



BERKELEY LAB
LAWRENCE BERKELEY NATIONAL LABORATORY



Lawrence Berkeley National Laboratory Overview

Ashok Gadgil
Division Director
Environmental Energy Technologies Division

May 2011

Berkeley Lab Mission



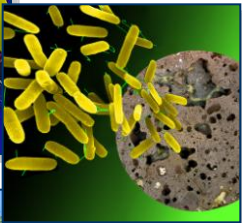
*Managed by the University of California for the
United States Department of Energy*



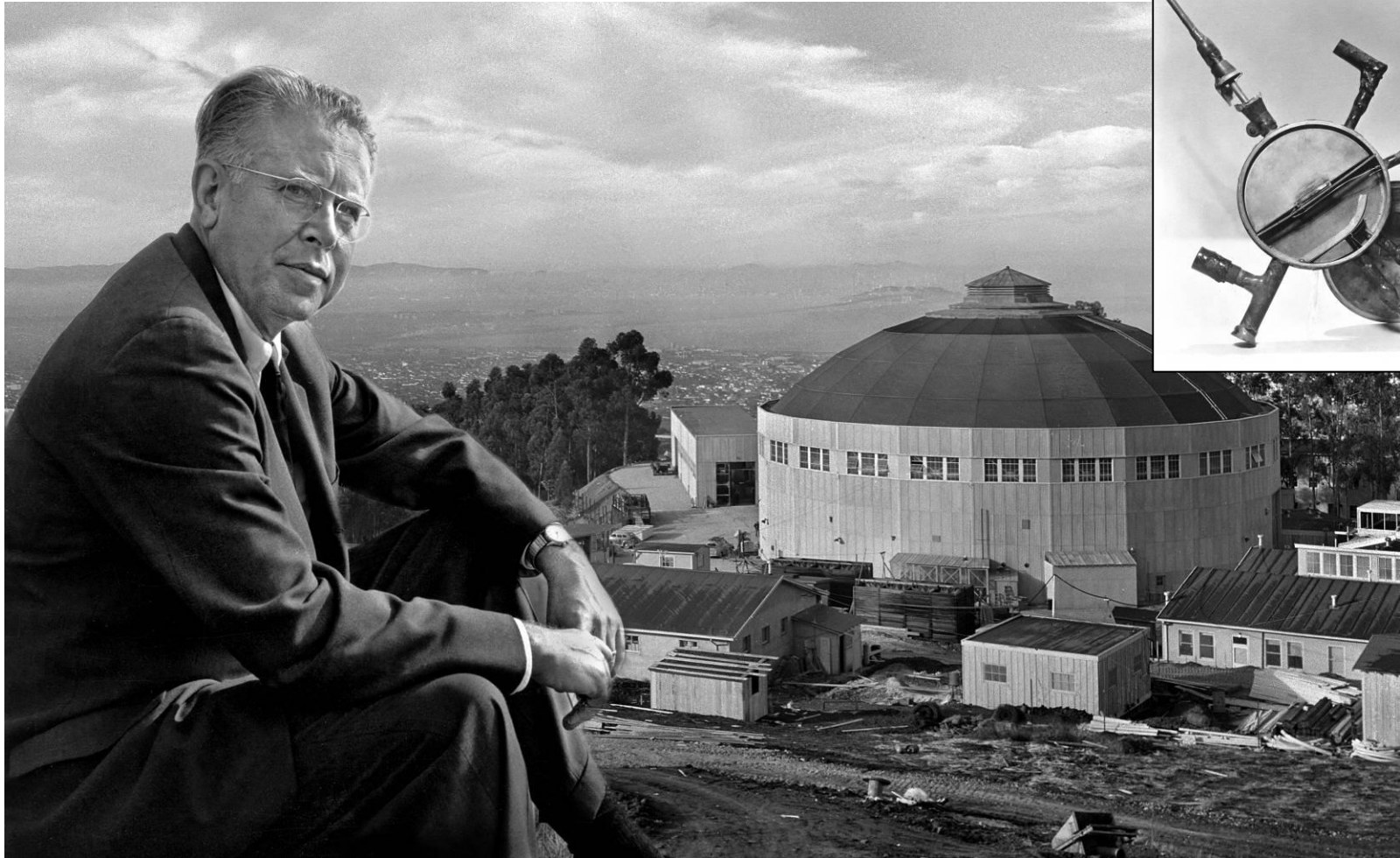
Lawrence Berkeley
National Laboratory



- **Solve the most pressing and profound scientific problems facing humankind**
 - Basic science for a secure energy future
 - Understand living systems to improve the environment and energy supply
 - Understand matter and energy in the universe
- **Build and safely operate world-class scientific facilities**
- **Train the next generation of scientists and engineers**



