



U.S. DEPARTMENT OF
ENERGY

Office of Science

COMMUNIQUE

29 April 2019

Communique 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.



Outside the Box Thinking for Unusual Nuclear Wastes

This is article part of a series that explores how scientific teams at the Department of Energy's Energy Frontier Research Centers come together to solve intractable problems.

"There won't be just one material that solves our nation's nuclear waste problem," said Kristen Pace, a doctoral student at the Center for Hierarchical Waste Form Materials (CHWM).

At CHWM, Pace and her colleagues learn what it takes to store a highly radioactive subset of defense-related waste. The conventional storage process turns liquid nuclear waste into radiation-resistant glass that won't leak. Some components of the waste, such as cesium, technetium, and iodine, will evaporate

into the air during this conventional process and need a different storage option. The ideal option would pack in several troublemakers, reducing the volume that's stored.

"I'm hopeful that in several more years, we'll be able to come up with a nice material for some of the radionuclides we want to sequester that will last as long as the time it takes for the last radionuclide to decay," said Hans-Conrad zur Loye, CHWM's Director and University of South Carolina professor. "We're doing great science for a good reason."

[Click here to read more about the diverse, collaborative group at the CHWM Energy Frontier Research Center.](#)

NEWS CENTER

The Office of Science posted 64 news pieces between 4/15/2019 and 4/29/2019, including 27 university articles and 26 pieces from the labs and user facilities.

Delivering modern electricity is a numbers game. From power plant output to consumer usage patterns, grid operators juggle a complex set of variables to keep the lights on. Cloud-based tools can help manage all of these data, but utility owners and system operators are concerned about security. Scientists at [Argonne National Lab](#) are developing and deploying tools to facilitate cloud computing for grid operations and planning. A framework being developed at Argonne masks sensitive data, allowing grid operators to perform complex calculations in the cloud to determine where and when to dispatch resources.

A team of scientists including researchers at [Brookhaven National Lab](#) has studied a catalyst that decomposes nerve agents, eliminating their harmful and lethal effects. For the first study at Brookhaven, the researchers used ultrabright X-rays to measure the elemental composition of a harmless sarin gas simulant. Because hazardous materials like nerve gases cannot be easily studied in conventional research facilities, the experiments were then recreated with actual sarin at the US Army's CCDC Chemical Biological Center. The team determined that interactions

Conductive inks have been around for nearly a decade, but for the technology to see broader use, these inks need to become more conductive and more easily applied to a range of surfaces. Researchers from [Drexel University](#) and Trinity College in Ireland, have created ink for an inkjet printer from a highly conductive type of two-dimensional material called MXene. Recent findings suggest that this ink can be used to print flexible energy storage components, such as supercapacitors, in any size or shape.

Using the Department of Energy's Advanced Light Source, a team led by [Carnegie Institution](#) researchers discovered an ancient sliver of the building blocks from which comets formed inside a meteorite. By undertaking sophisticated chemical and isotopic analysis of material inside a meteorite found at Antarctica's LaPaz Icefield, the team showed that the encased material likely originated in the icy outer solar system along with objects from the Kuiper Belt, where many comets originate. These findings reveal details about how the solar system's architecture was shaped during the early stages of planet formation.

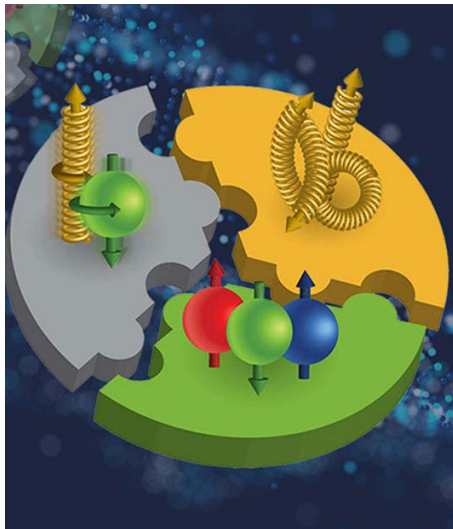
with zirconium were responsible for the decomposition of the nerve agent.

Scientists from the University of Virginia are employing neutron imaging techniques at [Oak Ridge National Lab](#) to probe lithium ion batteries and obtain insights into the characteristics of the batteries' materials and structures. Their research focused on tracking the charge/discharge processes in the battery's electrodes. Knowledge of this process is essential to aid understanding of the effects of local variations in mechanical, structural, transport, and kinetic properties on battery life and performance.

The North Atlantic warming hole (NAWH), a region of reduced warming located in the North Atlantic Ocean, significantly affects the North Atlantic jet stream in climate simulations of the future, according to a team led by researchers from [Pennsylvania State University](#). To investigate how the development of the NAWH impacts the jet stream, the team conducted large-ensemble, atmospheric model experiments in the Community Earth System model.

