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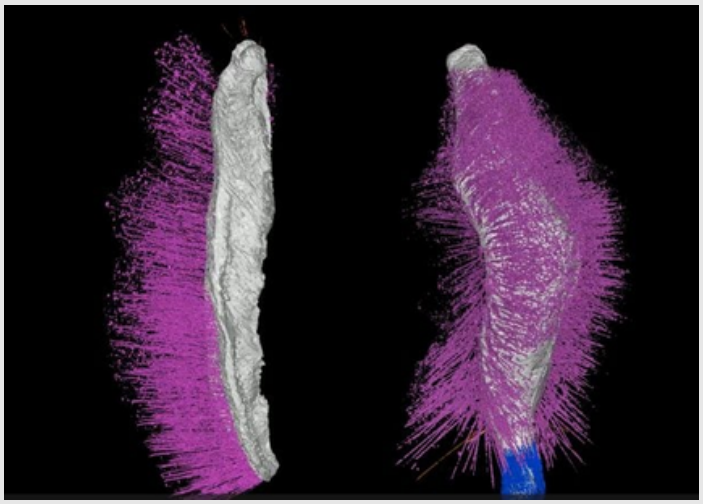
SPARC WEEKLY

RESEARCHERS UNEARTH 430-MILLION-YEAR-OLD FOSSILS THAT DEFY EVOLUTIONARY NORMS



Researchers have discovered two spectacularly preserved 430-million-year-old mollusk fossils, which have been named Punk and Emo. These are challenging long-held assumptions about the simplicity of early mollusks and their evolutionary history. In a study published in Nature, Dr. Mark Sutton and his colleagues used advanced imaging to create 3D models of the fossils, revealing unprecedented detail of their soft tissues and structural complexity.

The fossils, found in Herefordshire, are from the Aculifera group, which includes chitons and worm-like mollusks.

Although it had always been assumed that the first Aculiferan mollusks were primitive, the discoveries suggest that they were very complex and varied in form and locomotion.

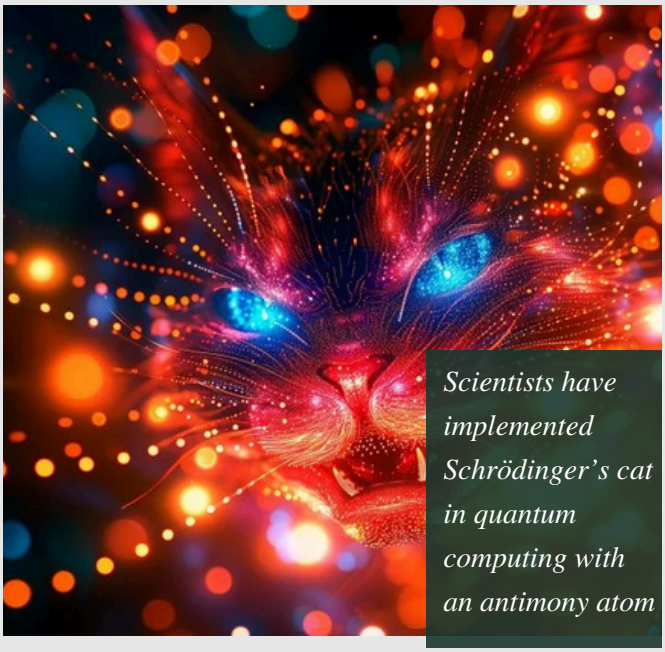
Emo showed inchworm-like locomotion with the aid of spines, while Punk possessed a ridge-like foot whose function is unclear. The undersides of both were smooth, indicating that they were probably sea-floor animals.

These "rebellious" fossils now show a mixture of features between modern chitons and worm-like mollusks, thereby yielding new insights into mollusk evolution. Punk, with its spiny appearance and broad foot, and Emo, featuring a long body with spines and compressed shells, underscore the evolutionary richness of early mollusks. Their discovery has broadened the understanding of mollusk diversity and adaptiveness during the Silurian.

Dr. Sutton likened Punk's spiky appearance to a punk rocker, inspiring its name along with Emo, which reflected their individuality. These discoveries reshape the mollusk evolutionary tree and show it to be more complex and flexible than previously envisioned while stressing how well-preserved fossils hold secrets of evolutionary history.

https://scitechdaily.com/researchers-unearth-430-million-year-old-fossils-that-defy-evolutionary-norms/

SCHRÖDINGER'S QUANTUM CAT AWAKENS TO REVOLUTIONIZE COMPUTING



Scientists have implemented Schrödinger's cat in quantum computing with an antimony atom

UNSW researchers have achieved a major breakthrough in quantum computing by applying the concept of Schrödinger's cat to an antimony atom. This innovation, published in Nature Physics, significantly improves quantum error correction, a critical step toward practical quantum computers.

Schrödinger's cat is a metaphor from quantum mechanics illustrating superposition—where an atom exists in multiple states simultaneously. In this experiment, the "cat" represents the quantum spin states of an antimony atom. Unlike standard qubits with two states (0 and 1), antimony's spin has eight possible directions, offering greater resilience to errors.