Founded on the Berkeley campus in 1931, moved to the current site in 1940



Lawrence Introduces Big Team Science

LBL: The First DOE National Laboratory



Eleven Nobel Laureates



Luis W. Alvarez



Melvin Calvin



Owen Chamberlain



Steven Chu



Donald A. Glaser



**Ernest Orlando
Lawrence**



Yuan T. Lee



**Edwin M.
McMillan**



Glenn T. Seaborg

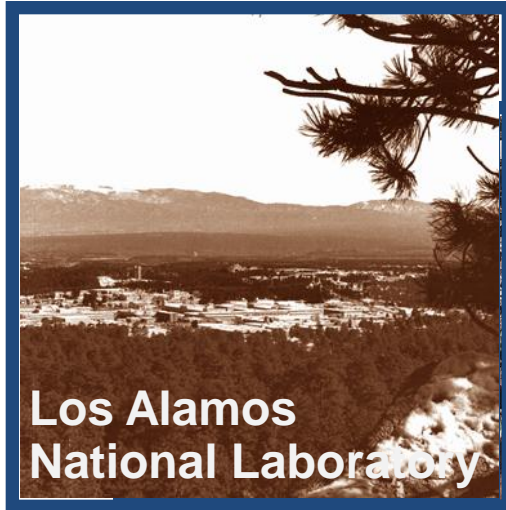


Emilio G. Segrè

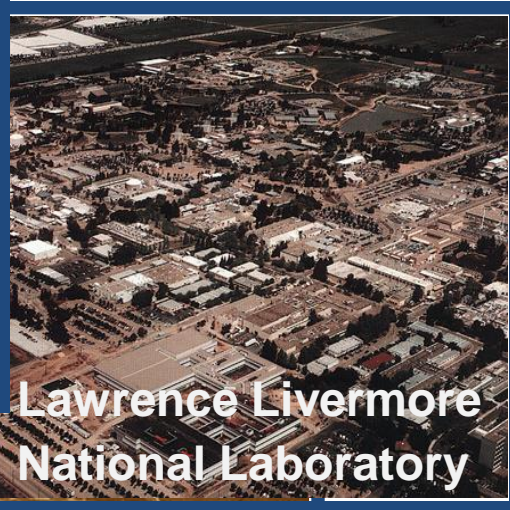


**George F.
Smoot**

Berkeley Lab: A birthplace of institutions



Los Alamos
National Laboratory



Lawrence Livermore
National Laboratory



Fermi National
Accelerator Laboratory



Joint Genome Institute

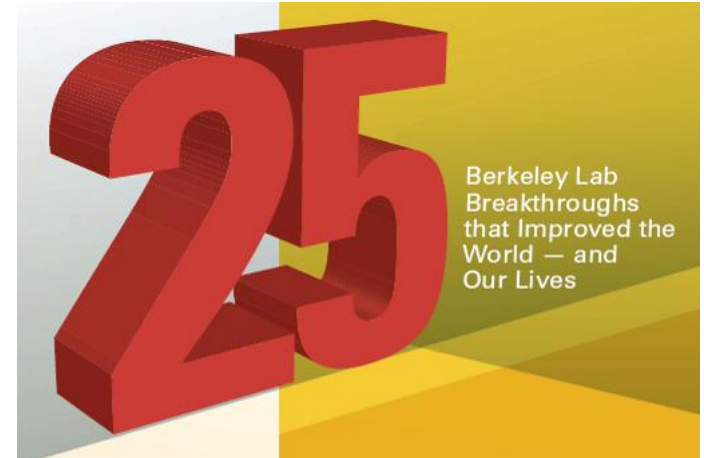


More than 30 start-up
companies since 1995

A legacy of improving our lives and understanding the world around us



- **Discovered 16 elements**
- **Identified good and bad cholesterol**
- **Confirmed the Big Bang and discovered Dark Energy**
- **Turned windows into energy savers**
- **Unmasked a dinosaur killer**
- **Exposed the Radon risk**
- **Explained photosynthesis**
- **Created the toughest ceramic**
- **Pitted cool roofs against global warming**
- **Given fluorescent lights their big break**
- **Caught Malaria in the act**
- **Built a better battery**
- **Preserved the sounds of yesteryear**
- **Fabricated the smallest machines**
- **Made appliances pull their weight**
- **Brought safe drinking water to thousands**
- **Created a pocket-sized DNA sampler**

