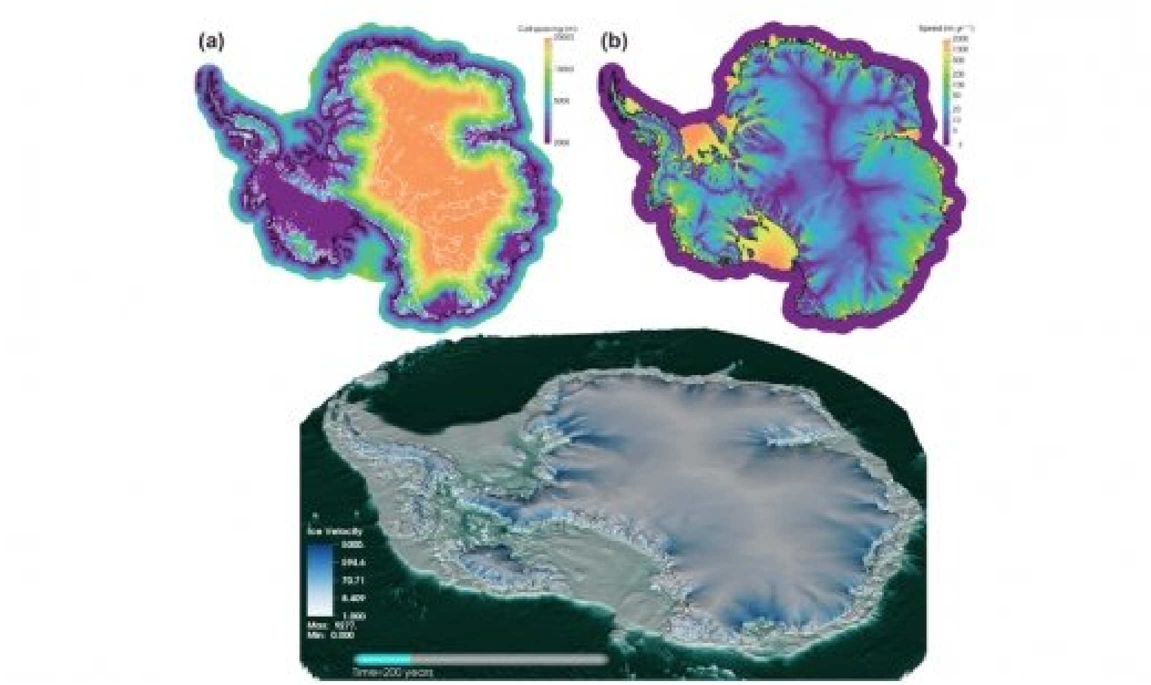
U.S. DEPARTMENT OF ENERGY

Office of Science

COMMUNIQUE

24 June 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. Communique will be taking a summer break and will be back July 22.*




## Simulating Ice at the Bottom of the World: Modeling the Antarctic Ice Sheets

The collapse of the Larsen B ice shelf in the West Antarctic Peninsula shattered more than ice — it shattered scientists' prevailing view of ice sheets and their floating shelves. Scientists had previously thought ice sheets would respond to recent climate change on time scales of hundreds to thousands of years. But where ice meets ocean, change can happen fast.

Scientists who work to understand and model Earth systems, including ice sheets, had to change their approach. Existing models didn't predict the ice sheet's sudden response. Ice shelves block rivers of ice from flowing into the ocean. With the shelf gone, the rivers of ice moved into the ocean three times faster than before. That shift dramatically increased the amount of ice moving from the land into the ocean.

In 2007, the Intergovernmental Panel on Climate Change published its regularly issued report noting that then-current computer models of ice sheets weren't good enough to accurately predict how those sheets would react to climate change and influence sea level rise, a critical gap in understanding the climate system.

The Department of Energy's (DOE) Office of Science responded to that need.

Click here to read more about the MALI and BISICLES ice sheet models.

# NEWS CENTER

**The Office of Science posted 51 news pieces between 6/9/2019 and 6/23/2019, including 26 university articles and 22 pieces from the labs and user facilities.**

Dark matter could be much "lighter," or lower in mass and slighter in energy, than previously thought. It could be composed of theoretical, wavelike ultralight particles known as axions. It could be populated by a wild kingdom filled with many species of as-yet-undiscovered particles. And it may not be composed of particles at all. Scientists at Berkeley Lab are now redoubling their efforts by designing new and nimble experiments and using previously untested methods. The new approach is akin to casting many smaller nets with much finer mesh.

Amyloid beta protein is a normal brain protein found in everyone but, for an unknown reason, it forms deposits in the brains of patients with Alzheimer's disease. A new study from Pacific Northwest National Lab looks at the soluble form of this protein, to consider a growing body of evidence that suggests that the toxic form of amyloid beta is not the one in the deposits but rather the soluble form.

Instead of flash drives, the latest generation of smart phones uses materials that change physical states to store and retrieve data faster, in less space and with more energy efficiency.

Tracking forest activity is crucial because photosynthesis pulls carbon dioxide out of the air; however, evergreen trees retain their chlorophyll-filled green needles year round, preventing scientists from detecting the onset and decline of photosynthesis on a large scale. For the first time, a new study including researchers from the University of Utah has linked photosynthesis with solar-induced fluorescence, a process trackable by satellites, allowing researchers to track photosynthesis cycles even in evergreen forests.

