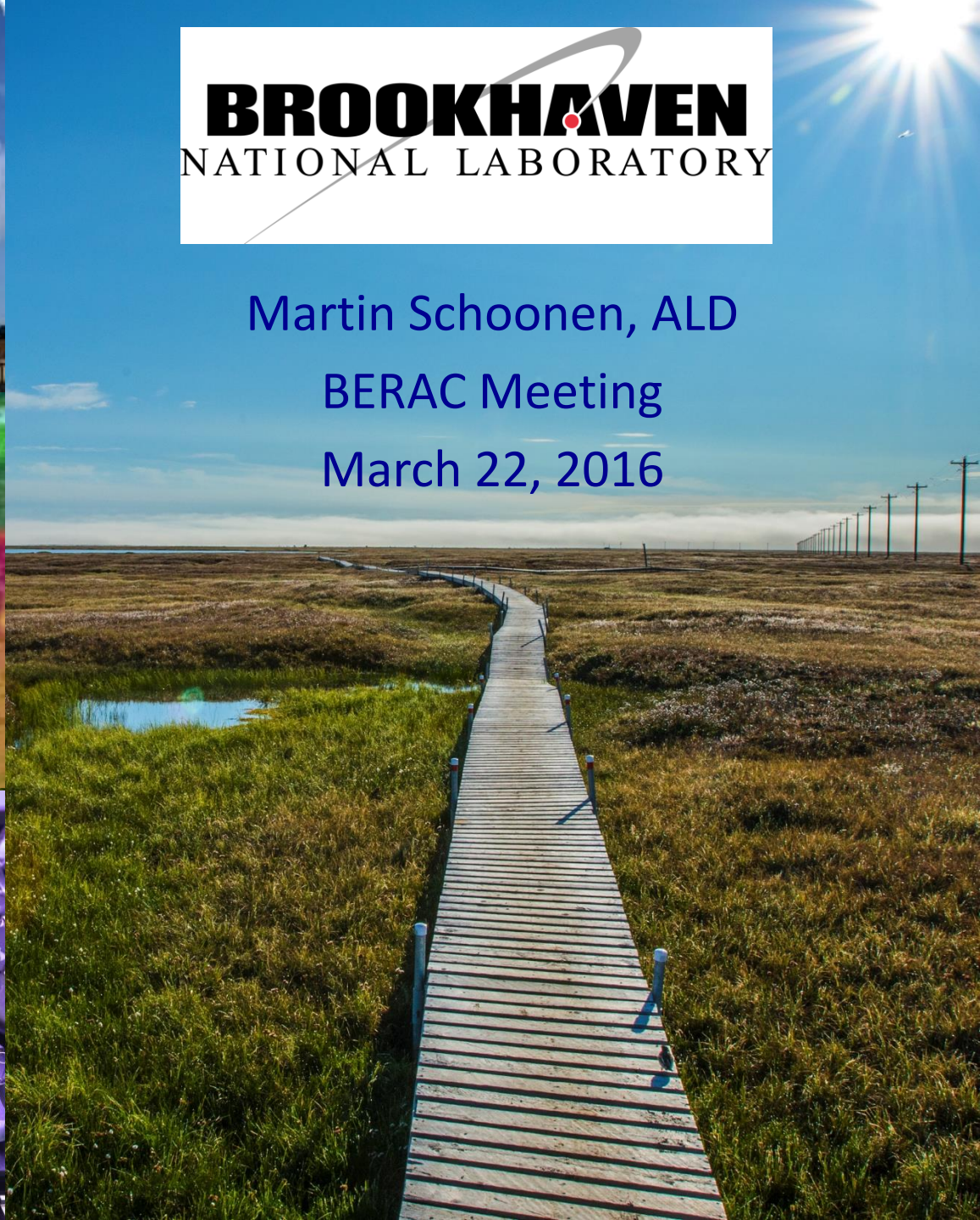
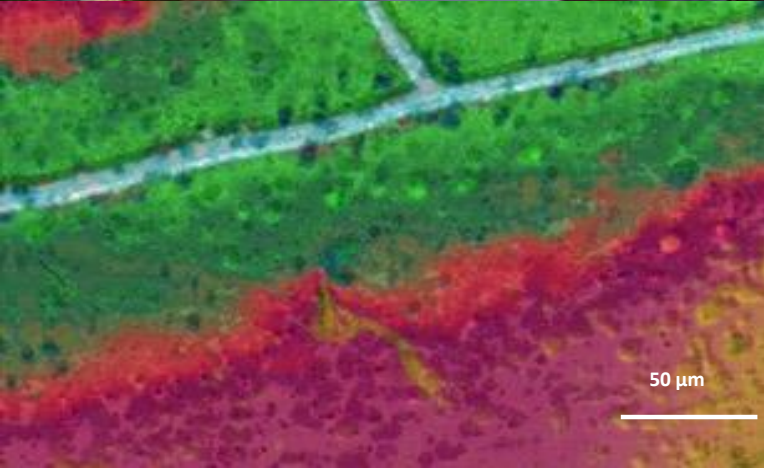




**BROOKHAVEN**  
NATIONAL LABORATORY

Martin Schoonen, ALD  
BERAC Meeting  
March 22, 2016



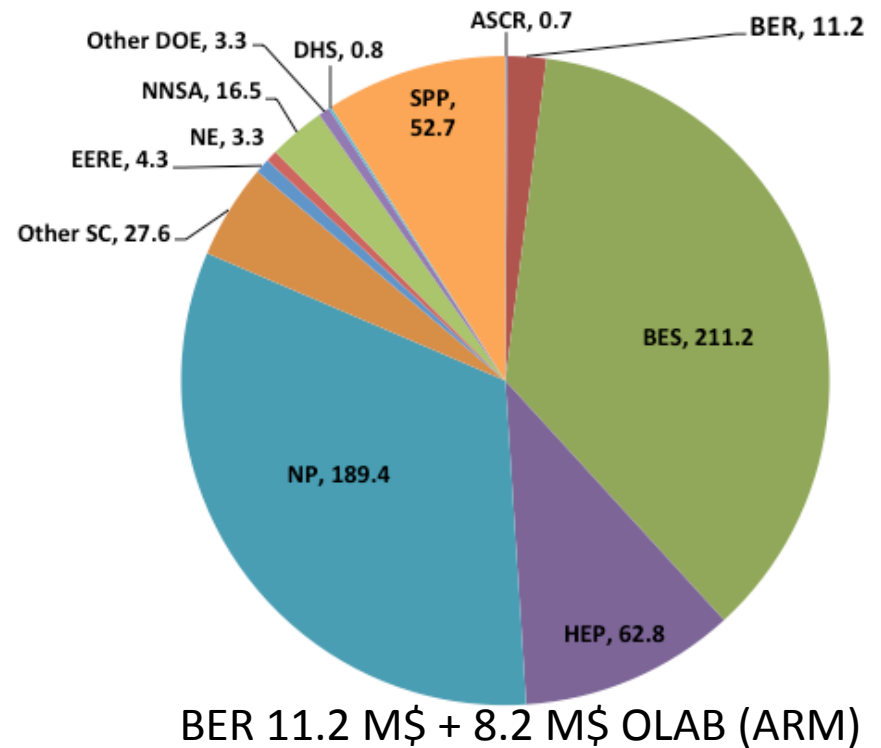
# BNL: Laboratory Mission and Overview

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

- Advance energy and environment-related basic research and apply them to 21<sup>st</sup> 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 Core Capabilities: Research & Facilities

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## **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

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**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

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## **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., HypsIRI) to provide global trait distributions
- NIH: BioMolecular Research facility at NSLS-II