



# LBNL

Lawrence Berkeley National Laboratory



## The Computational Research and Theory Facility

### A Catalyst for Scientific Discovery

When Ernest Orlando Lawrence started his lab eighty years ago, he brought together scientists, engineers and technicians to address pressing scientific concerns of his day. His legacy of team science laid the foundation for discoveries worthy of 13 Nobel Prizes and remains a driving force inspiring the work of Berkeley Lab.

The Computational Research and Theory (CRT) facility, builds on this tradition—encouraging an exchange of expertise while offering an optimal environment to advance research. The CRT's proximity to UC Berkeley will provide student and scientist alike a meeting place for the best minds in science and computing.

The project will include an approximately 140,000 gross-square-foot, \$145 million computer facility and associated infrastructure with accommodations for approximately 300 staff. Designed to take advantage of the cool Berkeley climate, the CRT is anticipated to set a new standard in energy efficiency for high-performance computing.

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The CRT will bring together these world-class programs within the Computing Sciences Division of Berkeley Lab for the first time:

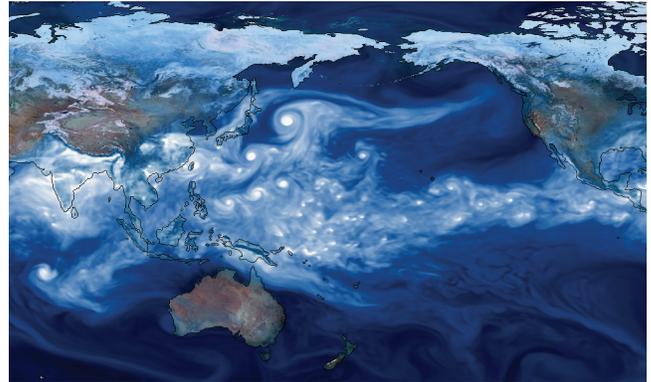
- **The National Energy Research Scientific Computing Center (NERSC)** is the Department of Energy's most scientifically productive super-computing center serving more than 4,000 researchers who use NERSC to generate nearly 1,500 papers a year. Advances in physics, materials science, and chemistry would be impossible without the horsepower of its fastest computer which is clocked at 1.05 quadrillion calculations per second.
- **The Computational Research Division** at Berkeley Lab fosters scientific breakthroughs in applied computer science R & D, data management and analytics, networking and distributed computing, and applied mathematics.
- **The Scientific Networking Division** promotes global scientific collaboration through its operation of the DOE's **Energy Sciences Network**, or ESnet, which provides high-bandwidth connections for researchers worldwide to work together on such problems as global climate change, developing fusion energy and our understanding of the Universe.
- Berkeley Lab Computing Sciences has joined with UC Berkeley to create a program called **Computational Science and Engineering at Berkeley (CSE)**. CSE trains Ph.D. students in the increasingly important fields of large-scale simulation and analysis of large data sets. The program also serves students at UC campuses in Davis, Merced, and Santa Cruz and lectures are freely available online.

# Supercomputers: Super Protectors of Our Planet

Global climate change, renewable energy, and energy efficiency are some of the most compelling scientific challenges of the 21st century. As scientists tackle these problems with experimental and theoretical methods, a third approach—supercomputing—has become an increasingly important tool for scientific discovery. Supercomputers are used to simulate problems that are otherwise too large, too small, too expensive, too fast, too slow, or too dangerous to model. Berkeley Lab's CRT will be more than just a data center; the facility promises to be a catalyst for making our planet a better place to live.

## Global Climate Change

Although our climate is extremely complex, computer models are simulating the intricacies of the atmosphere, oceans, land, sea ice and other phenomenon. Researchers come to Berkeley Lab to generate visual models of decades' worth of data and to predict the effects of mitigation measures. Supercomputers are also providing insight into the impact of warmer climates on food supplies and extreme weather.



## Clean, Renewable Energy

Solar and wind are playing an important role in reducing emissions of greenhouse gases. In just the past two years, California has issued permits for more than 16,000 megawatts of solar, wind and geothermal energy projects. Scientists are using supercomputers to explore the potential of these sources and the new materials that will make solar cells and wind turbines.



## Increasing Energy Efficiency

While Berkeley Lab is actively pursuing alternative energy sources, its scientists also realize that combustion of fuels will remain important for powering engines in jet aircraft and most power plants. Combustion is a mix of chemical processes that occur so quickly they cannot be measured in a lab, but new simulations are helping to find ways to reduce the amount of fuel burned and its resulting pollutants.