Using advanced techniques, the team embedded the antimony atom in a silicon chip, enabling precise control of its quantum state. This setup allows for enhanced error tolerance: small disruptions don't immediately corrupt the quantum information. For example, a single error is insufficient to flip a "dead cat" (0) into a "alive cat" (1). Instead, it would take seven consecutive errors, akin to the proverbial cat's nine lives.

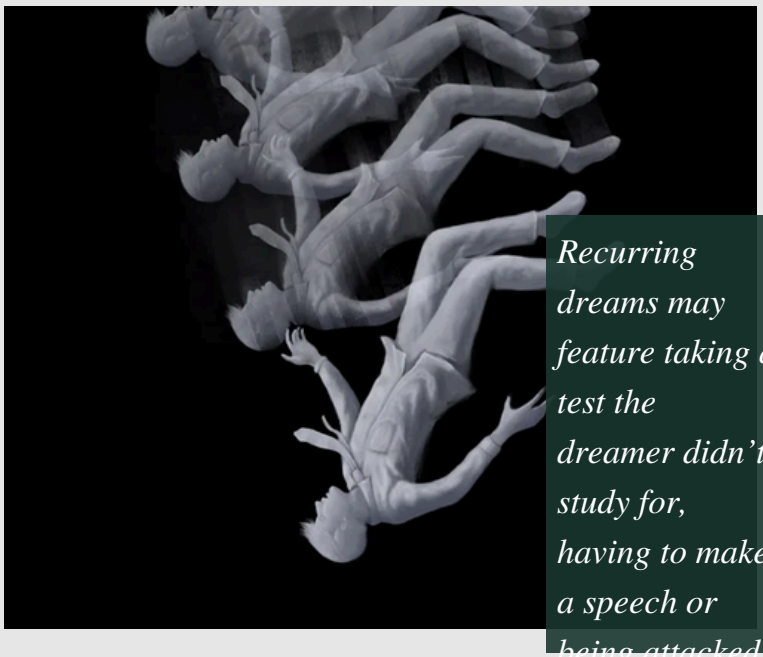
The silicon-based chip ensures scalability, as it aligns with current chip manufacturing methods, promising a feasible path for large-scale quantum computing. The collaboration involved UNSW, the University of Melbourne, and international partners, including NASA Ames and Sandia National Laboratories.

This advancement addresses quantum error detection and correction—a long-standing challenge in the field. Errors can now be identified and corrected before they propagate, increasing the reliability of quantum systems. The research highlights the potential of integrating complex quantum systems into familiar technologies, pushing the boundaries of what's possible in computation.

This milestone exemplifies the power of international collaboration, combining expertise in theory, device fabrication, and quantum operations. UNSW's work sets the stage for more robust and scalable quantum computing, bringing us closer to realizing its transformative potential.

https://scitechdaily.com/schrodingers-quantum-cat-awakens-to-revolutionize-computing/

“MIRROR BACTERIA” WARNING: A NEW KIND OF LIFE COULD POSE A GLOBAL THREAT



Recurring dreams may feature taking a test the dreamer didn’t study for, having to make a speech or being attacked

Recurring dreams, experienced by up to 75% of adults, are a common phenomenon that vary in themes, characters, and settings. Unlike PTSD-related nightmares, recurring dreams often incorporate varying scenarios, with two-thirds being negatively toned. These negative dreams frequently involve being chased, attacked, or failing, while positive ones may include flying or discovering hidden spaces. Research by Michael Schredl suggests that dreams amplify waking emotions, transforming minor feelings into exaggerated experiences.

Psychological and neurological factors contribute to recurring dreams. Negativity bias, a subconscious tendency to focus on unpleasant experiences, may intensify during sleep as the brain's logic centers dampen and emotional areas become more active.

This diminishes the filter between thoughts and feelings, leading to dreams that attempt to process unresolved emotions.