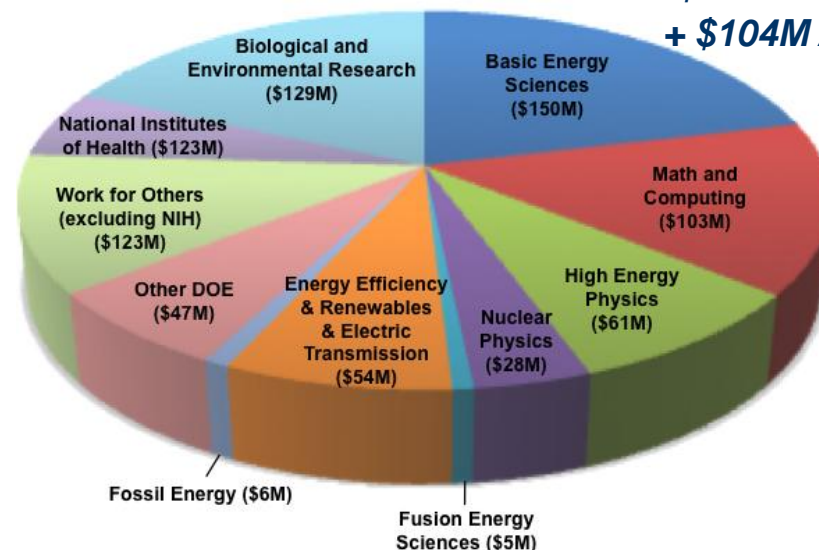
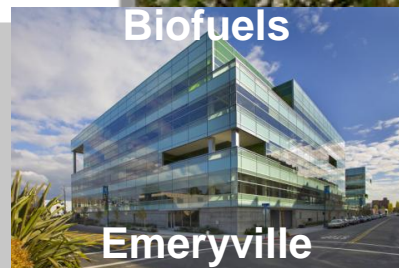
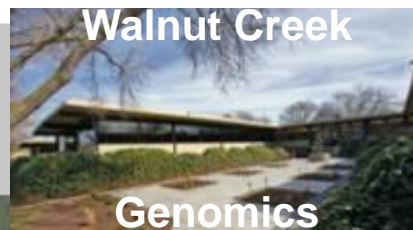


- **Revealed the secrets of the human genome**
- **Redefined the causes of breast cancer**
- **Given buildings an energy makeover**
- **Supercharged the climate model**
- **Derailed an ecological danger**
- **Helped bring energy efficiency to China**
- **Pioneered medical imaging**
- **Brought the stars closer**

LBLN at a glance – Fiscal Year 2010



**\$706.7M core
+ \$104M ARRA**

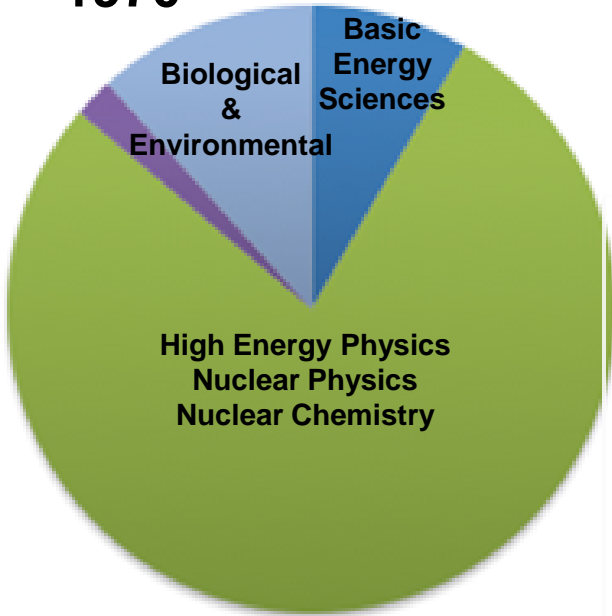


| | |
|-----------------------|--------------|
| Employees | 2,902 |
| Scientific | 708 |
| Technical | 1,548 |
| Support | 646 |
| Joint Faculty | 278 |
| Postdoctoral | 407 |
| Graduate | 314 |
| Undergraduate | 151 |
| Badged Facility Users | 6,010 |
| Visiting Scientists | 1,544 |

