U.S. DEPARTMENT OF ENERGY
Office of Science

COMMUNIQUE

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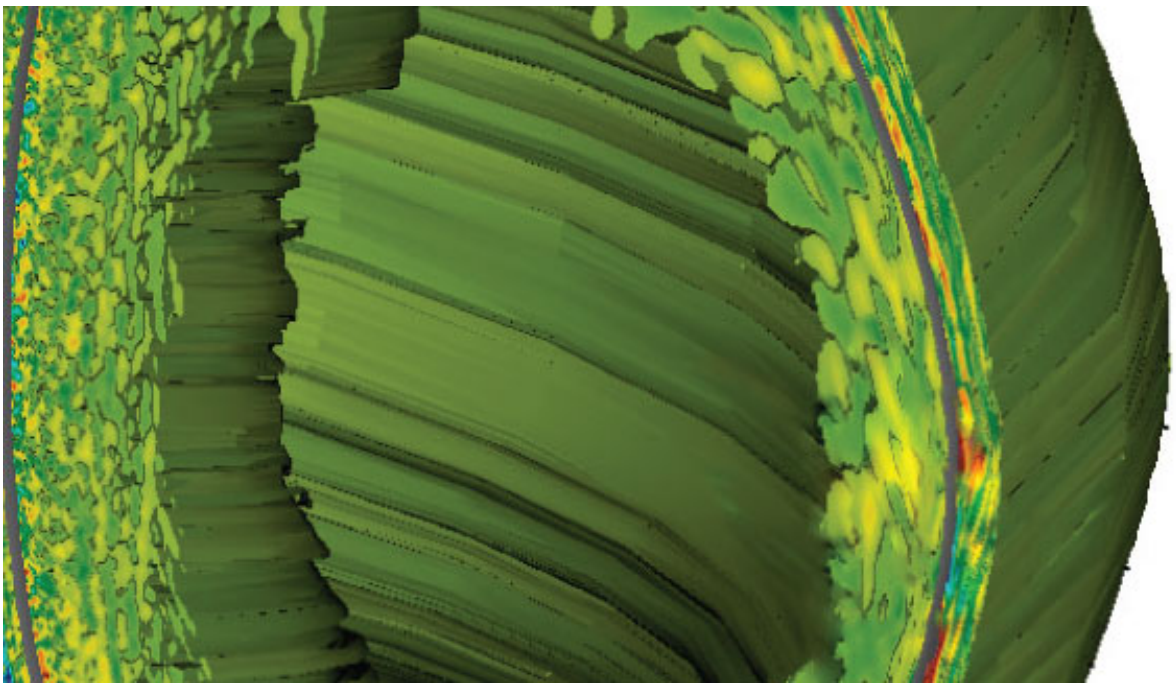
*Comm*unique provides a biweekly review of recent Office of Science Communications and Public Affairs work, including feature stories, science highlights, social media posts, and more. This is only a sample of our work promoting the research done at universities, national labs, and user facilities throughout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



Developing a Cookbook for Efficient Fusion Energy

Hot plasma swirls in a massive tokamak machine, burning 10 times hotter than the core of the sun. The plasma's energy rises and rises; the pressure builds and builds. The plasma along the edge, where it meets the machine's walls, turbulently whirls faster and faster. Suddenly, the plasma at the edge settles down. At that moment, the plasma has reached what fusion scientists call the "high-confinement mode" or H-mode. In the H-mode, a calm edge without turbulence reduces how much heat and how many charged particles the plasma loses. The reduced energy and particle losses also minimize damage to the material surfaces surrounding the plasma.

One day, fusion reactors could produce clean, reliable energy. Before that happens, scientists need to understand how to get a fusion reaction up and running so that reactors produce much more energy than they consume. They know fusion requires combining nuclei together at high pressure, but they need a recipe to get there. Knowing how to reach the H-mode is a fundamental part of developing that recipe.

[Click here to read more about physics and the future of fusion reactors.]

NEWS CENTER

The Office of Science posted 62 news pieces between 1/7/2019 and 1/21/2019, including 29 university articles and 25 pieces from the labs and user facilities.

