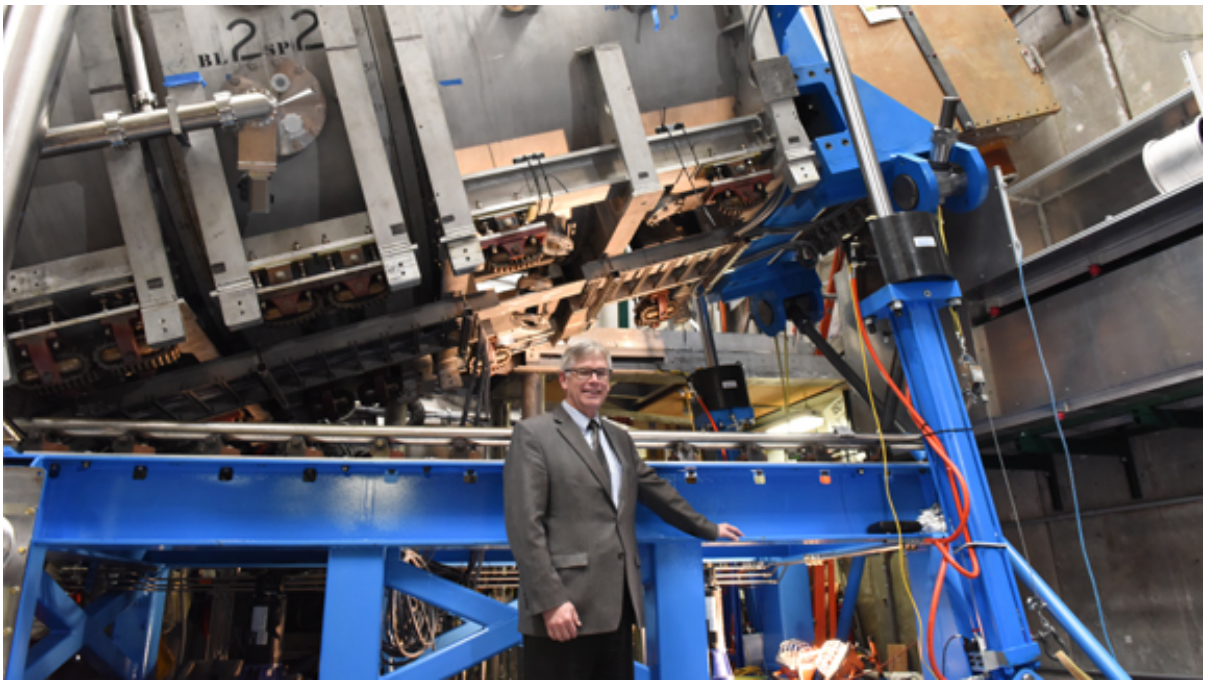
U.S. DEPARTMENT OF ENERGY

Office of Science

COMMUNIQUE

15 April 2019

*Comm*unique provides a biweekly review of recent Office of Science Communications and Public Affairs work, including feature stories, science highlights, social media posts, and more. This is only a sample of our recent work promoting research done at universities, national labs, and user facilities throughout the country.
Please note that some links may expire after time.



Meet the Director: David Hill, DIII-D

This is part of a continuing profile series on directors of the Department of Energy Office of Science user facilities. These scientists lead institutions that provide researchers with the most advanced tools of modern science including accelerators, colliders, supercomputers, light sources, and neutron sources, as well as facilities for studying the nano world, genomics, the environment, and the atmosphere.

To eight-year-old David Hill, the UFO-like top and spindly legs of the Space Needle looked like the future. When he saw the Needle finally completed, he felt like he was experiencing "tomorrow" right in the present day. Inspired in part by that taste of technology, 14 years later Hill graduated from college as a physics major. Although his PhD at UC Irvine focused on space plasmas, Hill's interests took a turn after graduation.

"I hadn't really thought about fusion," he said, "but it came time to get a job." With more jobs available in fusion energy research than space plasma physics, practicality won out.

It was the perfect shift. When he started interviewing at fusion research facilities, including at the national laboratories, he discovered a new passion. Now, Hill pursues that passion as the director of the largest magnetic fusion facility in the U.S., the DIII-D National Fusion Facility. DIII-D is an Office of Science user facility hosted by General Atomics. As director, Hill leads a team of more than 600 researchers working together to achieve one of science's boldest goals: fusion energy for the future.

Click here to read more about David Hill and his work as the director of the DIII-D user facility

NEWS CENTER

The Office of Science posted 54 news pieces between 4/1/2019 and 4/14/2019, including 19 university articles and 29 pieces from the labs and user facilities.

