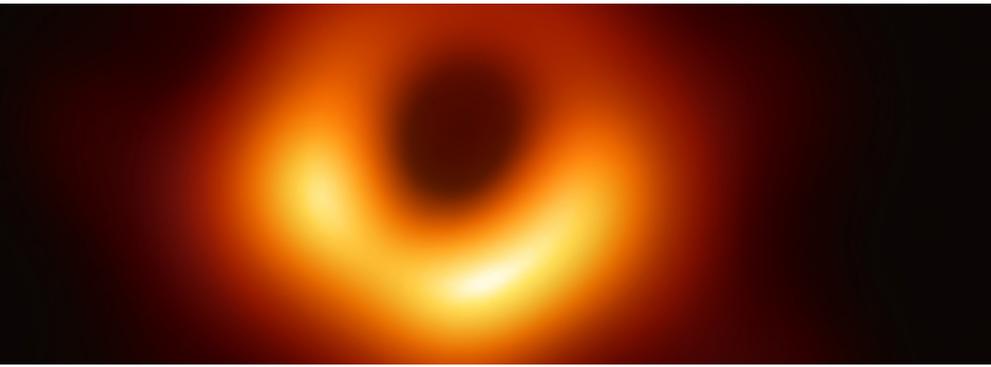




May 2, 2019

01

INTO THE VOID



Astronomers capture first image of a black hole

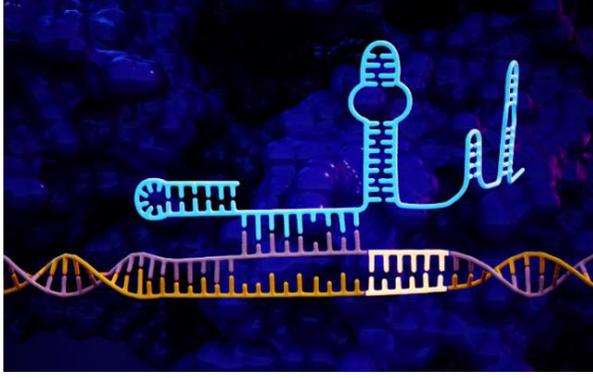
The Event Horizon Telescope (EHT), a planet-scale array of eight ground-based radio telescopes forged through international collaboration, was designed to capture images of a black hole. On April 10, in coordinated press conferences across the globe, EHT researchers revealed they have succeeded, unveiling the first direct visual evidence of a supermassive black hole and its shadow. The image reveals the black hole at the center of Messier 87, a massive galaxy in the nearby Virgo galaxy cluster. This black hole resides 55 million light-years from Earth and has a mass 6.5-billion times that of the sun. Read more about this historic announcement in this NSF [Press Release](#) and learn more about black holes in the NSF Special Report [NSF Exploring Black Holes](#).



02

Engineering 'hairpins' increases CRISPR accuracy

Biomedical engineers at Duke University have developed a method for improving the accuracy of the CRISPR genome editing technology by an average of 50-fold. The approach adds a short tail to the guide RNA that folds back and binds onto itself, creating a "lock" that can only be undone by the targeted DNA sequence. CRISPR/Cas9 is a defense system that bacteria use to target and cleave the DNA of invading viruses. While the first version of CRISPR technology, engineered to work in human cells, originated from a bacteria called *Streptococcus pyogenes*, many more bacteria species carry other versions. Find out more in this NSF [News from the Field](#).



03

Ancient lakes: eyes into the past, and the future

Baikal, Biwa and Bosuntwi. Maracaibo, Malawi and Matano. Tule, Tahoe and Titicaca. Ancient lakes, they're called: waterbodies more than 130,000 years old. These age-old lakes have long tolerated the presence of humans, supporting some of the earliest known settlements and playing key roles in cultural evolution and development. The lakes also support major economies, including fisheries and tourism. But research finds that it's these very uses that are degrading the ecological, socioeconomic and scientific value of many ancient lakes. Learn more in this NSF [Discovery](#).



04

Dance of the microbes: Bacteria living near coral reefs change in synchrony across distances