Much of the growing global concern about the plastics polluting oceans and clogging landfills has focused on reducing consumption and reusing where possible. Unlike recycling of less-complex materials like aluminum or glass, plastic is a "down-cycle" material, meaning that the processes used to clean and re-form it into new raw material degrade the plastic's quality. In an effort to change that, Aaron Sadow and colleagues at Ames Laboratory are teaming up with researchers at Argonne National Laboratory, UC Santa Barbara, University of South Carolina, Cornell University, and Northwestern University in an effort funded by the Office of Science to upcycle single-use plastics into more valuable chemicals that make recovery worthwhile.

In survival game shows, contestants are whisked away to a foreign location, where they face unfamiliar stresses and must adapt to the surroundings and work together with fellow competitors. As it turns out, the same is true on the microscopic level for microbes residing in fluids from hydraulic fracturing processes. With the resources at the Environmental Molecular Science Laboratory and the Joint Genome Institute user facilities, researchers began looking closely at these engineered worlds. Such worlds could even be considered as a model system for understanding how microbial community members interact within their ecosystems.

In 2017, University of Utah physicist Valy Vardeny called perovskite a "miracle material" for an emerging field of next-generation electronics, called spintronics, and he's standing by that assertion. Vardeny, along with Jingying Wang, Dali Sun (now at North Carolina State University) and colleagues have presented two devices—a spintronic light emitting diode and a spin valve—built using perovskite to demonstrate the material's potential in spintronic systems. Its properties, Vardeny says, bring the dream of a spintronic transistor one step closer to reality.

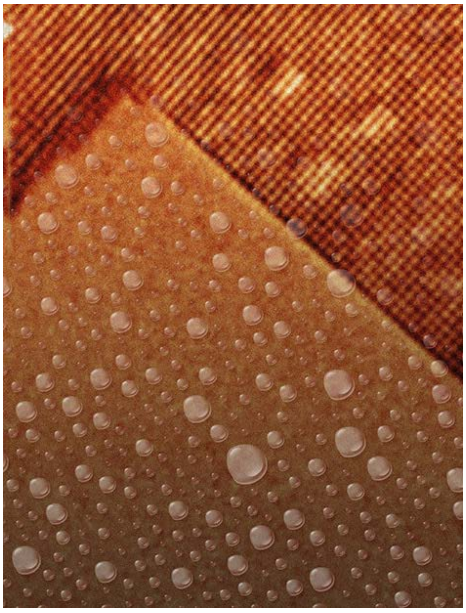
For decades, ecologists have differed over a longstanding mystery: Will a longer, climate-induced growing season ultimately help coniferous forests to grow or hurt them? Researchers from the University of Colorado Boulder found that, by applying different methods for characterizing growing season length to past studies, many previous datasets could be made to yield a positive (forest growth) or negative (forest decline) outlook depending on which single methodology was applied. The CU Boulder study provides recommendations and best practices for calculating growing season length by using an ensemble approach, combining multiple study methods and taking an average to come up with a more robust conclusion, to help future researchers find a more definitive answer to this question.

Scientists seeking to bring the fusion reaction that powers the sun and stars to Earth must keep the superhot plasma free from disruptions. Now researchers at the Princeton Plasma Physics Laboratory (PPPL) have discovered a process that can help to control the disruptions thought to be most dangerous. The PPPL finding focuses on so-called tearing modes — instabilities in the plasma that create magnetic islands, a key source of plasma disruptions. These islands, bubble-like structures that form in the plasma, can grow and trigger disruptive events that halt fusion reactions and damage doughnut-shaped facilities called tokamaks that house the reactions.

West Virginia University physicists are looking beyond the limits of classical computing used in our everyday devices and are working toward making quantum device applications widely accessible. The researchers proved that superconductivity could be manipulated by a weak, continuous ultraviolet light. This discovery has broad fundamental and applied impacts, such as those in the development of quantum computation.