Researchers at Lawrence Berkeley National Laboratory are applying deep learning and analytics to electronic health record data to help the Veterans Administration address a host of medical and psychological challenges affecting many of the nation's 700,000 military veterans. The DOE and the VA have been working together since 2017 to apply supercomputing, networking, and software development resources to medical data sets collected by the VA from some 700,000 veterans and to electronic health record data from another 22 million veterans.

Organic electronics could allow companies to print electronics like paper or incorporate them into clothing to power wearable electronics—if there were better ways to control their electronic structure. Addressing this challenge, Nick Jackson, a postdoctoral fellow in the University of Chicago's Institute for Molecular Engineering, developed a faster way of creating molecular models by using machine learning. The models dramatically accelerate the screening of potential new organic materials for electronics, and could also be useful in other areas of materials science research.

An international team of scientists led by Pacific Northwest National Laboratory's Manish Shrivastava has found that human-caused pollution spurs the production of climate-changing particles known as secondary organic aerosols much more than previously thought. These findings illustrate how pollution from cars, power plants, and other sources combines with natural emissions from trees in the Amazon to spur a marked increase in the tiny particles that can reflect or absorb sunlight, help create clouds, change rainfall patterns, and determine

With support from a grant from the Office of Science and experiments performed at the Advanced Photon Source and the Stanford Synchrotron Radiation Lightsource, an international group of scientists—led by Natalia Korotkova of the University of Kentucky—has gained some insight into bacteria like Group A Streptococcus and the hope of a vaccine. The group set out to identify the genes that conferred Group A Streptococcus resistance by bombarding the bacteria with two antimicrobials and found that both assays identified the same genetic culprit.

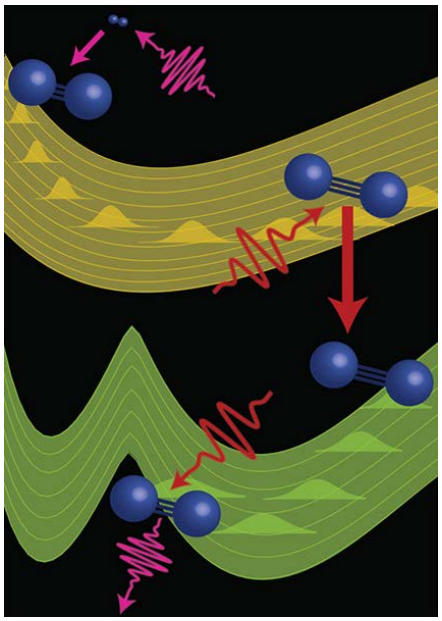
how carbon flows between the land and atmosphere – all with dramatic effects on the planet.

The Children's Museum of Indianapolis announced plans this week for Mission Jurassic, a project that will support paleontological excavation of a fossil-rich plot of land in northern Wyoming. The project will bring together scientists from around the world, including SLAC National Accelerator Laboratory, to reveal dramatic new secrets about the world of millions of years ago. Using SLAC's Stanford Synchrotron Radiation Lightsource, researchers will shine bright X-rays onto the fossils to detect a wide range of biological and geochemical elements.

Usually, when a material is compressed, it becomes a better conductor of heat. In boron arsenide however, a research team from Boston College found that, when the material is compressed, conductivity first improves and then deteriorates. This behavior can be explained by an unusual competition between different processes that provide heat resistance, the likes of which have never been predicted or observed before.

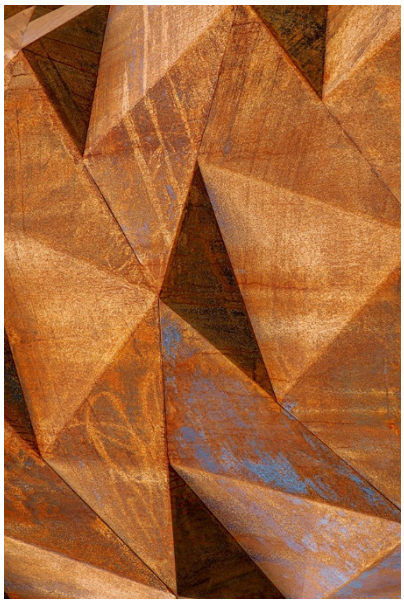
SCIENCE HIGHLIGHTS

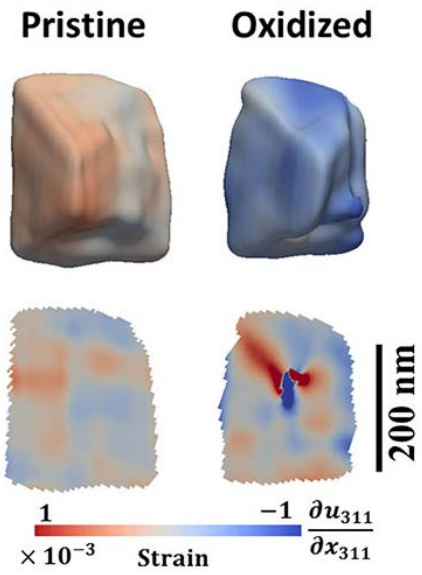
The Office of Science posted seven highlights between 4/1/2019 and 4/14/2019 spotlighting science from two programs: BES and NP.