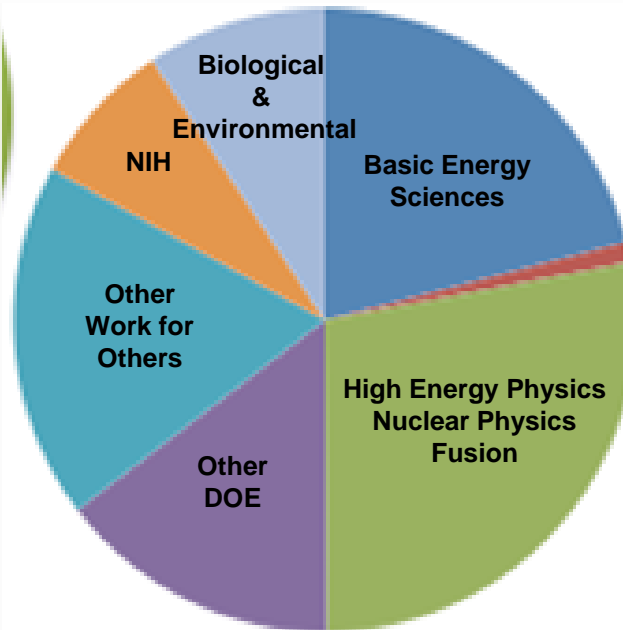
Change in Program Share of Berkeley Lab Budget



