Science News

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Life Science

Naked mole-rats 'turn into plants' when oxygen is low

Deprived of oxygen, naked mole-rats can survive by metabolizing fructose just as plants do. Understanding how the animals do this could lead to treatments for patients suffering crises of oxygen deprivation, as in heart attacks and strokes. In humans, laboratory mice, and all other known mammals, when brain cells are starved of oxygen they run out of energy and begin to die. But naked mole-rats have a backup: their brain cells start burning fructose, which produces energy anaerobically through a metabolic pathway that is only used by plants — or so scientists thought. In the new study, the researchers exposed naked mole-rats to low oxygen conditions in the laboratory and found that they released large amounts of fructose into the bloodstream. The fructose, the scientists found, was transported into brain cells by molecular fructose pumps that in all other mammals are found only on cells of the intestine. At oxygen levels low enough to kill a human within minutes, naked mole-rats can survive for at least five hours. They go into a state of suspended animation, reducing their movement and dramatically slowing their pulse and breathing rate to conserve energy. And they begin using fructose until oxygen is available again. The naked mole-rat is the only known mammal to use such a method to survive oxygen deprivation.
https://www.sciencedaily.com/releases/2017/04/170420141844.htm

Earth Science

Lessons from Parkfield help predict continued fault movements after earthquakes

A new study shows that the San Andreas Fault continued to slip gradually for six to twelve years after the 2004 magnitude 6.0 Parkfield, California, earthquake, raising the issue of continued damage to structures built across fault zones after damaging earthquakes. This long period of "afterslip" compares to just a year of afterslip for a similar magnitude quake in Napa, California, in 2014, demonstrating a large variation in fault behavior after

earthquakes. The findings suggest that there can be a range of afterslip durations along faults, making it more challenging to predict how post-earthquake movements might damage nearby infrastructure for years after a major earthquake. Afterslip refers to the aseismic* movement or "creeping" that takes place along a fault, including the trace of its surface rupture, after an earthquake.
https://www.sciencedaily.com/releases/2017/04/170417144928.htm

*Aseismic = Not characterized by earthquake activity

Climate Change

Water is streaming across Antarctica

In the first such continent-wide survey, scientists have found extensive drainages of meltwater flowing over parts of Antarctica's ice during the brief summer. Researchers already knew such features existed, but assumed they were confined mainly to Antarctica's fastest-warming, most northerly reaches. Researchers found that these meltwater flows are widespread now, and have been for decades. Many of the newly mapped drainages start near mountains poking through glaciers, or in areas where powerful winds have scoured snow off underlying bluish ice. These features are darker than the mostly snow-covered ice sheet, and so absorb more solar energy. This causes melting, and on a slope, liquid water then melts a path downhill through overlying snow. If the continent warms this century as projected, this process will occur on a much larger scale. This study tells us there's already a lot more melting going on than scientists previously knew about.
https://www.sciencedaily.com/releases/2017/04/170419131741.htm

Physical Science and Technology

Physicists create 'negative mass'

Physicists have created a fluid with negative mass, which is exactly what it sounds like. Push it, and unlike every physical object in the world we know, it doesn't accelerate in the direction it was pushed. It accelerates backwards. Hypothetically, matter can have negative mass in the same sense that an electric charge can be either negative or positive. People rarely think in these terms, and our everyday world sees only the positive aspects of Newton's second law of motion, in which a force is equal to the mass of an object times its acceleration, or $F=ma$. In other words, if you push an object, it will

accelerate in the direction you're pushing it. Mass will accelerate in the direction of the force. With negative mass, if you push something, it accelerates toward you. The negative-mass fluid was created by cooling rubidium atoms to just a hair above absolute zero, creating what is known as a Bose-Einstein condensate. In this state, predicted by Satyendra Nath Bose and Albert Einstein, particles move extremely slowly and, following the principles of quantum mechanics, behave like waves. They also synchronize and move in unison as what is known as a superfluid, which flows without losing energy. The lasers trapped the atoms as if they were in a bowl measuring less than a hundred microns across. At this point, the rubidium superfluid has regular mass. Breaking the bowl will allow the rubidium to rush out, expanding as the rubidium in the center pushes outward. To create negative mass, the researchers applied a second set of lasers that kicked the atoms back and forth and changed the way they spin. Now when the rubidium rushes out fast enough, it behaves as if it has negative mass. [That wasn't a very satisfying explanation, but as the research progresses, I plan to provide more information about this fascinating topic. —MB]
https://www.sciencedaily.com/releases/2017/04/170417095534.htm

Astronomy

Light rays from a supernova bent by the curvature of space-time around a galaxy

An international research team has detected for the first time multiple images from a gravitationally lensed Type Ia supernova. The new observations suggest promising new ways to study the accelerating expansion of the universe, gravity, and the distribution of dark matter in the universe. Type Ia supernovae, nature's own "standard candles," have been used for many years by astronomers to measure cosmological distances. These studies led to the discovery that the expansion of the universe is accelerating. The researchers observed, for the first time, the rare appearance of multiple images of the same exploding star (named iPTF16geu), which belongs to a class of supernovae known as Type Ia. The phenomenon, called gravitational lensing is a result of the intense warping of the supernova light by an intervening galaxy positioned between us and the star in near perfect alignment. In this special case, the supernova appeared magnified, but also multiplied, as its light passed through the "gravitational lens" along multiple paths. The new observations provide a promising new tool to test key cosmological theories about the accelerating expansion of the universe and the distribution of dark matter. Type Ia supernovae are abundant and frequently used by astronomers to accurately measure distances in the universe. Gravitational

lensing — the curving of space due to gravity — has also been observed many times since the early 20th century when it was predicted by Einstein. Yet, imaging a gravitationally lensed Type Ia supernova had proven extremely difficult — until now. Researchers can now measure the light focusing power of gravity more accurately than ever before, and probe physical scales that may have seemed out of reach.
https://www.sciencedaily.com/releases/2017/04/170420141758.htm

Science & Society

Polling is still best predictor of election outcomes

Donald Trump's surprising election as President of the United States was viewed by some people as evidence that electoral polling no longer works, but researchers report they have developed models using global polling data that can correctly predict up to 90 percent of election outcomes around the world. The study focused on executive elections in which voters cast ballots directly for the person who will hold executive office, rather than having that leader elected by parliament. The researchers say it offers strong evidence that polling data, used correctly, is the best predictor of election outcomes, not just in the U.S., but worldwide. Researchers submitted forecasts two weeks prior to elections in Latin America in 2013 and 2014 and correctly forecast the winners in 10 out of 11 elections, or 90.9 percent of the time. A second test, involving live predictions for all global direct executive elections starting in mid-2013, had a success rate of 80.5 percent. Less democratic institutions, unsurprisingly, tended to favor the incumbent party. Open democratic elections and whether one candidate was an incumbent improved the likelihood of accurate predictions. The person who holds the seat is able to use their power and name recognition to win subsequent elections. But, researchers note, the most valuable predictor turned out be polling results, something that proved true across the globe. People normally wouldn't find this surprising. But given the recent U.S. presidential election, now maybe it does seem surprising.
https://www.sciencedaily.com/releases/2017/02/170202141926.htm

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