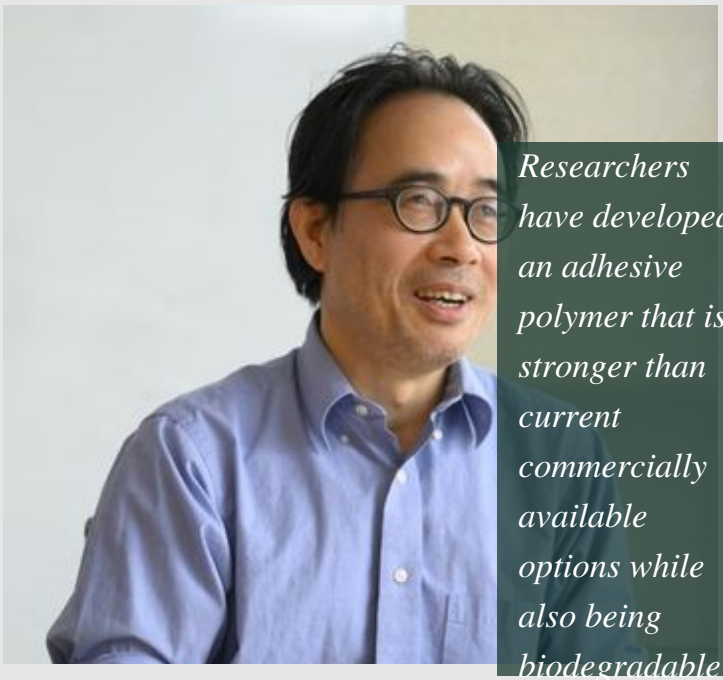
Shared traumas like 9/11 or the COVID-19 pandemic reveal patterns in recurring dreams. Dream researcher Deirdre Leigh Barrett found a notable increase in negatively-toned dreams after such events, often centered around fear, illness, or disaster. Early pandemic dreams were literal and fear-inducing, evolving into less alarming scenarios, such as social embarrassment. This shift aligns with the "continuity hypothesis," where dreams reflect unprocessed waking emotions.

Controlling recurring dreams is possible through practices like imagery rehearsal therapy, which involves reimagining nightmares with positive outcomes. Additionally, maintaining good sleep hygiene—consistent sleep schedules, limited screen use, and avoiding stimulants before bed—can reduce emotional carryover into dreams. Conscious efforts to establish boundaries between waking life and sleep can help minimize anxiety-driven dreams, according to experts like Nirit Soffer-Dudek.

While recurring dreams often stem from unprocessed feelings, they are a normal part of the sleep process. Understanding their psychological roots and adopting proactive measures can help individuals manage and even transform these nocturnal experiences into less distressing ones.

https://www.scientificamerican.com/article/why-are-recurring-dreams-usually-nightmares/

POLYMER RESEARCH SHOWS POTENTIAL REPLACEMENT FOR COMMON SUPERGLUES WITH A REUSABLE AND BIODEGRADABLE ALTERNATIVE



Researchers have developed an adhesive polymer that is stronger than current commercially available options while also being biodegradable

In order to solve the global plastic waste crisis, researchers at Colorado State University have developed a new adhesive polymer that is stronger, biodegradable, and reusable. The polymer, chemically re-engineered from the naturally occurring material poly(3-hydroxybutyrate) or P3HB, outperforms most traditional petroleum-based adhesives, such as Gorilla Glue and J-B Weld, in strength while offering sustainability. The research, led by CSU's Eugene Chen and also including collaborators from the National Renewable Energy Laboratory and the University of California, Berkeley, is published in the journal Science.

“P3HB is a biobased, biodegradable polymer produced by microbes under certain conditions. Naturally not adhesive, Chen's team altered its structure to formulate a powerful bonding agent that would work on a wide array of surfaces, from aluminum and glass to wood and steel. The adhesion strength of P3HB can be tuned to fit various applications. In testing, one such glue stick made with P3HB supported up to 20 pounds-performing better than many commercial hot-melt adhesives.

Adhesives are a $50 billion industry at the heart of many industries, including automotive, packaging, and construction. However, they are one of the main contributors to plastic pollution since they cannot be recycled. The P3HB adhesive will provide a sustainable alternative because it is biodegradable in landfills, oceans, and soils, among other varied environments. Besides, the P3HB adhesive can be recovered, reprocessed, and reused, hence an environmentally friendly solution.

Chen's team is commercializing this polymer through the BOTTLE Consortium by reducing its costs and environmental impacts for mass production. Combining experimental research, simulation, and process modeling, the team found critical improvements needed to scale up the material. This is a major step toward sustainable materials that would solve many of the environmental challenges presented by traditional adhesives, further opening the doors to greener industrial applications.

https://www.sciencedaily.com/releases/2025/01/250116161241.htm

WHO ARE WE?

SPARC Robotics Team's mission and vision is to make our environment the best it can be. On a volunteer basis, we look at the problems that are happening around us and make them our problems, both as SPARC and individually, and help as much as we can with appropriate projects. NASA ACCP (Astro Camp Community Partners) was only in the US until four years ago. This year they came to Turkey with us after four years of traveling to many countries. ACCP educates school-age children from kindergarten to high school on science-related topics of interest with practical knowledge and application, while also supporting children's craft development, general culture and questioning skills. As SPARC, we have brought this training provided by NASA to our country in the most comprehensive way and our continuous communication with NASA not only enables us to improve our trainings day by day, but also gives us the opportunity to learn about the innovations in the field of STEM instantly, from the most accurate source and to spread the knowledge we have around us.

EDITOR

Dear reader,

Greetings from SPARC Weekly, in which we gather latest scientific news.

We would be delighted to hear your comments or suggestions and we encourage you to write to us if you have any views or opinions on the stories in SPARC Weekly. We look forward to hearing from you.
Have a nice week and enjoy the magazine.

Defne Şehidoğlu and Reyhan Doğanca