Berkeley Lab Vision & Characteristics

Joint Genome Institute

NERSC

Advanced Light Source

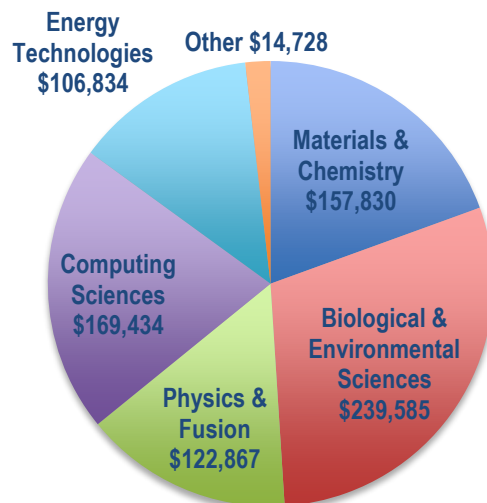**Energy Sciences Network**

Molecular Foundry & NCEM

- Pioneering research that brings energy and environmental solutions to the world

- Open, Connected and Sharing

- Interdisciplinary, big team-science… since Day 1

- Berkeley Lab User Facilities Enable Science Community to Discover, Learn and Create - *over 10k users each year*

- Office of Science Multi-Program Laboratory

- Operated by University of California

- Co-location of BER science to center of Berkeley Lab campus
- Two of Berkeley's Six Science Areas aligned with BER

BioSciences

EARTH & ENVIRONMENTAL SCIENCES

BERKELEY LAB
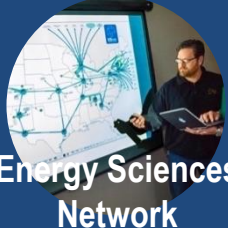
- 3,304 FTE
- 245 Joint faculty
- 476 Postdoctoral researchers
- 330 Graduate students
- 149 Undergraduates
- 10,798 Facility users
- 2,170 Visiting scientists and engineers

FY 2015 Funding: $811.276M (excluding ARRA funding)

Costs by Direct Funding Source by Division, FY'15 ($K)

Energy Technologies $106,834

Other $14,728

Materials & Chemistry $157,830

Biological & Environmental Sciences $239,585

Computing Sciences $169,434

Physics & Fusion $122,867

U.S. DEPARTMENT OF ENERGY | Office of Science

Four DOE Defined Core Capabilities & Two Key Facilities

B S S D

Biological Systems Science: Integrates functional genomics, multi-scale imaging, metabolomics, computational biology, microbiology/metagenomics and plant science to understand how complex biological communities function

Biological and Bioprocess Science and Engineering: New core capability is focused on the engineering of biological systems and processes to solve challenges in energy and environment

C E S D

Environmental Subsurface Science: Provides foundation to understand and predict watershed functioning relevant to water resources, environmental remediation, agriculture and biogeochemical cycling.

Climate Change Science and Atmospheric Science: Provides the foundation to acquire a range of atmospheric and terrestrial observations and to develop robust predictions of ecosystem, water-energy and climate system long-term behavior.

F A C I L I T I E S

JGI:

- BER-funded User Facility
- Largest producer of plant & microbial genomes
- Innovative DNA analysis algorithms
- DNA design and synthesis program

ABPDU:

- EERE-funded User Facility
- Bioprocess engineering for biofuels & bioproducts
- Scale-up to demonstrate commercial viability

Logos shown: jbei (Joint BioEnergy Institute), BSISB (Berkeley Synchrotron Infrared Structural Biology Program), ENIGMA, KBase, Watershed Scientific Focus Area Function, M2B microbes to biomes, ACME (Accelerated Climate Model for Energy), IDEAS productivity, cri (Climate Readiness Institute), CASCADE, AmeriFlux, BGC FEEDBACKS (Quantifying Feedbacks and), JGI (Joint Genome Institute, Department of Energy), ABPDU (Advanced Biofuels Process Demonstration Unit)

Six Strategic Science Priorities

B
S
S
D

① **Predictive Integrative Genomics:** Scalable measurement technologies for predictive modeling of molecular, cellular and ecosystem functions. Integration of genomics with multi-scale imaging, structural biology, metabolomics, and computations.