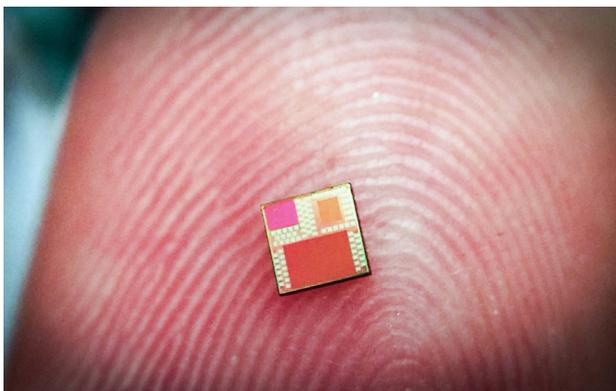
Bacteria in waters above dozens of coral reefs change dramatically during the night, scientists have discovered, then return to the same daytime community they lived in the morning before. As if these communities are all on the same schedule, the changes are synchronized in reefs separated by hundreds of miles, this according to recent research from San Diego State University (SDSU). In coral reef ecosystems, microorganisms are essential for recycling nutrients that are important to reef organisms, transforming bits of organic matter into nitrogen and phosphorus, for example. Investigations of day and night rhythms of reef processes are needed to understand the roles of microbes in these ecosystems, according to Linda Wegley Kelly, a marine biologist at SDSU and co-lead author of the study. Read more in this NSF [Discovery](#).



05

New technology marks a key step toward shrinking a medical lab to fit on fingertip

Identifying a patient's viral infection or diagnosing a blood disorder usually requires a lab and skilled technicians. Now, in an important step toward making medical diagnoses using handheld devices, researchers at Princeton University have adapted silicon chip technology similar to what's found in personal computers and mobile phones to function as a biosensor. The technology uses tiny metal layers, embedded in a microchip, to eliminate all complex and bulky optical instrumentation employed in the diagnostic labs. As a result, the new system is almost as small as a grain of salt, and far less costly to manufacture than current diagnostic systems. Find out more in this NSF [News From the Field](#).



06

Researchers provide evidence-based tool to add counternarcotic efforts

The success of illegal drug trafficking through wider and wider swaths of Central America is a consequence of law enforcement activity to curtail it, according to new research led by The University of Alabama (UA). A model developed by Nicholas Magliocca, a UA assistant professor, and others from around the country found the cat-and-mouse game of cocaine smuggling and government interdiction strategies results in a larger geographic area for trafficking with little success in stopping the drug from reaching the United States. Find out more in this NSF [News From the Field](#).



07

Tracking a supercell thunderstorm across the Great Plains

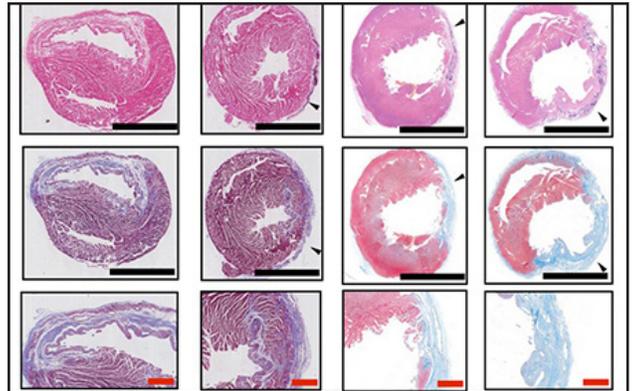
NSF recently awarded a three-year, \$2.4 million grant for the most ambitious drone-based investigation of severe thunderstorms to date. The project, called Targeted Observation by Radars and UAS of Supercells (TORUS), will soon be launched by atmospheric scientists at the University of Nebraska-Lincoln and three partner institutions: Texas Tech University, the University of Colorado Boulder and the National Oceanic and Atmospheric Administration's National Severe Storms Laboratory. The research will employ radar and unmanned aircraft systems (UAS) to reveal the small-scale structures in a supercell storm that contribute to tornado formation. Scientists hope to reduce the number of "false alarm" tornado warnings and improve detection of potentially lethal storms. NOAA is also providing support for TORUS. Learn more in this NSF [Discovery](#).



08

Heart patch could limit muscle damage in heart attack aftermath

A collaboration of researchers has designed a new type of adhesive patch that can be placed directly on the heart and may one day help to reduce the stretching of heart muscle that often occurs after a heart attack. Made from a water-based hydrogel material, the patch was developed using computer simulations of heart function in order to fine-tune the material's mechanical properties. A study in rats showed that the patch was effective in preventing left ventricle remodeling -- a stretching of the heart muscle that's common after a heart attack and can reduce the function of the heart's main pumping chamber. The research also showed that the computer-optimized patch outperformed patches whose mechanical properties had been selected on an ad hoc basis. Read more in this NSF [News From the Field](#).



09

Research helps farmers pinpoint high- and low-yield fields, leads to better use of fertilizer

Farmers can't predict their annual corn harvest with certainty, but with the help of new research, they can now pinpoint parts of their fields that consistently produce good or bad yields. The information will save farmers time and money and solve one of the most widespread problems facing crop-producing regions: nitrogen loss to the environment. "This is the first time anyone has been able to quantify how much small-scale yield variability there is in the U.S. corn belt," said Bruno Basso, an ecologist at Michigan State University and lead author of the study. "These findings allow farmers to know exactly which portions of their farm fields have stable yields." Find out more in this NSF [Discovery](#).



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