SCIENCE FLASH NEWS

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A predicted quasicrystal is based on the 'einstein' tile known as the hat

The "hat" wowed mathematicians. Now the shape is shaking up physics.

In 2023, mathematicians reported that the 13-sided tile was the first known "einstein." That's a shape that can perfectly cover an infinite plane — no gaps or overlaps — but can do so only without a repeating pattern (SN: 3/24/23).

Now, scientists have predicted the properties for a two-dimensional material based on the hat. It's a quasicrystal, a material that is orderly like a crystal, but in which the arrangements of atoms don't repeat. Intriguingly, <u>the hat-based material shares</u> <u>properties with graphene</u>, a crystalline material, the researchers report in a paper to appear in Physical Review Letters.

https://www.sciencenews.org/article/quasicrystal-einstein-tile-hat-shape

Black hole at center of the Milky Way resembles a football

The supermassive black hole in the center of the Milky Way is spinning so quickly it is warping the spacetime surrounding it into a shape that can look like a football, according to a new study using data from NASA's Chandra X-ray Observatory and the U.S. National Science Foundation's Karl G. Jansky Very Large Array (VLA). That football shape suggests the black hole is spinning at a substantial speed, which researchers estimated to be about 60% of its potential limit.

The work, led by Penn State Berks Professor of Physics Ruth Daly, was published in the <u>Monthly Notices of the Royal Astronomical Society</u>.

https://www.psu.edu/news/research/story/black-hole-centermilky-way-resembles-football/

Diamonds are a chip's best friend: Research determines spin-orbit effects on exciton complexes

Besides being "a girl's best friend," diamonds have broad industrial applications, such as in solid-state electronics. New technologies aim to produce high-purity synthetic crystals that become excellent semiconductors when doped with impurities as electron donors or acceptors of other elements. These extra electrons—or holes—do not participate in atomic bonding but sometimes bind to excitons—quasi-particles consisting of an electron and an electron hole—in semiconductors and other condensed matter...

The work is <u>published</u> in the journal *Physical Review Letters*.

https://phys.org/news/2024-02-diamonds-chip-friendorbit-effects.html

Scientists closer to finding quantum gravity theory after measuring gravity on microscopic level

Experts have never fully understood how the force that was discovered by Isaac Newton works in the tiny quantum world. Even Einstein was baffled by quantum gravity and, in his <u>theory of general relativity</u>, said there is no realistic experiment that could show a quantum version of gravity.

But now physicists at the University of Southampton, working with scientists in Europe, have successfully detected a weak gravitational pull on a tiny particle using a new technique.

They claim it could pave the way to finding the elusive quantum gravity theory. The experiment, <u>published</u> in *Science Advances*, used levitating magnets to detect gravity on microscopic particles—small enough to border on the quantum realm.

https://phys.org/news/2024-02-scientists-closer-quantum-gravitytheory.html

Researchers synthesize two new isotopes, osmium-160 and tungsten-156

Researchers at the Institute of Modern Physics (IMP) of the Chinese Academy of Sciences (CAS) and their collaborators have synthesized two new isotopes—osmium-160 and tungsten-156—which sheds new light on nuclear structures and hints that lead-164 could be a doubly magic nucleus with increased stability.

<u>The study</u> was published in *Physical ReviewLetters* and highlighted as an Editors' Suggestion.

https://phys.org/news/2024-02-isotopes-osmium-

Altermagnetism: A new type of magnetism, with broad implications for technology and research

The experimental discovery of this new branch of magnetism is <u>reported</u> in *Nature* and signifies new fundamental physics, with major implications for spintronics...

Altermagnets have a special combination of the arrangement of spins and crystal symmetries. The spins alternate, as in antiferromagnets, resulting in no net magnetization. Yet, rather than simply canceling out, the symmetries give an <u>electronic</u> <u>band structure</u> with strong spin polarization that flips in direction as you pass through the material's energy bands—hence the name altermagnets. This results in highly useful properties more resemblant to ferromagnets, as well as some completely new properties.

https://phys.org/news/2024-02-altermagnetism-magnetism-broadimplications-technology.html

Scientists Slowed Down Light by 10,000 Times in an Experiment

Scientists have previously established that light <u>can be slowed down</u> in certain scenarios, and a new study demonstrates a method for achieving it that promises to be one of the most useful approaches yet.

The researchers behind the breakthrough, from Guangxi University and the Chinese Academy of Sciences in China, say that their method could benefit computing and <u>optical communication</u>.

The research has been published in *Nano Letters*.

<u>https://www.sciencealert.com/scientists-slowed-down-light-by-</u> <u>10000-times-in-an-experiment</u>

Thank you!

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