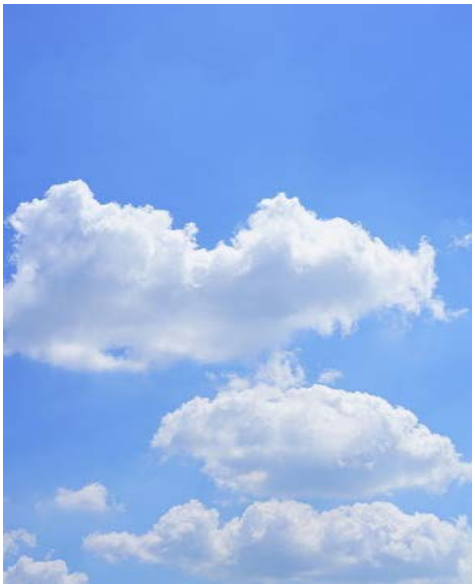
SCIENCE HIGHLIGHTS

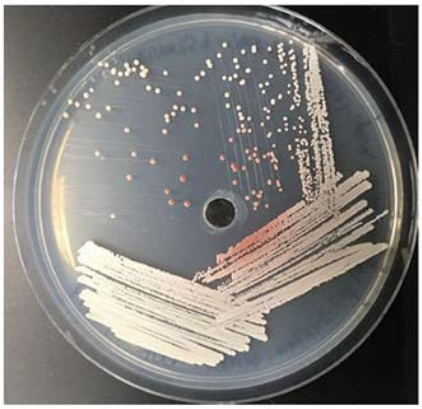
The Office of Science posted 15 highlights between 1/7/2019 and 1/21/2019 spotlighting science from 2 programs: BER and BES.



Engineers have long known water vapor can accelerate corrosion of metals and alloys, but the exact mechanisms remain elusive and difficult to prevent. An international team of scientists, in part from Pacific Northwest National Laboratory, has peered into the atomic-level workings of water vapor corrosion. Knowing how water vapor such as mist or steam corrodes metals and alloys can help engineers keep industrial systems working at peak performance longer.

Shallow cumulus clouds are hard to model and predict. Because they are close to the Earth's surface and are very bright, these puffball clouds have a cooling effect. Even small changes to their abundance could have a substantial effect as the planet warms. Scientists at the Atmospheric Radiation Measurement user facility site in Oklahoma situated digital cameras to provide stereoscopic views of the clouds. Data from these cameras give scientists a complete 3-D view of how the clouds change. These high-resolution observations will allow scientists to test theories regarding the behavior of these important clouds.

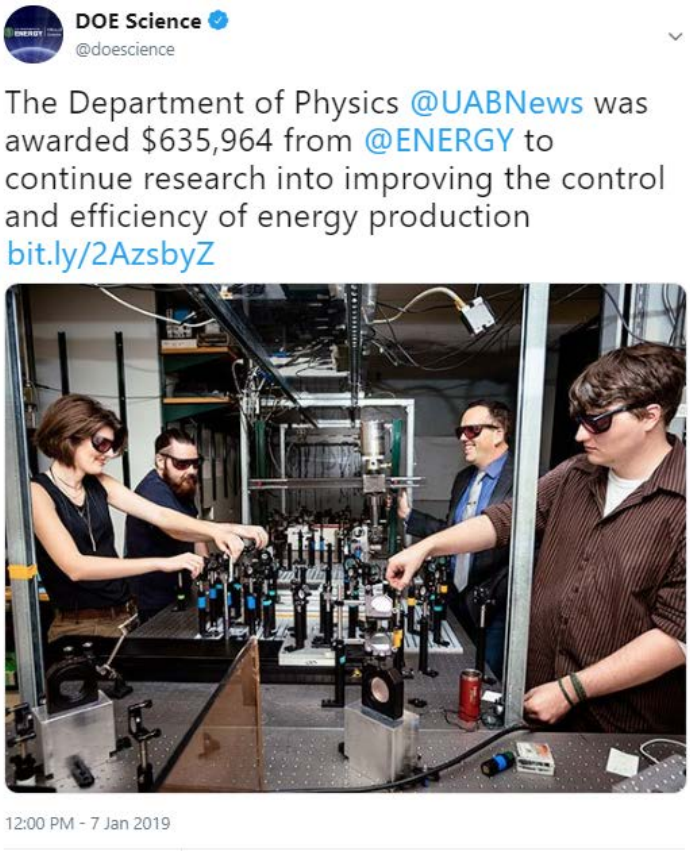




Scientists from the University of Wisconsin-Madison revealed a four-gene cluster associated with the production of pulcherrimin, the iron-binding molecule in budding yeasts. Yeasts use the same pathway to make pulcherrimin and isobutanol—an alcohol of interest for biofuels. High pulcherrimin producers may be harnessed for increased isobutanol, potentially boosting the production of biofuels.

