



April 1, 2019

01

Penguins...and more!

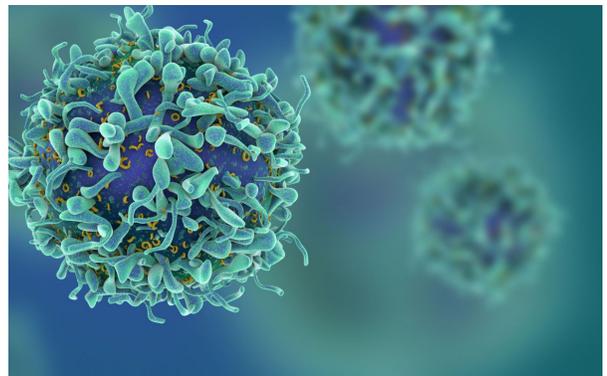
The U.S. Antarctic Program manages a robust, cutting-edge Antarctic program, supporting researchers who study everything from penguins and biology to astrophysics and geology. Penguins, which live exclusively in the Southern Hemisphere, have adapted to their environments through a long and complex evolutionary history. Various penguin species are interesting for different reasons. Some act as barometers of ecological change, while others possess physiological features -- such as the ability to dive deep for a long time without breathing -- that may provide researchers with useful lessons for developing tools that society can use, like new anesthetics. Find out more in this NSF [Special Report](#).



02

For infection-fighting cells, a guideline for expanding the troops

A new study from Princeton University researchers uses mathematical modeling to explain how T cells, part of the body's key defenses against pathogens, expand to fight a new infection. The team found that the amount of T-cell expansion is related to the quantity of infectious material, or antigen, as well as the stickiness with which the T cell binds the antigen. Learn more in this NSF [News From the Field](#).



03

Sweat holds most promise for noninvasive testing

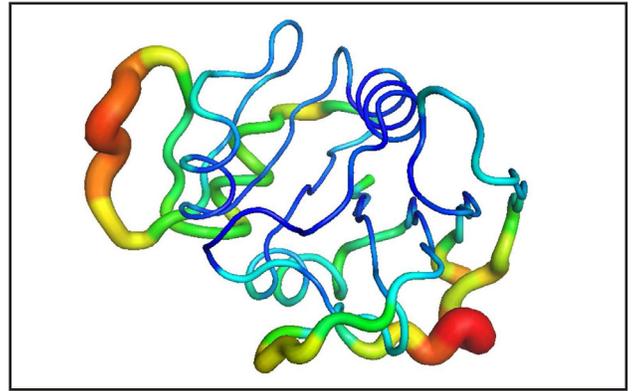
University of Cincinnati professor Jason Heikenfeld and his students have been creating new sensors on a wearable patch the size of a Band-Aid that stimulates sweat even when a patient is cool and resting. The sensor measures specific analytes over time that doctors can use to determine how the patient is responding to a drug treatment. Find out more in this NSF [News From the Field](#).



04

Gotcha! Scientists fingerprint proteins using their vibrations

In the cells of every living organism -- humans, birds, bees, roses and even bacteria -- proteins vibrate with microscopic motions that help them perform vital tasks ranging from cell repair to photosynthesis. Now, a team led by University at Buffalo physicist Andrea Markelz reports that it has developed a method for rapidly measuring proteins' unique vibrations. Learn more in this NSF [News From the Field](#).



05

Navigating the new Arctic

The Arctic connects us all, whether we realize it or not. There are eight countries usually regarded as "Arctic nations": the U.S., Canada, Denmark (including Greenland), Finland, Iceland, Norway, Russia and Sweden. There are also indigenous communities throughout the Arctic that have called it home for centuries. Then there's the larger group of nations that are increasingly interested in the Arctic. As the region changes, new opportunities arise for things like shipping, resources and scientific study. Even countries not considered "Arctic Nations" are impacted by this region. For example, if you consume goods brought to you through global shipping; if you're a coastal nation; or if you support scientific progress and increased collaboration among researchers, the Arctic affects you. Find out more in this NSF [Director's speech](#).