Molecular reactions have typically been difficult to observe. The reactions are just too fast. Until now. A team of scientists from Lawrence Berkeley National Laboratory devised a way to reveal time- and energy-resolved information on “dark” states of molecules—ones that are normally inaccessible by controlling the evolution of a highly electronically excited molecule by nonlinear optical methods in the extreme ultraviolet spectrum. This method allows scientists to observe and control molecular and atomic dynamics at the fastest timescales to date.

Scientists from Pacific Northwest National Laboratory have discovered how iron atoms continually re-arrange on surfaces, offering insights into metal corrosion and soil remediation. Using tracer ions, scientists followed chemical reactions in rust to create 3D “atomic maps” showing the rearrangement of iron atoms on a surface. This study illustrates how rust persists on metal pipes under changing chemical conditions, enabling it to continually corrode and deteriorate over time.





The most magnetic mineral on Earth, magnetite, cleans water contaminated by heavy metals. This process has not, up to now, been directly observed. Now, a team led by scientists from Argonne National Laboratory imaged the surface of magnetite and mapped the reactions. They found that these reactions increase the magnitude and variability of tension and defect formation. Insights like this one into these oxides is vital for environmental science and materials science.

TOP TWEETS

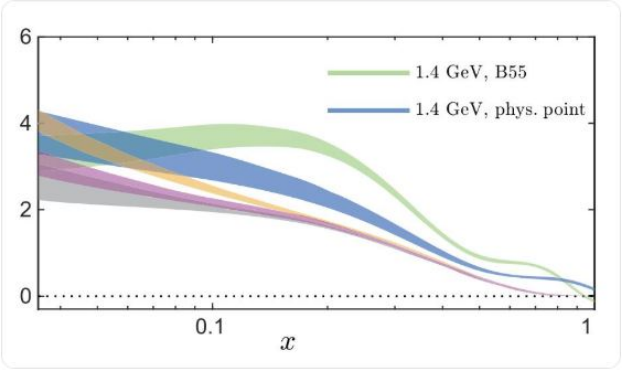
The Office of Science sent out 52 tweets between 4/1/2019 and 4/14/2019. Here are our two most popular from the past two weeks:

DOE Science ✓
@doescience

Climate warming gives trees longer growing period & heightens their vulnerability to cold @NAU @nature #ScienceNeverSleeps science.energy.gov/ber/highlights ...

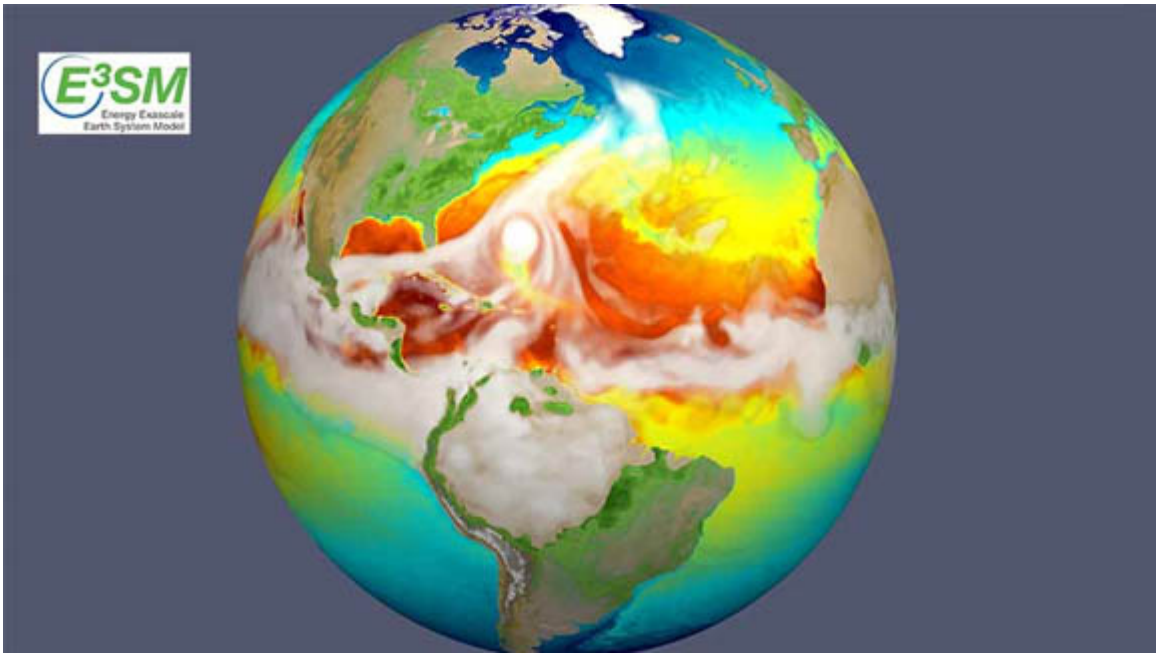
DOE Science ✓
@doescience

Using the Titan supercomputer at @OLCFGOV, researchers modeled the location of one of the subatomic particles inside a proton @TempleUniv @ORNL @UCYOfficial @desynews olcf.ornl.gov/2019/04/03/get ...