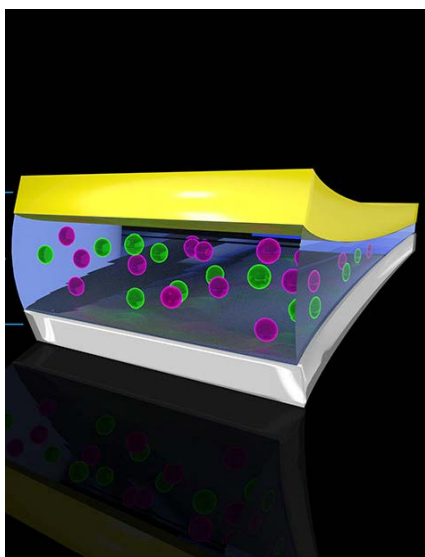
SCIENCE HIGHLIGHTS

The Office of Science posted 10 highlights between 4/15/2019 and 4/29/2019 spotlighting science from four programs: ASCR, FES, BES, and NP.



The STAR experiment at the [Relativistic Heavy Ion Collider](#) provided data to help show how the building blocks that make up a proton contribute to its spin. The results reveal that different “flavors” in the “sea” of antiquarks inside the proton contribute differently to the proton’s overall spin. Solving this puzzle may help scientists understand how the complex interactions within the proton give rise to its overall structure, and in turn to the nuclear structure of the atoms that make up nearly all visible matter in our universe.

Massive disruptions can halt fusion reactions and potentially damage the fusion reactors. By applying deep learning—a powerful version of the machine learning form of artificial intelligence, researchers from [Princeton University and Princeton Plasma Physics Lab](#) have a new code to reliably forecast disruptive events. Such predictions are a crucial for future large reactors and could open avenues for active reactor control and optimization.



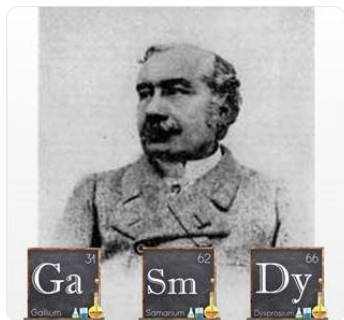
Energy-dense fluoride batteries are exciting, but they only work at high temperatures. Using resources from the Oak Ridge Leadership Computing Facility, the National Energy Research Scientific Computing Center, and the Molecular Foundry, researchers from the [California Institute of Technology](#) discovered a liquid electrolyte that conducts fluoride in fluoride-based rechargeable batteries at room temperature. These batteries could hold up to eight times more charge than lithium batteries, aiding in the development of new kinds of energy storage.

TOP TWEETS

The Office of Science sent out 71 tweets between 4/15/2019 and 4/29/2019. Here are our two most popular from the past two weeks:



Not only did he discover elements #31, #62, and #66, Paul-Émile Lecoq de Boisbaudran published the first French book on [#chemical spectroscopy](#) and suggested an unsuspected series of elements – later known as the noble gases. bit.ly/2uFt5GL #IYPT2019



Don't miss this opportunity! The Office of Science Graduate Student Research (SCGSR) program is now accepting applications. Apply by 5/9

science.energy.gov/wdts/scgsr/

[@APLU_GovAffairs](#) [@BlackPhysicists](#)
[@CGSGradEd](#)



BY THE NUMBERS

Office of Science Graduate Student Research Program



The Office of Science announced [70 Graduate Student Research awards](#), going to students at 52 universities. These awards prepare graduate students for science, technology, engineering, and mathematics careers by providing graduate thesis research opportunities at Department of Energy laboratories. The research opportunity is expected to advance the graduate students' overall doctoral

thesis while providing access to the expertise, resources, and capabilities available at the DOE laboratories/facilities.

END NOTES

Our Favorite Elements

BROOKHAVEN NATIONAL LABORATORY *Our Favorite Elements* **U.S. DEPARTMENT OF ENERGY**

My Favorite

The United Nations has declared 2019 the International Year of the Periodic Table in honor of the 150th anniversary of that chart of the chemical elements. To celebrate, our friends at [Lawrence Berkeley National Lab](#) launched a video campaign highlighting scientists and others talking about their favorite elements—shared on social media with the hashtags [#MyFaveElement](#) and [#IYPT2019](#). We're joining in with this interactive chart of Brookhaven Lab staff's picks. Click on any blue element below to learn who liked it and why. Some choices relate directly to our research; some are personal preferences; and some are just for fun!

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