06

Using light to move wireless data faster

Mobile computing is accelerating beyond the smartphone era. Today, people wear smart glasses, smart watches and fitness devices, and they carry smartphones, tablets and laptops. In a decade, the very same people are likely to be wearing or carrying tens of wireless devices and interact with the internet and computing infrastructure in markedly different ways. Computer scientist Xia Zhou is working to make sure there are no traffic jams with the increased demand. With support from NSF, Zhou and her team at Dartmouth College are developing ways to encode and transmit all that data faster and more securely with the visible light spectrum. They see visible light communication as a much-needed advance in wireless data transmission. Watch this episode of [Science Nation](#) to learn more.



07

Scaling up innovative sensor installation on the Mighty Mac

The first 20 prototype infrastructure sensors installed in 2016 on the Mackinac Bridge and powered solely by vibrations from traffic, have proven their durability and performed as intended. Now, researchers at Michigan State University and Washington University in St. Louis are ready to roll out the next phase of testing: installing up to 2,000 of the tiny devices to explore the logistics of a large-scale deployment and provide useful monitoring data to the Mackinac Bridge Authority. Learn more in this NSF [News From the Field](#).



08

Scientists set sail on expedition to investigate ‘Iceberg Alley’ off Antarctica

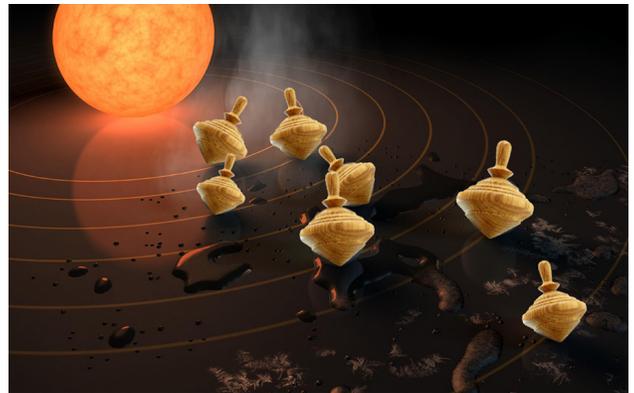
More than two dozen researchers aboard the drillship [JOIDES Resolution](#) left Punta Arenas, Chile, on March 20, on an expedition in which they will obtain cores of sediment from a remote section of seafloor, where ancient icebergs are believed to have left clues. Information from these cores will help researchers to chart how the ice sheet waxed and waned in response to climate over the past 10 million years. The two-month cruise, called [Expedition 382: Iceberg Alley and Subantarctic Ice and Ocean Dynamics of the International Ocean Discovery Program](#), is a collaboration of scientists who coordinate large-scale ocean expeditions to study the Earth’s history as it is recorded in sediments beneath the ocean floor. Find out more in this NSF [Discovery](#).



09

The case of the over-tilting exoplanets

For almost a decade, astronomers have tried to explain why so many pairs of planets outside our solar system have an odd configuration -- their orbits seem to have been pushed apart by a powerful unknown mechanism. Now, Yale University researchers say they’ve found a possible answer, and it implies that the planets’ poles are majorly tilted. Learn more about this finding in this NSF [News From the Field](#).



10

Marine organisms in Southern Ocean will face shallower zone for life

New research results forecast that at current carbon dioxide emission rates, the depth at which some shelled organisms can survive will shrink from an average of 3,280 feet (1,000 meters) to just 492 feet (150 meters) by the year 2100, a drastic reduction in habitat. The change, which could happen over a period as short as one year in some areas, could significantly impact marine food webs and lead to cascading changes across ocean ecosystems, including disruptions of fisheries. “This study shows that our current carbon dioxide emission rates are influencing not only the chemistry of the Southern Ocean but its food web structure as well,” says Simone Metz, a program director in NSF’s Division of Ocean Sciences, which funded the research, along with NSF’s Division of Atmospheric and Geospace Sciences and the Office of Polar Programs. Find out more in this NSF [Discovery](#).



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