



December 10, 2018

## 01

### **NSF awards \$50M in grants to improve STEM education**

With the 2018-2019 school year underway, K-12 students have new opportunities for learning. Science, technology, engineering and mathematics (STEM) teachers also have new prospects to sharpen their skills and innovate in their classrooms. NSF's [Discovery Research PreK-12 \(DRK-12\) program](#) aims to help students and teachers accomplish all of the above. In fiscal year (FY) 2018, DRK-12 issued 59 new awards to institutions in 24 states and the U.S. Virgin Islands totaling more than \$50 million. NSF program managers anticipate the awards will result in classroom products and outcomes that have been field-tested and informed by research to strengthen teaching, learning and assessment. Find out more in this NSF [news release](#).



## 02

### **Researchers create first-of-its-kind composable storage platform for high-performance computing**

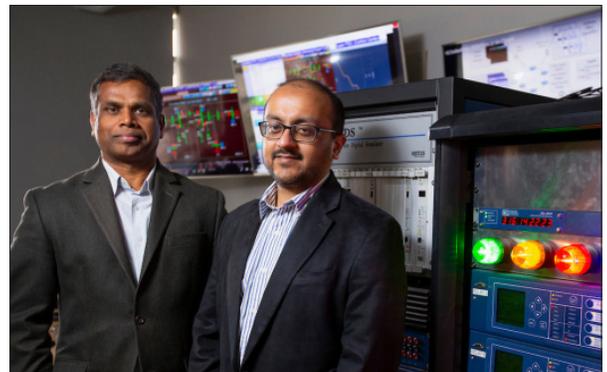
Virginia Tech researchers have found a way to give high-performance computing (HPC) data systems the flexibility to thrive with a first-of-its-kind framework called BespoKV, perhaps helping to one day achieve the HPC goal of performing at the exascale, or a billion billion calculations per second. The new platform functions using key value systems, which store and retrieve important data from very fast memory-based storage instead of slower disks. The research is relevant to industries that process large amounts of data such as intense visual graphics of movie streaming sites; millions of financial transactions at large credit card companies; or user-generated content at social media outlets. Read more in this NSF [News From the Field](#).



## 03

### **Engineers use game theory to quantify threats of cyberattacks on power grid**

Engineers at Iowa State University are seeking to develop a better way to assess the threats of cyberattacks on the power grid and to try and do so in a quantitative way. The engineers will incorporate scientific methods, computer algorithms and game theory to help with risk assessment, attack-defense modeling and “what-if” contingency analysis that could help mitigate attacks. Find out more in this NSF [News From the Field](#).



# 04

## Floodwater in rivers affects vulnerability to waterborne diseases

In sub-Saharan Africa, diarrheal disease, a preventable and treatable illness, remains the second-leading cause of death in children under the age of five, as well as an overall public health threat. Now, NSF-funded researchers have uncovered a connection between the water in rivers and vulnerability to the disease. Scientists Kathleen Alexander of Virginia Tech and Alexandra Heaney and Jeffrey Shaman of Columbia University conducted research along the Chobe River floodplain in northern Botswana and discovered that increases in disease were closely tied to periods of rainfall, with a 3-foot drop in river height in the dry season linked with a staggering 16.7 percent increase in diarrheal disease in children under the age of five. Learn more about this research in this NSF [Discovery](#).



# 05

## New attacks on graphics processors endanger user privacy

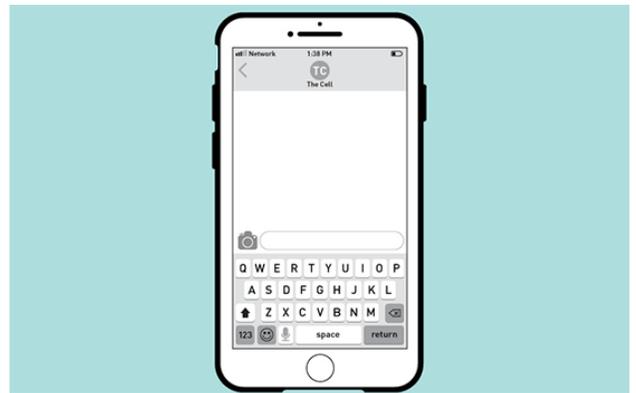
Computer scientists at the University of California, Riverside, have revealed for the first time how easily attackers can use a computer's graphics processing unit, or GPU, to spy on web activity, steal passwords and break into cloud-based applications. Find out more in this NSF [News From the Field](#).



