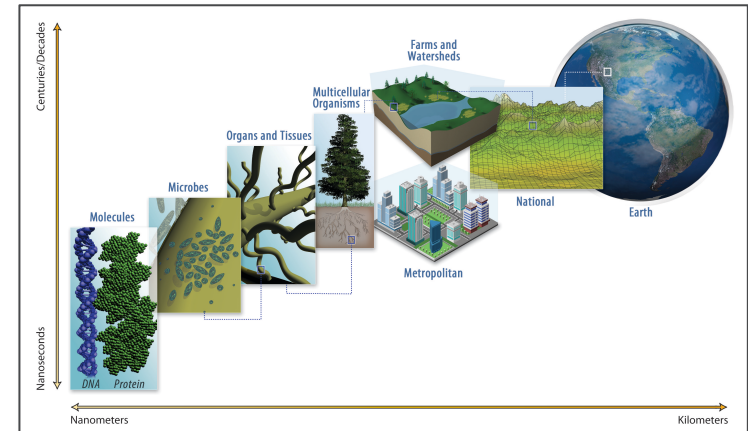
Future program

- eBERlight will serve as a liaison between BER researchers and the APS
- Leverage additional ANL resources
- Integrate with other DOE / BER facilities

DOE BIOLOGICAL AND ENVIRONMENTAL RESEARCH



“Biological and Environmental Research (BER) program supports transformative science and scientific user facilities to achieve a predictive understanding of complex biological, earth, and environmental systems for energy and infrastructure security, independence, and prosperity.”



Grand Challenges for Biological and Environmental Research: Progress and Future Vision, 2017