TOP TWEETS

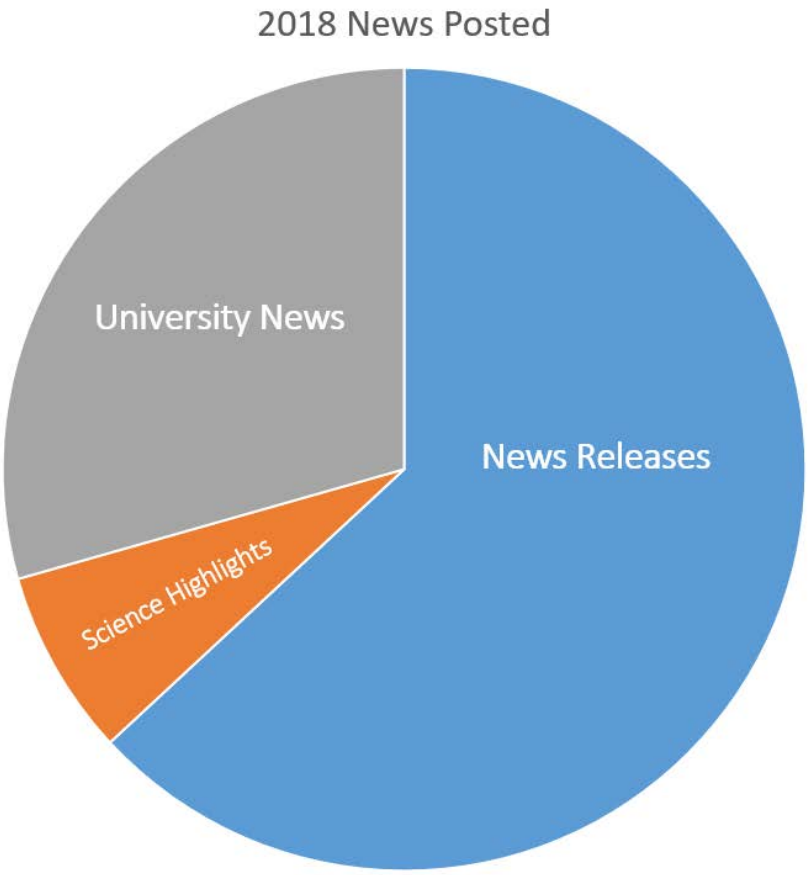
The Office of Science sent out 47 tweets between 1/7/2019 and 1/21/2019 and gained 166 new followers.



STATISTICS

The Office of Science by the numbers.

News Posted to the SC Website in 2018



In 2018, SC spotlighted science in 2,099 pieces: lab and other SC news releases, university releases, and science highlights. About 63% of news posted in 2018 reported on lab and user facility news, 29% was comprised of university news releases, and the remaining eight percent were science highlights from the six SC programs. These pieces were all featured on the SC website.

END NOTES

Students Nationwide to Compete in 29th Department of Energy National Science Bowl®

Ardsley High School's head coach Sangmi Chung (far right), Joshua Park, James Park, Jared Cole, Jainil Sutaria, and Kyle Cheng of Ardsley, N.Y., pose for a photo with Paul Dabbar, Dept. of Energy Under Secretary for Science, after winning the high school national championship at the 2018 National Science Bowl®.

Thousands of students from middle and high schools across the country are looking forward to a bit of an adrenaline buzz and a dopamine high as they prepare to compete in the Department of Energy's (DOE's) 29th National Science Bowl®. These students are hard at work studying, practicing, and strategizing to win their local, regional, and finally the national competition. More than 14,000 middle and high school students from around the country will participate in these fast-paced competitions covering all areas of science and mathematics. The competitions start this month, with four students from each team facing off in a fast-paced, question-and-answer format.

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