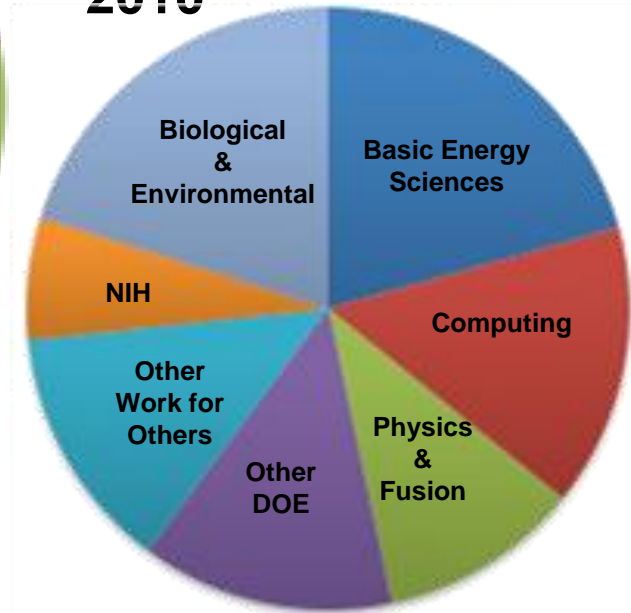
1970



1990



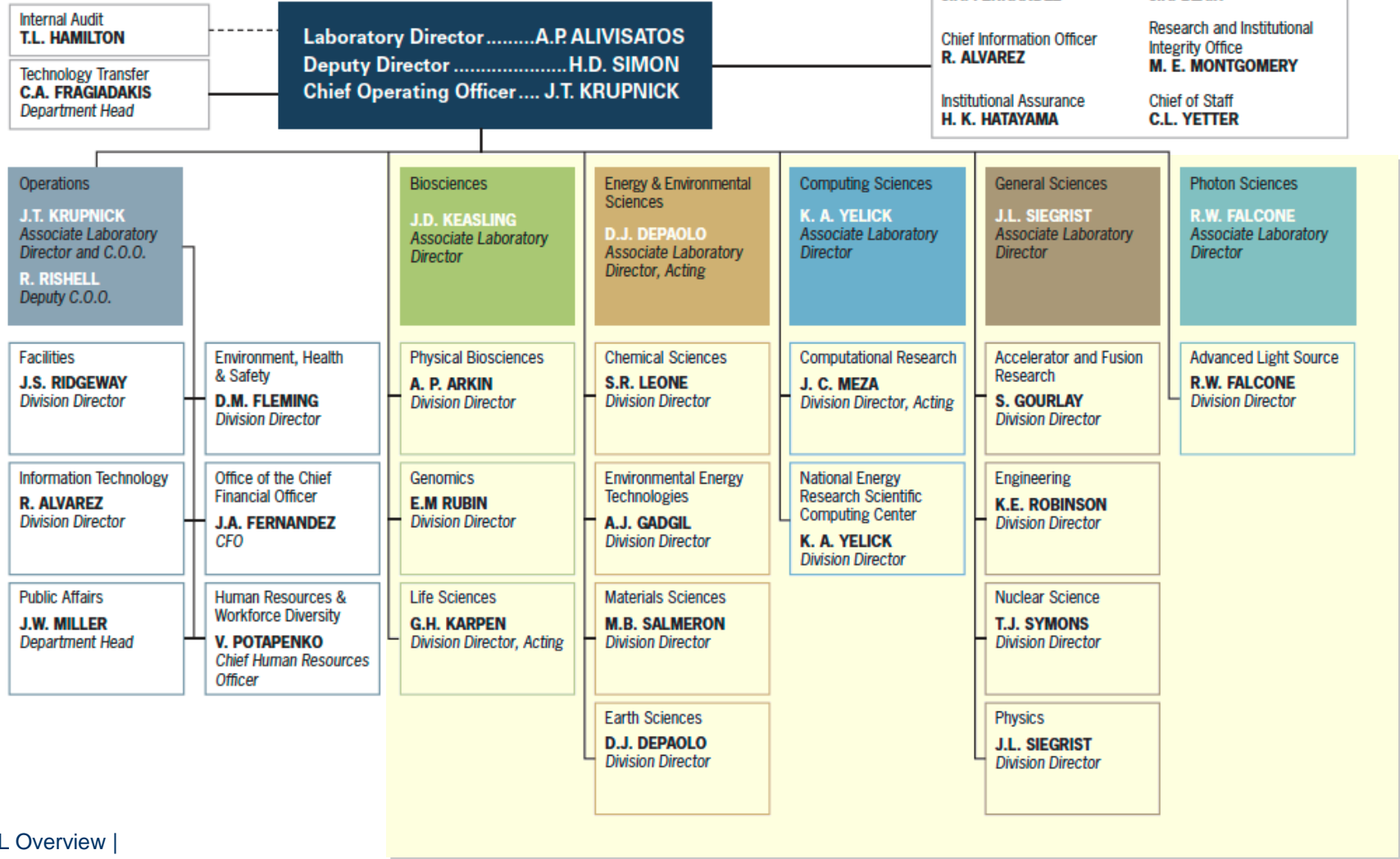
2010



LBNL organization



Ernest Orlando Lawrence Berkeley National Laboratory
University of California



Berkeley Lab's facilities host visitors from university, industry, and research institutions



Selected Core Laboratory Strengths

- *Biological Systems Science*
- *Chemical and Molecular Science and Engineering*
- *Subsurface and Environmental Science*
- *Technologies for Energy Efficiency*
- *System Analysis for Energy Applications*
- *Photon Science*
- *Computational Science*
- *Particle- and Astro- Physics*
- *Climate Science*

Advanced Light Source



National Energy Research Scientific Computing Center



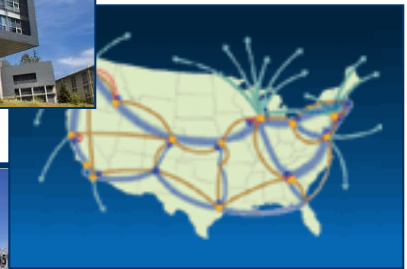
88-Inch Cyclotron



Molecular Foundry



Energy Sciences Network (ESnet)



Joint Genome Institute



National Center for Electron Microscopy

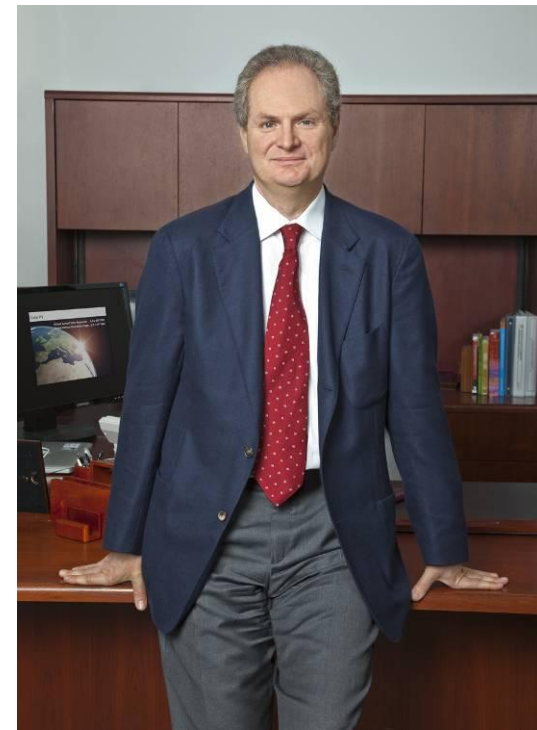


New Laboratory Director announced on November 19, 2009



A. Paul Alivisatos **with LBNL since 1991**

- 2008** LBNL Deputy Director
- 2007** Larry and Diane Bock Chair of Nanotechnology, University of California, Berkeley
- 2005** Associate Laboratory Director for Physical Sciences
- 2002** Director of DOE/LBNL Molecular Foundry
- 1986** PhD in Chemical Physics, University of California, Berkeley
- 1981** BA in Chemistry, University of Chicago