Rice University researchers have simplified the synthesis of a unique, nearly 2D form of iron oxide with strong magnetic properties that is easy to stack atop other 2D materials. The material could be useful for spintronic devices and could be used as a testing ground to see how magnetic properties act across interfaces.

Researchers from the University of Rochester have conceived an idea for a 'quantum refrigerator' which would cool atoms to nearly absolute zero. This refrigerator could be used to facilitate and enhance

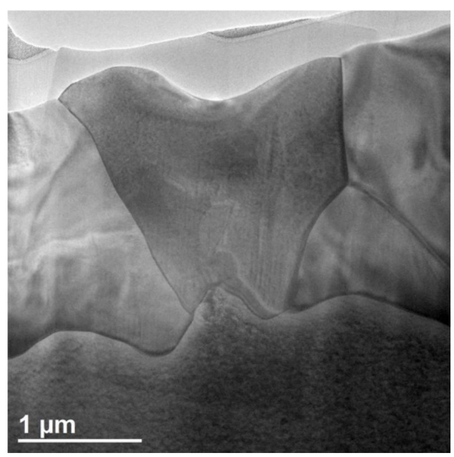
Now, scientists collaborating with researchers at SLAC National Accelerator Laboratory have discovered how these phase changes occur on an atomic level. the performance of quantum sensors or circuits for ultrafast quantum computers.

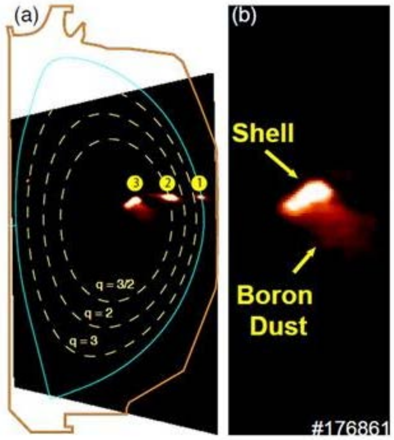
# SCIENCE HIGHLIGHTS

**The Office of Science posted 14 highlights between 6/9/2019 and 6/23/2019 spotlighting science from NP, ASCR, BES, BER, HEP, and FES.**

By simulating tin-100's decay into indium-100, researchers from Oak Ridge National Lab have solved a 50-year-old puzzle to explain why beta decays of atomic nuclei are slower than what's expected based on the beta decays of free neutrons. These findings emphasize the need to include subtle effects when predicting nuclear processes.

Superconducting radio-frequency cavities are the "muscle" of many modern particle accelerators, increasing the energy of beams of charged particles passing through them. Scientists from Fermilab coated one such cavity with a film of niobium-tin, a promising superconducting material, allowing the cavity to accelerate the beams without long pauses between pulses.






A team at the DIII-D National Fusion Facility devised a way to inject impurities deep into plasma using thin-walled diamond shells that carry a payload of boron dust. Introducing the impurities into the plasma mitigates disruptions that can damage tokamak walls and other structures. Safely mitigating these disruptions is essential for reliable operation of larger-scale fusion facilities like ITER.

# TOP TWEETS

The Office of Science sent out 42 tweets between 6/9/2019 and 6/23/2019. Here are our two most popular from the past two weeks:

**DOE Science** @doescience

When the Larsen B ice shelf collapsed, 1000 sq miles of ice was gone & scientists realized they needed to improve models to more accurately simulate ice sheets. @Energy supported @BerkeleyLab, @LANL, & @SandiaLab to take on the challenge energy.gov/science/articl ...


**DOE Science** @doescience

For the first time, a new study has linked seasonal Gross Primary Production (GPP) cycles to a process that occurs with photosynthesis but has recently become trackable by certain satellites—solar-induced fluorescence (SIF) bit.ly/2Iam7RS @UUtah

# BY THE NUMBERS

## TOP500: U.S. Supercomputers Still Fastest In The World

Two DOE national labs continue to house the fastest supercomputers in the world, according to the new TOP500 List, a semiannual ranking of the world's fastest computing systems. Ranked number one is the IBM Summit system at Oak Ridge National Laboratory, which is devoted to open science and has held the number one ranking on the TOP500 list since June 2018. Lawrence Livermore National Laboratory's IBM Sierra system, which is focused on national security applications, kept the number two spot, where it has been ranked since October.

# END NOTES

## SLAC: A day in the life of an accelerator designer

Tor Raubenheimer at SLAC is an accelerator physicist — someone who designs, builds or operates particle accelerators. It's a title that only a few thousand people lay claim to worldwide. Throughout his career, Raubenheimer has operated SLAC's accelerators and designed new ones through international collaborations.

The multifaceted nature of accelerator physics makes it an interesting challenge. On top of theory and simulations, Raubenheimer says, "you have to worry about plumbing, and all the details of how you support things, and what metals go in radiofrequency fields and what don't. So it's a very broad field. It requires expertise and knowledge across a wide set of disciplines."

For profiles of the wide variety of people who work at the national labs, user facilities, and universities and more, check out the Office of Science LinkedIn page here.

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