BERKELEY LAB



STATE OF THE LAB Director Mike Witherell

Doudna Rd.

Lawrence Rd.

smoot Rd.



WHAT DOES THE NATION NEED FROM BERKELEY LAB

- Scientific solutions addressing national priorities: Energy and climate, resilience, the environment, health, and the economy
- Discovery Science
- Unique scientific capabilities and facilities
 - National user facilities
 - o Advanced instrumentation
- Managed, large research teams
- Important technologies of strategic national interest with long, difficult R&D paths
- Response to national emergencies

RKELEY LAB

 And perhaps most importantly: A diverse group of highly trained, creative individuals committed to working together in teams on these grand national challenges





GREAT SCIENTISTS ADDRESSING NATIONAL CHALLENGES





15 Awardees to date





47 Fellows to date





BERKELEY LAB SCIENTIFIC LEADERSHIP

Carol Burns Dep. Director for Research





Michael Witherell Lab Director



Michael Brandt Dep. Director for Ops & COO









BIOSCIENCES Paul Adams, ALD





ENERGY SCIENCES Jeff Neaton, ALD





COMPUTING SCIENCES Jonathan Carter, ALD









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EARTH & ENVIRO. SCIENCES Susan Hubbard, ALD





PHYSICAL SCIENCES Natalie Roe, ALD



BERKELEY LAB OPERATIONS LEADERSHIP

Carol Burns Dep. Director for Research

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Michael Witherell Lab Director



Michael Brandt Dep. Director for Ops & COO











NATIONAL USER FACILITIES

The user facilities provide the tools and the expertise needed to address the grand national challenges.



Bright x-ray beams and leading instruments for chemistry, materials, biology, and more. FY20 Users: 1,816



HPC for all DOE science: simulation, data analytics, and machine learning. FY20 Users: 8,369

BERKELEY LAB

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Expertise and instruments for nanoscale science. FY20 Users: 1,552



Connects DOE labs and experiments 1,027 Peta-bytes/yr. in FY20



STRATEGIC PRIORITIES TO SHAPE THE FUTURE OF THE LABORATORY



INFRASTRUCTU

RENEWAL

BERKELEY LAB

ENABLING SCIENTIFIC

DISCOVERY



NEW CAPABILITIES in BIOLOGICAL and

ENVIRONMENTAL SCIENCE

HIGHLIGHTS OF BERKELEY LAB INITIATIVES TO ADDRESS THE CLIMATE CRISIS





BERKELEY LAB ENERGY STORAGE CENTER



Noël Bakhtian Executive Director

Founded: November 2020

Expertise: 100+ PIs across Berkeley Lab

Goal:

To harness, guide, and galvanize the expertise, capabilities, and innovation across Berkeley Lab resulting in the science, technology, and policy to accelerate real-world energy storage solutions. Work with academic, national lab, and industry partners around the world to enable the nation's transition to a clean, affordable, and resilient energy future.

CLIMATE-RESILIENT WATER SUPPLIES FOR COMMUNITIES AND INDUSTRY: NATIONAL ALLIANCE FOR WATER INNOVATION

Early stage breakthrough research in:

Process Innovation and Intensification

Data, Modeling and Analysis

Vision: Transform reliability and availability of U.S. water supplies through dramatically lowering the cost and energy of unconventional water treatment.

Water-Smart Buildings and Communities: Develop new building systems that integrate wate reuse and water-energy storage systems

Wastewater Resource Recovery: Using cutting edge chemical modeling and physical test-beds to "mine" wastewater

Significant recent progress:

- Five end-use roadmaps developed through engagement of >300 stakeholders
- First projects announced on the Achilles' heel of desalination: brine management
- Stood up Governance Board, Industry Board, and Commercialization Committee

REMOVING CARBON FROM NATURAL AND BUILT ENVIRONMENTS

To achieve net zero, we need the capability of removing 10-20 GT/yr from the atmosphere.

BUT: we are currently adding ~50GT/yr.

Removing carbon dioxide from the atmosphere and ocean via largescale deployment of negative emissions technologies

HYDROGEN @ BERKELEY LAB

Fundamental, systematic research to solve applied problems informed by energy analysis to realize H2@SCALE Integrated facility across science paradigms that utilizes user facilities and energizes the community

DECARBONIZING AGRICULTURE FOR THE BIOECONOMY

FABRICATED ECOSYSTEMS AND SENSORS FOR HEALTHY SOILS AND SUSTAINABLE CROPS

EcoFAB and EcoBOT: small scale fabricated ecosystems for studying plant and microbial community relationships in automated, high-throughput, and reproducible experiments