BY THE NUMBERS

Earth and Environmental System Modeling

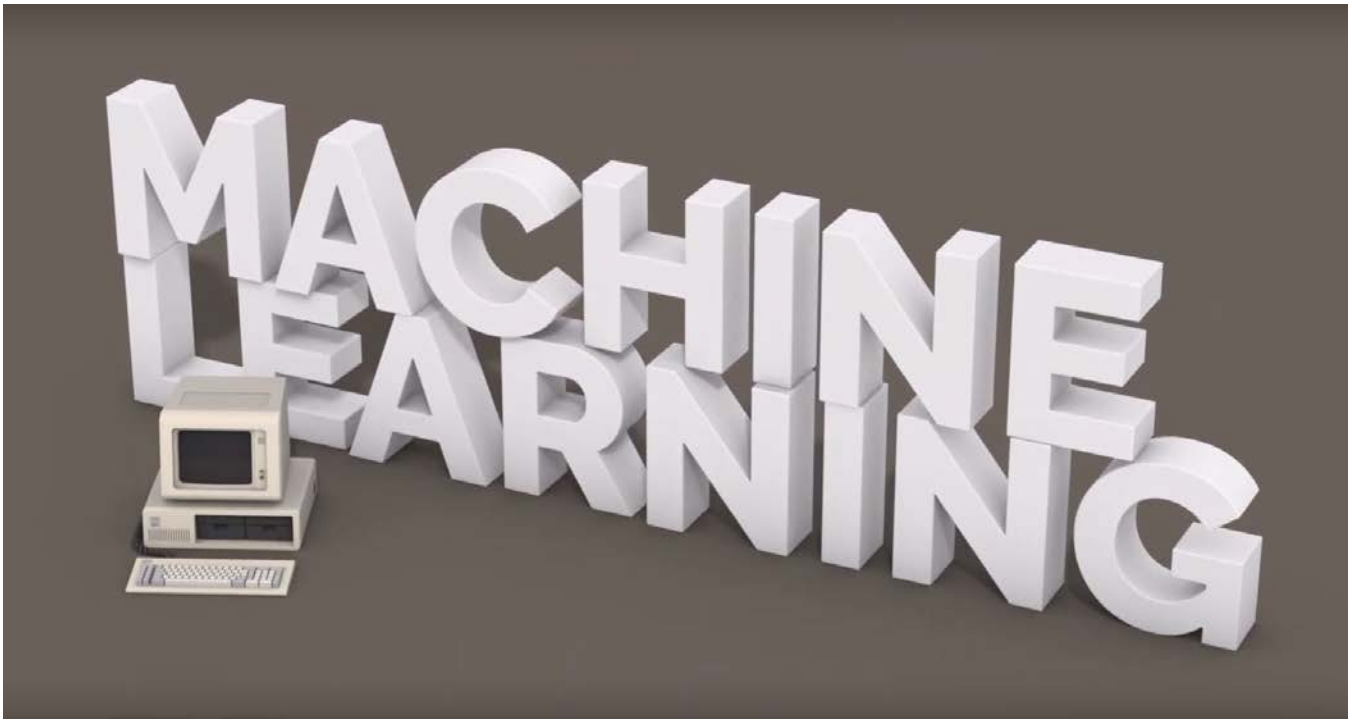


The Office of Science supports research into Earth and Environmental Systems modeling to provide DOE and the nation with the best possible information about the evolving Earth system. Knowledge from these models helps scientists predict changes in the environment and will ensure energy assets and infrastructures remain robust throughout their lifetimes. These models have already predicted a potential 20 percent drop to fishery yields by 2300, analyzed the rate of glacier loss from ocean warming, indicated a connection between arctic sea-ice and California's rainfall, and projected a 20 to 40 percent decrease in North American farmers' corn yields by 2050, among many other advancements in biological and environmental research.

Findings from these models can also help to inform resiliency and sustainability efforts, like those highlighted by the Department of Energy in their Earth Day campaign.

END NOTES

Video: Brown University's SciToons "What are Neural Networks?"



Brown University's *SciToons* series tackles neural networks and machine learning in this video from late March.

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