② **Biofoundry Enabled Discovery Science:** Open source foundational tools for efficient engineering of biological systems to speed biological construction and testing. Biological components & hosts that can be recombined and reused

③ **Harnessing Microbial Communities for Environment and Energy Benefits:** Developing a predictive understanding of microbial community interactions with host biomes across a range of critical length scales and environmental conditions, with a particular focus on soil-microbe-plant biomes.

C
E
S
D

④ **Predicting Future Watershed and Ecosystem Behavior**: New approaches to quantify and simulate ecosystem feedbacks to climate as well as the influence of climate and other disturbances on watershed function and dynamics.

⑤ **Climate Action**: Developing robust predictions of future hydroclimate behavior at scales useful to guide actionable management.

⑥ **Resilient System Science**: Coupling of natural and human systems to provide the scientific foundation for optimal management of water, energy, urban and agricultural systems

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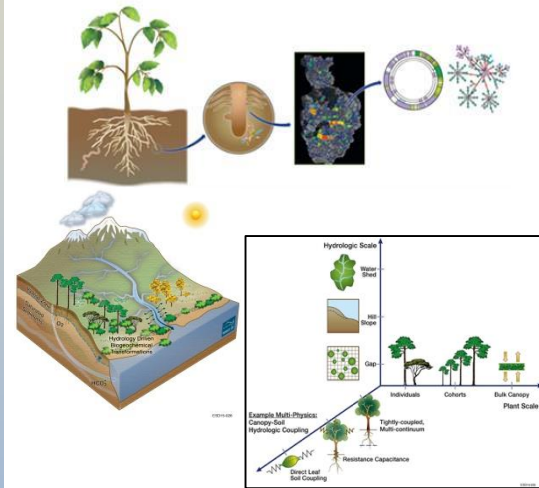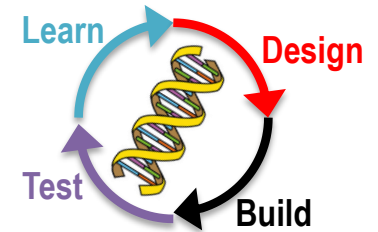
Strategic Partnerships Important for Berkeley Lab Vision

- Many **Universities** and **National Labs,** including UC Berkeley and UC Davis

- **BER** and other **DOE Offices**
  - **ASCR:** Widely heterogeneous datasets and exascale vision for prediction
  - **BES:** Key facilities and leveraged projects
  - **EERE:** ABPDU & FutureBio

- **California State Agencies:** Water, energy, climate, healthy soils

- **Industry,** esp. biotech

- **International partners,** esp. those associated with water-energy, climate modeling, global carbon cycling and Mission Innovation
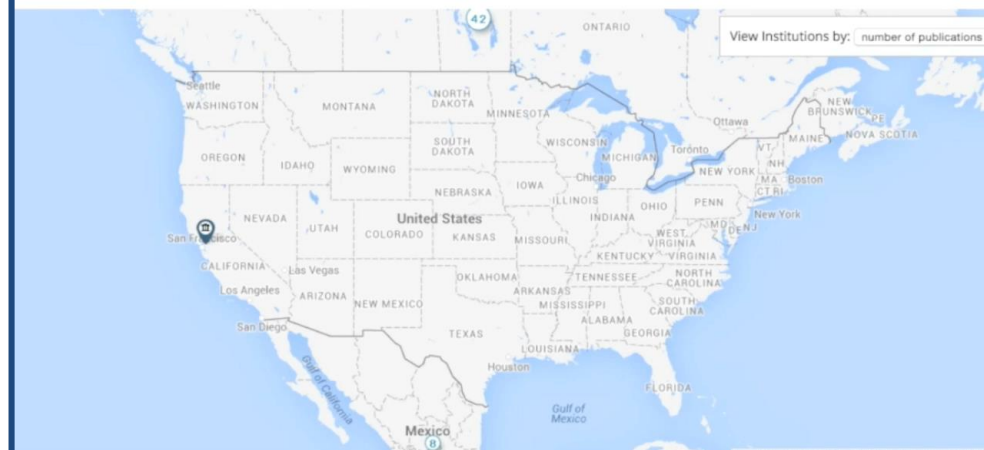
Thank You