EcoPOD: enclosed environments for intensive monitoring and manipulation of plant-soilmicrobe-atmosphere interactions; "pilot-scale" ecosystems

Twin Ecosystems: scale-down field observations by linking fabricated ecosystems, field studies, sensors, and autonomous controls

TURNING FOREST WASTE INTO BIOENERGY

CARIBOU: Development and on-site testing for a mobile biorefinery that can be deployed to forests to clear thinnings and residues to prevent wildfires

- Produces electricity and biofuels for on-site use
- Biochar co-product as soil amendment

GEOTHERMAL SCIENCE AT BERKELEY LAB

Improved technologies for exploration and development of high-temperature resources

- Development of SIMFIP tool for measuring stress perturbations and rock deformation in real-time
- Fiber-optic sensing for improved monitoring of temperature, strain, and seismicity
- Extension of THCM modeling to supercritical conditions
- Lost circulation management for geothermal drilling
- Induced seismicity monitoring and mitigation

Ambient noise imaging – Brawley

Newberry supercritical native state model

Innovative approaches that extend use of geothermal to heating, cooling, energy storage, and mineral recovery

- Community geothermal project that couples building energy use to subsurface
- Reservoir thermal energy storage
- Retrospective analysis of GTO studies of mineral recovery from geothermal brines

ENERGY TECHNOLOGIES AND ENERGY JUSTICE

The impact of policies and business models on income equity in rooftop solar adoption

Eric O'Shaughnessy^{©1}, Galen Barbose^{©2}, Ryan Wiser^{©2}⊠, Sydney Forrester^{©2} and Naïm Darghouth²

Berkeley Lab has the capabilities needed to translate the idea of Energy Justice into action:

- Policy, finance, and business models
- Heat resiliency technologies and strategies
- Impact of technology integration: efficiency, storage, and renewable energy
- Air pollution monitoring and mitigation
- Supporting clean energy entrepreneurs to bring to market innovative, equitable solutions

Energy Justice40 Fellows from Berkeley Lab

SALMA ELMALLA

Graduate Student Research Assistant

MIGUEL HELENO

Energy/ Environmental Policy Research Scientist/Engineer

C.ANNA SPURLOCK

Energy/ Environmental Policy Research Scientist/Engineer

Lady Idos, temporarily serving at DOE to establish DEI plan

Jessica Granderson, temporarily serving at the Council on Evironmental Quality

SYDNEY FORRESTER

Energy/ Environmental Policy Project Scientist/Engineer

Scientific

Engineering

HIGHLIGHTS OF BERKELEY LAB'S PLACE-BASED RESEARCH

Berkeley Lab's custom-built sensors track black carbon pollution in West Oakland neighborhood

Through a collaboration with the West Oakland Environmental Indicators Project, Environmental Defense Fund, Bay Area Air Quality Management District, and Port of Oakland, LBNL scientists recruited community members willing to host the sensors outside of their homes and businesses.

WIRED

Schools (and Children) Need a Fresh Air Fix

18.14.2020

At Lawrence Berkeley National Lab, scientists have been studying indoor air quality in schools for decades...They've found that...more fresh air is linked to fewer symptoms, says Rengie Chan, a Berkeley Lab research scientist.

OAKLAND UNIFIED

Springs National Park Colorado River Salton Sea Imperial Valley Bravley All-American Contrado River Imperial Dam San Diego

"Lithium Valley"?

Developing additional geothermal energy sources will provide environmental benefits to the region, including reduced greenhouse gas emissions. Revenue from the land leases and mineral recovery is expected to support environmental restoration projects, which some sources estimate may cost between \$3 billion and \$9 billion.

BUILDING THE BERKELEY LAB OF THE FUTURE

RUS

STEWARDSHIP Inclusion Diversity Equity Accountability

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THE IDEA INITIATIVE: BUILDING A CULTURE OF WELCOMING AND BELONGING

INCLUSION

Promote inclusion through worklife balance and well-being **DIVERSITY** Narrow gaps in representation

EQUITY

Promote fairness and remove barriers to opportunities and advancement

ACCOUNTABILITY

Embed accountability within organizational culture

https://diversity.lbl.gov/idea-strategy/

BUILDING THE BERKELEY LAB OF THE FUTURE: STEWARDSHIP OF THE LAB'S PEOPLE, RESEARCH AND RESOURCES

Our Mission

At Berkeley Lab, our collective purpose is to serve humankind through science.

Our Responsibility

As leaders and citizens of the Lab, we are entrusted to care for the people, research, and resources that make our mission possible, a responsibility we call stewardship. In taking care of the Lab and each other, we commit to these core values that guide our decisions and behaviors.

team science we collaborate across boundaries

respect WE CARE FOR ONE ANOTH

