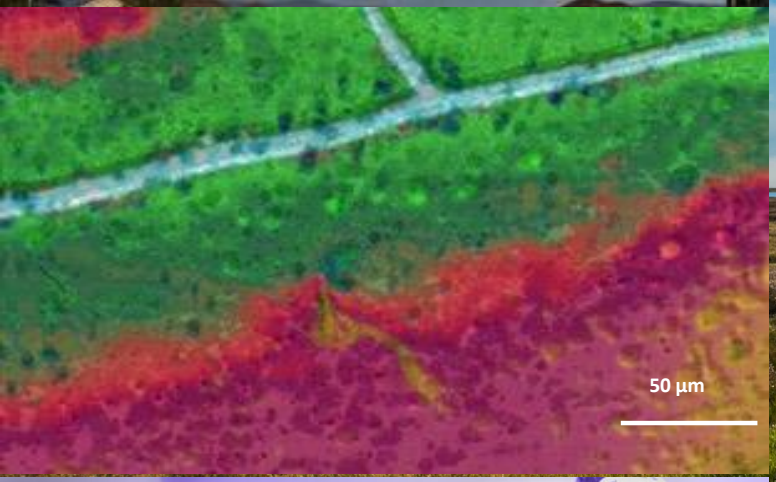


BROOKHAVEN NATIONAL LABORATORY

Martin Schoonen, ALD

BERAC Meeting

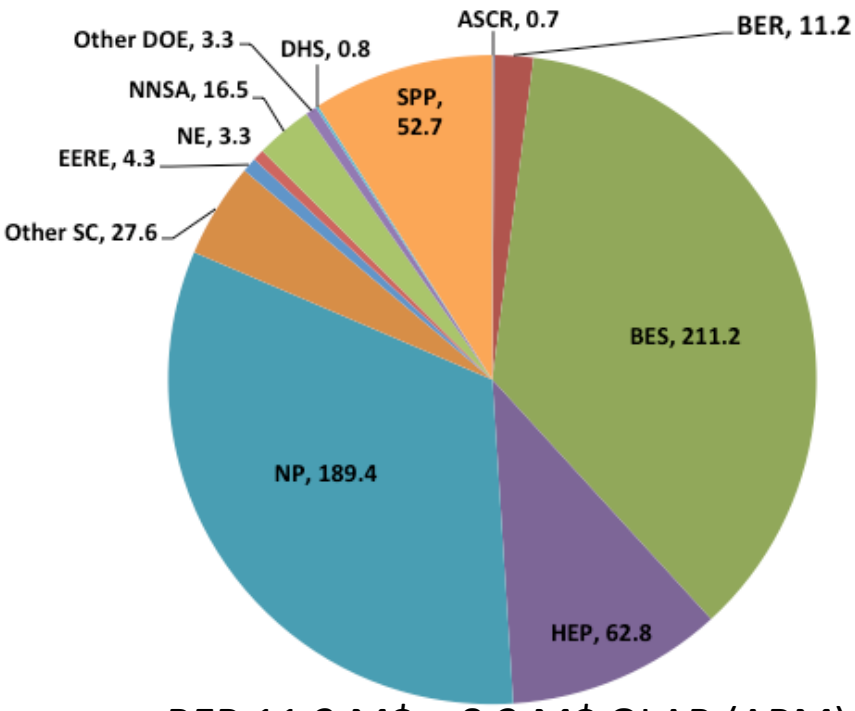
March 22, 2016

BNL: Laboratory Mission and Overview

BNL's mission is to utilize our world-class facilities and expertise to:

- Advance energy and environment-related basic research and apply them to 21st Century problems of critical importance to the Nation
- Advance fundamental research in nuclear and particle physics to gain a deeper understanding of matter, energy, space, and time

FY 2015 Funding by Source ($M; 584 total)



BER 11.2 M$ + 8.2 M$ OLAB (ARM)

BER Core Capabilities: Research & Facilities

RESEARCH CORE CAPABILITIES:

Atmospheric System Sciences: advance process-level understanding of interactions along the aerosol-cloud-precipitation continuum and their impacts on climate

Climate Modeling: component development and validation

Terrestrial Ecosystem Science & Technology: improve representation of plant physiological and ecological processes in Earth System Models

Structural Biology: development and operational support for 3 beamlines at NSLS-II

CURRENT FACILITIES CORE CAPABILITIES:

ARM Climate Research Facility: support long-term measurements, design and build of mobile aerosol laboratories, instrument mentorships, radar data analysis & retrievals, Large-Eddy Simulations, lead External Data Center and ARM metadata management

NSLS-II: 5 beamlines designed for the study of biomolecules; other beamlines support BER environmental & atmospheric science communities

Computational Science Initiative (CSI): methods, tools, and infrastructure to support data-driven discovery

Land model Uncertainty Quantification & Variance Decomposition: hosting Predictive Ecosystem Analyzer tool for BER community

Functional Genomics: scalable and versatile automated phenomics high-throughput platform to support functional genomics study of microbial photosynthetic organism as model system

Future strategic science priorities

Atmospheric System Science: Improve representation of processes along aerosol-cloud-precipitation continuum in climate models

- Effect of absorbing aerosols (black and brown carbon) on climate
- Aerosol number and CCN count in regions with most profound aerosol impacts
- Initiation of drizzle and evolution of droplet size distribution in turbulent clouds
- Develop LES and high-resolution process modeling capability

Terrestrial Ecosystem S&T: establish links between plant traits and spectral signatures

- Remote retrieval of plant traits to reduce parametric uncertainty in next generation models
- Instrument and software development in support of UASs for remote trait retrievals

Genome-Enabled Biology: improve predictive power of genome-scale models by reducing "genomic dark space"

- Gene discovery in core plant metabolism, metal homeostasis and transport processes
- Leverage prior BER investments in Chlamydomonas (only unicellular photosynthetic BER Flagship organism) to accelerate discovery relevant to bioenergy crops
- Synergize with existing strengths in plant physical biochemistry, NSLS-II, CFN, CSI

BioMolecular Research: establish correlative multi-technique imaging for biological systems.

- Develop new synchrotron-based imaging and structural biology tools, leveraging NSLS-II with world-leading brightness and resolution
- Establish atomic resolution Cryo-EM user facility linked to NSLS-II

Future strategic partnerships

Within DOE Complex:

- Partner with ORNL, PNNL, LBNL, ANL, LLNL, LANL in support of NGEE, ASR, and ARM programs and ACME project
- JGI and Bioenergy Centers: collaborations in support of genome-enabled research

Stony Brook University:

- Joint faculty appointments (Pavlos—Radar science; Harrison, Chapman—CSI)
- Graduate program faculty appointments
- Graduate and undergraduate student involvement

Other key University, Institute, and Industry Partners:

- Penn State, UMass-Amherst, CCNY, SUNY-Albany, Raytheon, ProSensing—Radar science
- Cold Spring Harbor Laboratory—QPSI and Cryo-EM
- Yale, Columbia, Harvard, NY Structural Biology Center—Cryo-EM
- Boston University, University of Illinois Champaign Urbana, Spectra Vista Corp—TEST
- Aerosol Dynamics Inc—novel aerosol measurement technology

Agencies:

- NASA: satellite data (e.g., HyspIRI) to provide global trait distributions
- NIH: BioMolecular Research facility at NSLS-II