*Carbon
Cycle 2.0*



*Building
Community*



*Safety and
Efficiency*



*Next Gen
Light Source*



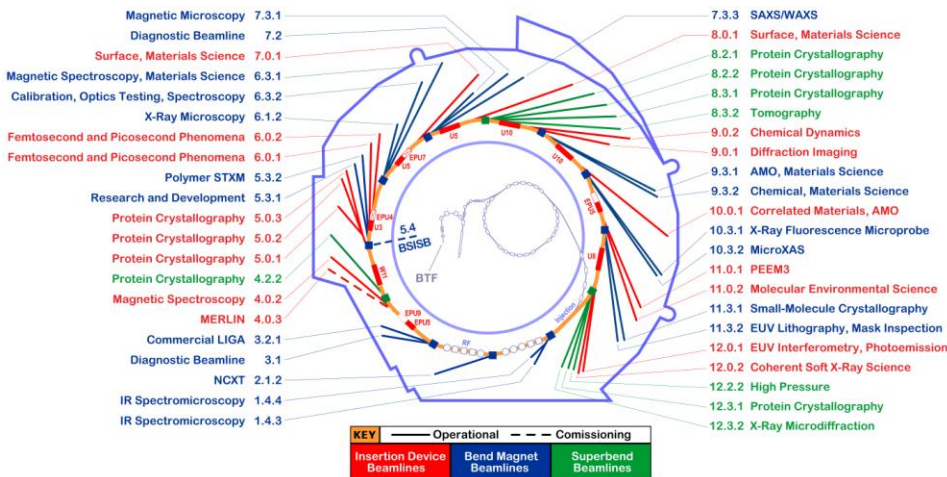
*Space for our
future*

One of the world's brightest sources of ultraviolet and x-ray beams, the ALS at Berkeley Lab makes previously impossible studies possible.

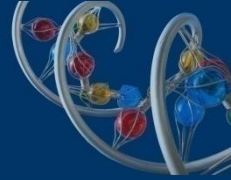
- Wavelengths from infrared to hard x-rays: the right range for examining the atomic and electronic structure of matter
- Ability to probe and understand these properties allows us to design new materials, understand biological processes



ALS Beamlines 2011



- Includes 39 beamlines, serves over 2000 users, produces 600 publications per year
- Subjects investigated include life science, environmental science, materials science, physics, and chemistry
- Funded by the DOE's Office of Basic Energy Sciences



Walnut Creek, California facility

Opened in 1999

~250 employees

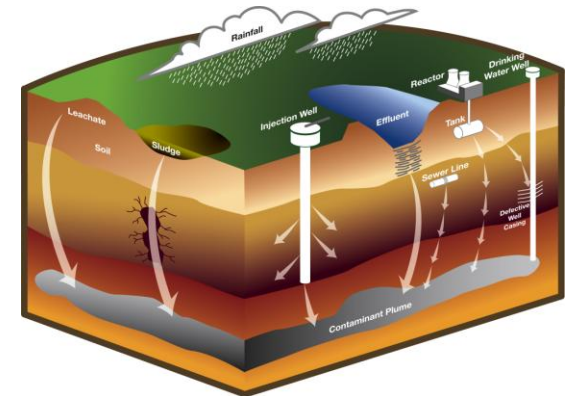
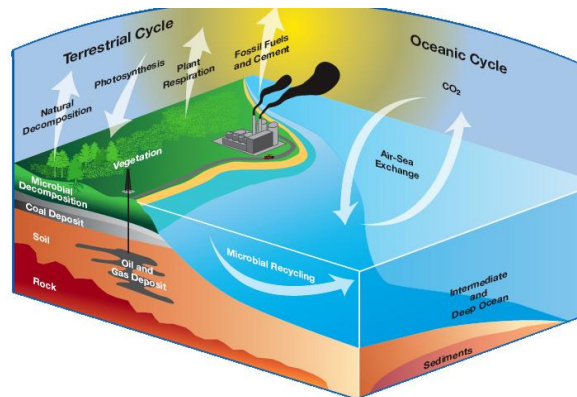
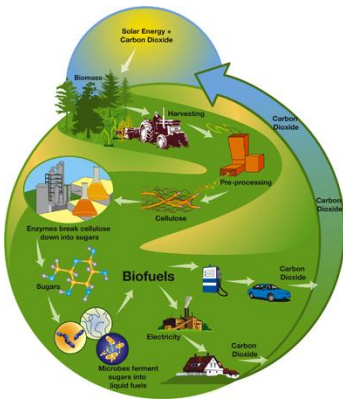
\$69M annual budget

