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The following news release announcing funding for projects in "ultrafast" science was issued by the U.S. Department of Energy (DOE). One of the projects will be led by Ian Robinson, a physicist at DOE's Brookhaven National Laboratory. Robinson will use x-ray laser techniques at SLAC's Linac Coherent Light Source to study dynamic characteristics of quantum materials such as high-temperature superconductors—materials that carry electric current with no energy loss. The work will help elucidate how changes in electronic, magnetic, and crystal characteristics are related to these materials' properties and may lead to ways to engineer "properties on demand" via strategic ultra-fast excitation of quantum materials. For more information about Robinson's project, contact: Karen McNulty Walsh, [kmcnulty@bnl.gov](mailto:kmcnulty@bnl.gov), (631) 344-8350.

## Department of Energy Announces \$30 Million for "Ultrafast" Science

Research aims at new insights into materials and chemistry

July 27, 2018



The Linac Coherent Light Source at SLAC National Accelerator Laboratory (Credit: SLAC)

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Tuesday, 11/7, at 1

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Wednesday, November 1, 2023

## Brookhaven National Laboratory

Brookhaven National Laboratory is a multipurpose research institution funded by the U.S. Department of Energy. Located on Long Island, NY, Brookhaven operates large-scale facilities for studies in physics, chemistry, biology, medicine, applied science, and advanced technology. The Laboratory's almost 3,000 scientists, engineers, and support staff are joined each year by more than 5,000 visiting researchers from around the world.



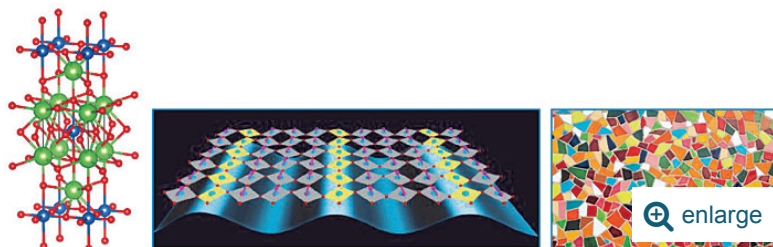
**WASHINGTON, D.C.** – Today, the U.S. Department of Energy (DOE) announced \$30 million in funding for 10 projects to advance research in the important and growing field of “ultrafast” science.

The research efforts span both materials science and chemistry, and will take advantage of new and emerging capabilities to probe materials and chemical processes at time scales of a quadrillionth of a second or less. The goal is to help speed discovery of new materials and chemical processes through better step-by-step observation and control of matter’s behavior at atomic and molecular scales.

“Discoveries in materials science and chemistry have long been critical drivers of technological innovation and economic growth,” said U.S. Secretary of Energy Rick Perry. “These projects will keep American scientists on the cutting edge of one of today’s most promising and potentially productive areas of research.”

While the research spans a range of topics, a major focus is preparing for the upgrade of America’s premier installation for ultrafast science, the Linac Coherent Light Source (LCLS), a DOE Office of Science user facility at SLAC National Accelerator Laboratory.

Deployed in 2009 as the world’s first hard x-ray free electron laser (XFEL), LCLS gave ultrafast science a major boost, with its exquisite capability to probe matter with femtosecond (quadrillionth of a second) laser pulses 120 times a second—and thereby closely track the motions of atoms and molecules.



Brookhaven Lab project: Scientists will use x-ray laser techniques to study crystalline materials such as cuprate superconductors (left) to learn what timescales are needed for electrons to become arrayed into wave-like ordered arrangements (center) that can allow electrical current to flow. The novelty of the Brookhaven project is to identify the roles of domains, or regions where the waves are located in the material (like tiles in a mosaic), that can rearrange in response to a laser.

To maintain the U.S. leadership in ultrafast science, LCLS is presently undergoing an upgrade, which will produce up to 1 million laser pulses a second, delivering even finer time resolution.

A major thrust of the new ultrafast projects is understanding how to structure and shape experiments to take advantage of these revolutionary new capabilities. In the process, the research can be expected to provide

detailed new insights into the behavior of catalysts, the movement and exchange of electrons in chemical reactions, and even exotic quantum effects that may eventually find application in quantum computing, quantum information processing, and advanced sensors.

Resulting discoveries can ultimately be expected to benefit a wide range of technologies throughout the U.S. economy.

Projects were chosen by competitive peer review under a DOE Funding Opportunity Announcement, [RESEARCH AT THE FRONTIERS OF X-RAY FREE ELECTRON LASER ULTRAFast CHEMICAL AND MATERIALS SCIENCES](#), sponsored by the [Office of Basic Energy Sciences](#) within the Department's Office of Science.

Funding totals \$30 million for projects lasting three years in duration. A list of projects can be found [HERE](#).

DOE Media Contact: (202) 586-4940

*Brookhaven National Laboratory is supported by the Office of Science of the U.S. Department of Energy. The Office of Science is the single largest supporter of basic research in the physical sciences in the United States, and is working to address some of the most pressing challenges of our time. For more information, please visit [science.energy.gov](http://science.energy.gov).*

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