# 06

## Machine-learning algorithm predicts how cells repair broken DNA

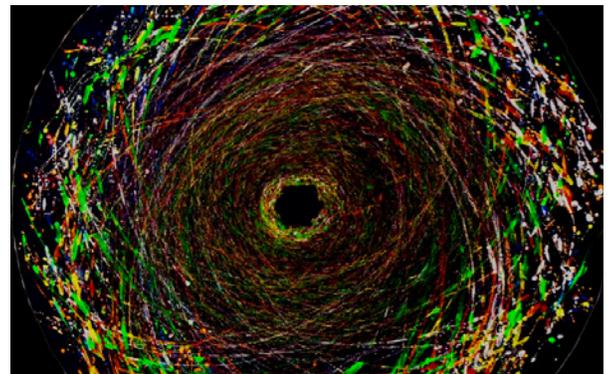
By creating a machine-learning algorithm that predicts how human and mouse cells respond to CRISPR-induced breaks in DNA, a team of researchers discovered that cells often repair broken genes in ways that are precise and predictable, sometimes even returning mutated genes back to their healthy version. In addition, the researchers put this predictive power to the test and successfully corrected mutations in cells taken from patients with one of two rare genetic disorders. Read this NSF [News From the Field](#) to learn more.



# 07

## NSF, Popular Science announce this year's Vizzies winners

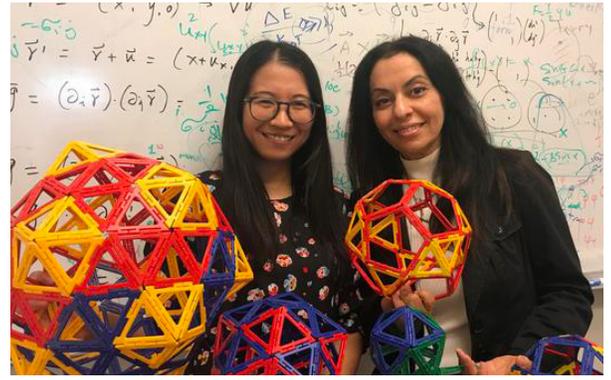
Popular Science magazine and NSF announced the winners of the 16th Annual Vizzies Challenge, celebrating the use of visual media to artfully and clearly communicate scientific data, principles and research. The competition recognizes the best visualizations of all types, including photographs, illustrations, posters and graphics, interactives, videos, GIFs and other submissions produced by artists, hobbyists or academic researchers. "NSF's goal is to educate and engage the public in science and engineering," said NSF Director France Córdoba. "Visualizations like these can inspire people with the wonder and beauty of science." Learn more in this NSF [news release](#).



# 08

## Physicists explain how large spherical viruses form

Viruses are the simplest physical objects in biology. They consist of a protein shell, called the capsid, that protects their nucleic acid genome -- RNA or DNA. The capsid can be cylindrical or conical in shape, but more commonly it assumes an icosahedral structure, like a soccer ball. Recent research by a team, led by a scientist at the University of California, Riverside, and supported by NSF, explains how large virus shells are formed. The team's work can also be used to explain how large spherical crystals form in nature. This understanding may help researchers interrupt viruses' formation, thereby containing the spread of viral diseases. Find out more in this NSF [News From the Field](#).



# 09

## Study reveals why tropical mountains are so biodiverse

Lack of varied seasons and temperatures in tropical mountains have led to species that are highly adapted to their narrow niches, creating the right conditions for new species to arise in these areas, according to a new, NSF-supported study. Still, the same traits that make tropical mountains among the most biodiverse ecosystems on Earth also make the species that live there more vulnerable to rapid climate changes. The research compares rates that new species evolve in three types of aquatic stream insects in temperate and tropical mountain areas. The findings have implications for similar patterns in other tropical mountain species. Find out more in this NSF [News From the Field](#).



# 10

## Rare and diverse giant viruses unexpectedly found in a forest soil ecosystem

Until recently, scientists thought of viruses as mostly small infectious agents, tiny compared to typical bacteria and human cells. So you can imagine their surprise when biologist Jeff Blanchard and Ph.D. student Lauren Alteio of the University of Massachusetts Amherst, with others at the U.S. Department of Energy's Joint Genome Institute, discovered giant viruses -- relatively speaking, the size of Macy's Parade balloons -- in soil at Harvard Forest in Petersham, Massachusetts. Learn more in this NSF [News From the Field](#).



Image credits [top to bottom]: (page 1) Christina S. Murrey, College of Education, University of Texas at Austin; Virginia Tech; Christopher Gannon (page 2) Virginia Tech; istock.com; Susanna Hamilton, Broad Institute; Arjun Lev Pillai Hausner (page 3) I. Pittalwala, UC Riverside; José Vieira/USFQ/Tropical Herping, Nushiño River, Napo Basin, Ecuador; Harvard Forest/Andrew McDevitt.