~1800 annual users world-wide



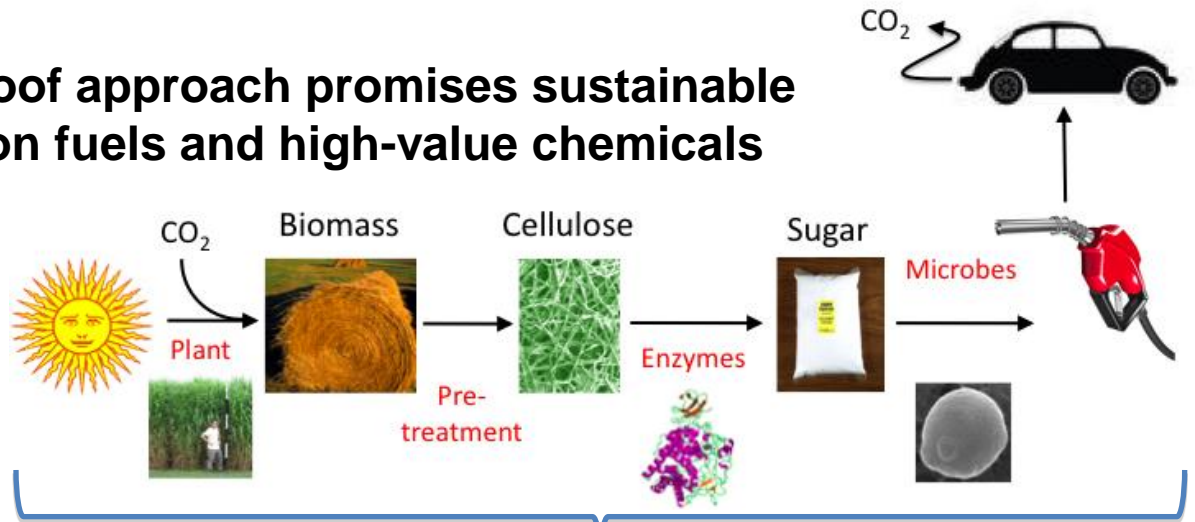
Mission:

Founded to speed the completion of the Human Genome Project, DOE, JGI now serves as a genomic user facility in support of the DOE missions: **bioenergy, carbon cycling, & biogeochemistry**



Joint BioEnergy Institute

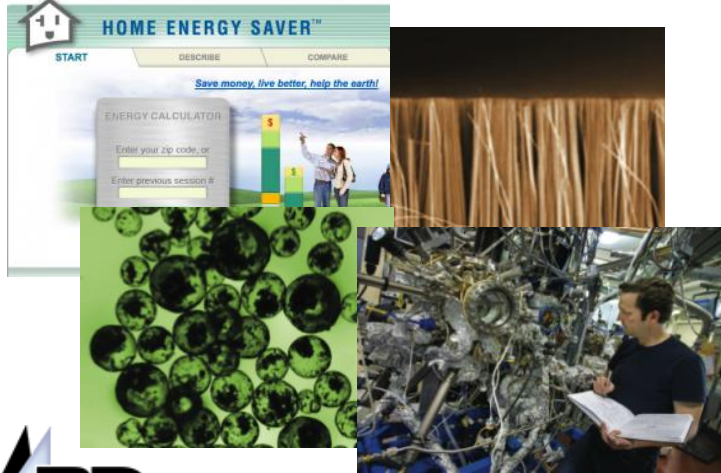
- **Mission:** to advance the development of the next generation of biofuels—liquid fuels derived from the solar energy stored in plant biomass
- **Integrated under-one-roof approach** promises sustainable low-cost next-generation fuels and high-value chemicals



Six institutions: one location



Recent Laboratory-wide accomplishments and initiatives



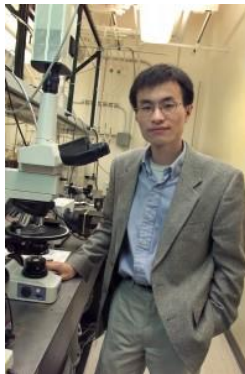
Discovery of a route for microbial production of fatty-acid-derived fuels from plant biomass



Four R&D 100 Awards



LBL is the only National Laboratory named on *The Scientist's* list of the top 40 places to work