MULTIMODAL APPROACH TO BER SCIENCE AT APS-U

APS-U Techniques

Complementary

*Solution
SAXS*

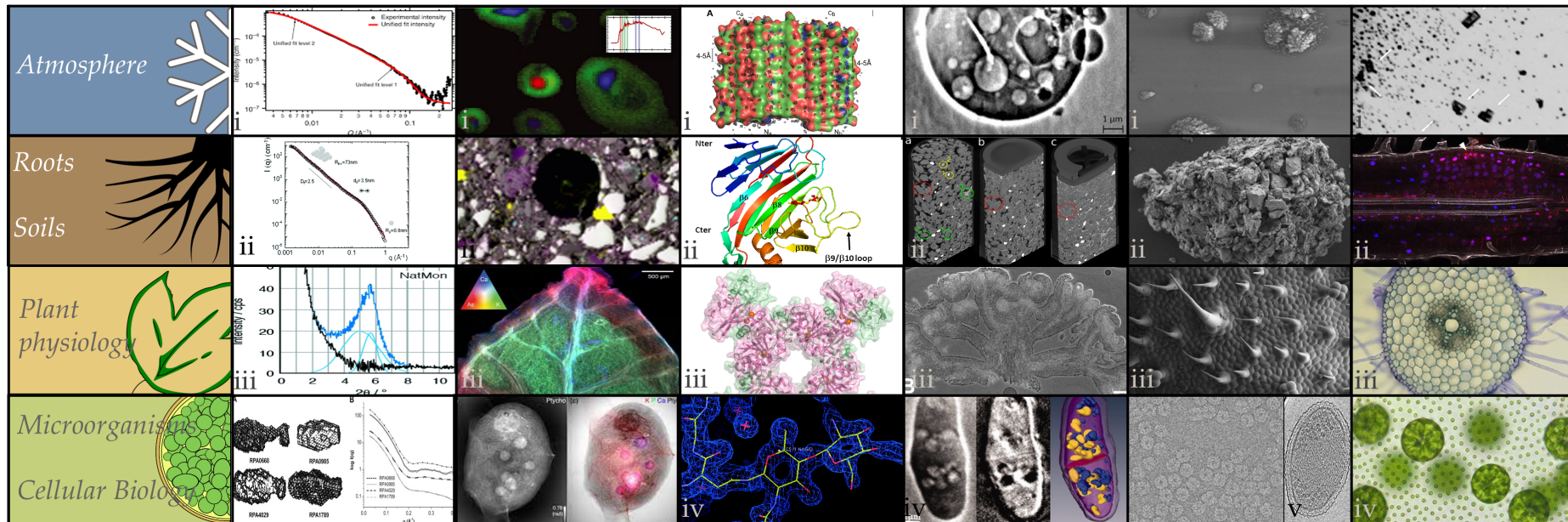
*Point Probe
XFM / XAS*

*Crystallographic
MX*

*Full-field Imaging
XMIC*

*Electron Microscopy
EM*

*Non-Destructive
Optical MIC*



nm - μ m

nm - mm

atomic

nm - mm

<nm - mm

μ m - mm

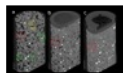
eBERlight CAPABILITIES FOR BIOLOGICAL & ENVIRONMENTAL SCIENCE

Crystallography
21-ID (LS-CAT)



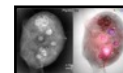
Full-field imaging

2-BM
32-ID



X-ray microscopy

2-ID-D
2-ID-E
(ISN,
25-ID-D,E)



Molecular biology

Advanced Protein
Characterization
Facility



Microfluidics

Advanced Protein
Characterization
Facility



Sample preparation

Cryolab at APS
Lab infrastructure
in bld. 203



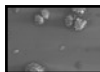
Computing

Argonne Leadership
Computing
Facility



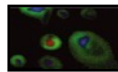
Electron microscopy

Center for Nanoscale
Materials
Picoprobe



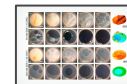
**X-ray absorption
spectroscopy**

9-BM
20-BM
25-ID-D,E
10-ID, BM



**Small-angle X-ray
scattering**

9-ID
12-ID
12-BM



eBERlight INTEGRATION WITH OTHER DOE/BER RESOURCES



Environmental Molecular Sciences Laboratory (EMSL)
Pacific Northwest National Laboratory
- Cryo-EM
Contact: James Evans

Advanced Light Source (ALS)
Lawrence Berkeley National Laboratory
- Berkeley Synchrotron Infrared Structural Biology (BSISB) – Fourier transform infrared (FTIR) spectromicroscopy
Contact: Hoi-Ying Holman
- National Center for X-Ray Tomography (NCKT) – Soft X-ray tomography
Contact: Carolyn Larabell
- Structurally Integrated Biology for the Life Sciences (SIBYLS) – Macromolecular crystallography, small-angle X-ray scattering
Contact: Greg Hura

Stanford Synchrotron Radiation Lightsource (SSRL)
SLAC National Accelerator Laboratory
Stanford University
- Structural Molecular Biology (SMB) – Macromolecular crystallography, X-ray spectroscopy, small-angle X-ray scattering, microXAS imaging
Contact: Keith Hodgson
- Cryo-EM and Tomography
Contact: Wah Chiu

Advanced Photon Source (APS)
Argonne National Laboratory
- Structural Biology Center (SBC) – Macromolecular crystallography
Contact: Andrzej Joachimiak

National Synchrotron Light Source (NSLS-II)
Brookhaven National Laboratory
- Center for BioMolecular Structure (CBMS) – Macromolecular crystallography, small-angle X-ray scattering/diffraction
Contact: Sean McSweeney
- Cryo-EM
Contact: Ligu Wang

Spallation Neutron Source (SNS) and High Flux Isotope Reactor (HFIR)
Oak Ridge National Laboratory
- Center for Structural Molecular Biology (CSMB) – Small-angle neutron scattering, biodeuteration
Contact: Hugh O'Neill

★ DOE Office of Basic Energy Sciences light and neutron facilities
● Cryogenic electron microscopy (Cryo-EM) facilities

February 2020

berstructuralbioportal.org

eBERlight ORGANIZATION

Comprehensive program for BER community starting FY24

Virtual Collaborative Access Team (CAT) managed by X-ray Science Division

Guaranteed beamtime across several beamlines (max. 2 beamlines equivalent)

Effort distribution:

25% crystallography (LS-CAT)

65% microscopy & imaging (XSD)

10% X-ray absorption spectroscopy & SAXS (XSD)

50% of the eBERlight guaranteed beamtime to support CAT members (BER researchers), 50% to support General User Program

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