Joint Center for Artificial Photosynthesis

CalTech and LBNL awarded DOE Energy Innovation Hub

CALTECH



Major S&T initiatives: Carbon Cycle 2.0

Pioneering science for sustainable energy solutions



Efficiency



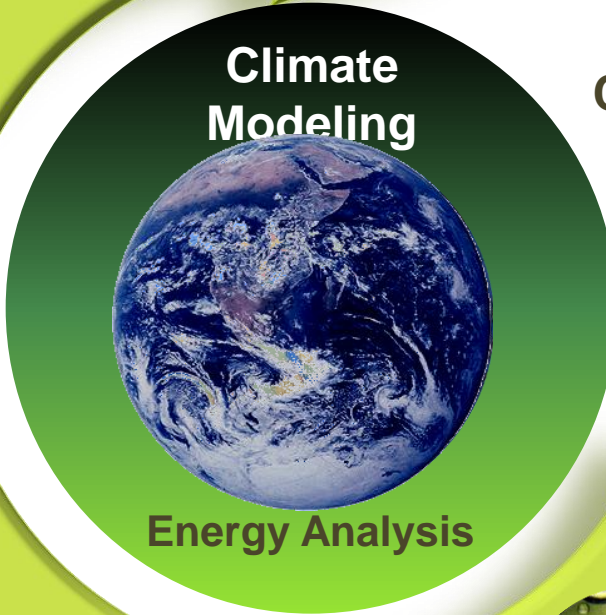
Combustion



Photovoltaics



Developing World



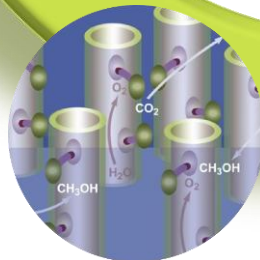
Energy Analysis



Carbon Capture & Storage



Energy Storage



Artificial Photosynthesis



Biofuels

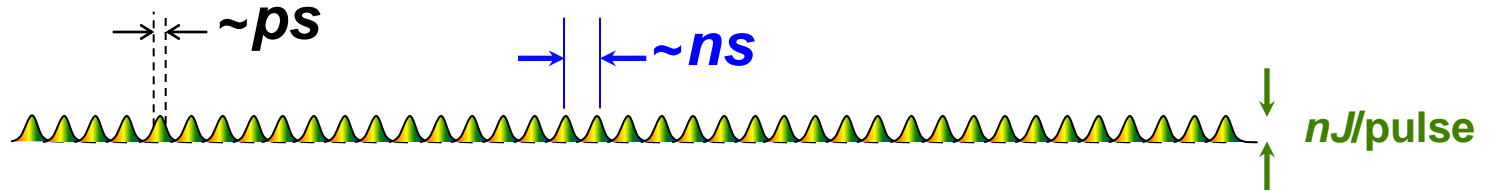
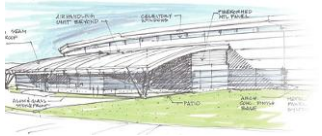


Major S&T initiatives: A next-generation light source



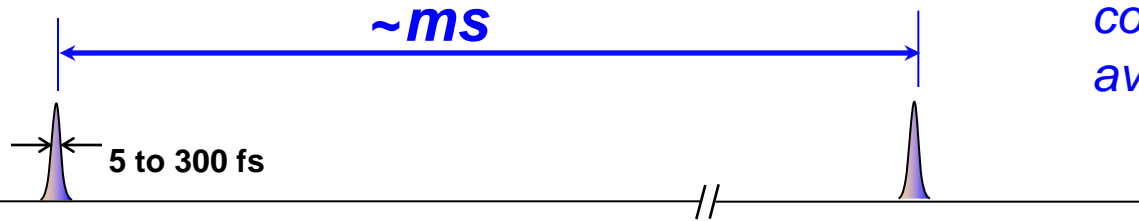
Storage Rings

NSLS-II



FELs

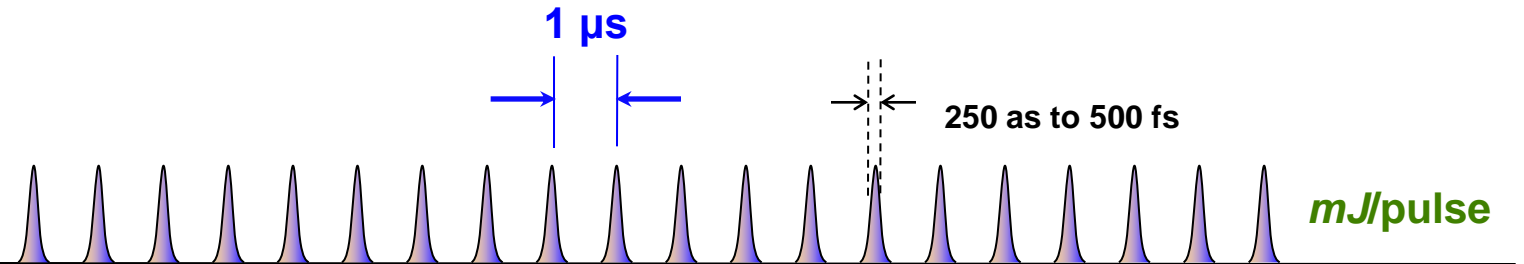
LCLS-II



$nJ/ns \sim mJ/ms$
comparable
average power

$mJ/pulse$

NGLS



$>100x$ average power

NGLS will produce fully coherent X-ray pulses at MHz rates

Lawrence Berkeley National Laboratory Questions/Discussion



Ashok Gadgil
Division Director -- EETD