Triannual Science e-newsletter

SCIENCE FORUM, G. L. CHOUDHURY COLLEGE, BARPETA ROAD

SCI-PULSE

Volume 01

28th Feb 2025

Edited by: Dr. J. P. Biswas

Editorial

Stepping into AI era, we have access to 99.9% of the knowledge that exist just to our verbal command. The limitation is, what knowledge do we seek for. Growth of young minds depends on the questions they ask. Institutional education can neither quench all their curiosity nor provide enough information on recent developments. Opposed to that, social media is flooded with unlimited entertainment contents, driving them away before they come to self-realization.

The increasing global threats and future sustainability demands all individuals to learn ways of scientific living in all ways possible. Thus, keeping track of newer science and technology developments, the reasons and implications behind them is going to become necessity. Being mentors of undergraduate students, Sci-Pulse is our small effort to plant curiosity among students and create a base to use modern tools for expanding their knowledge.

Message from the Principal

It is with great enthusiasm and pride that I present the first edition of SCI-PULSE, the triannual science e-newsletter, brought to you by the Science Forum of G. L. Choudhury College, Barpeta Road. This e-newsletter marks a significant milestone in our efforts to engage students in the fascinating world of science and to create a platform for sharing ideas, discoveries, and insights within our academic community.

SCI-PULSE is more than just an e-newsletter; it is a reflection of the curiosity and intellectual vitality that our students embody. Through this publication, we aim to foster a deeper understanding of scientific concepts and stimulate creative thinking among our students. The e-newsletter will feature articles, essays, and reflections on a wide array of scientific topics.

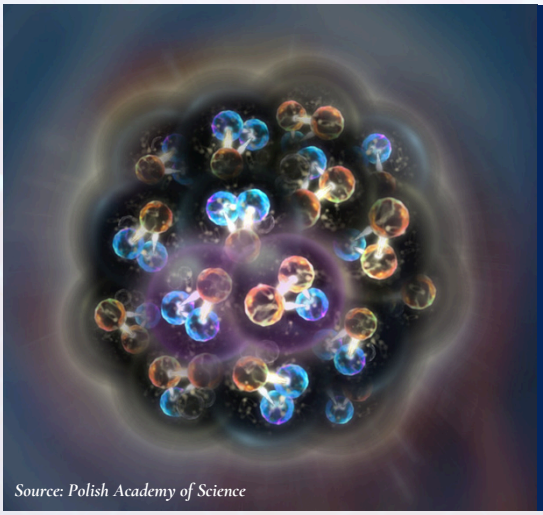
I commend the editorial team and all contributors for their hard work, commitment, and dedication in bringing this initiative to life. SCI-PULSE will, I believe, inspire our students to continue exploring the vast and ever-evolving field of science and encourage them to communicate their ideas in innovative ways.

I wish SCI-PULSE every success and look forward to seeing it grow and thrive in the coming editions. May it continue to ignite curiosity and passion for science among all its readers.

Piyali Ghosh

Principal i/c, G. L. Choudhury College

S & T News



Source: Polish Academy of Science

First Image of Nucleus with Gluons and Quarks

We all know that particles with opposite charges attract, while those with same charge repeal each other. Then how all positively charged protons are stay together inside the nucleus. This is a century long problem. Despite knowing the existence of quarks and gluons, how they keep protons and neutrons together, could not be described, as only protons and neutrons can be observed at low energy and at high energy only quarks and gluons can be studied. Last year, by analyzing experimental data from LHC at CERN, a group of international scientists finally provide a clear picture of how quarks and gluons are distributed among protons and neutrons in a nucleus.

Colors of Parrot

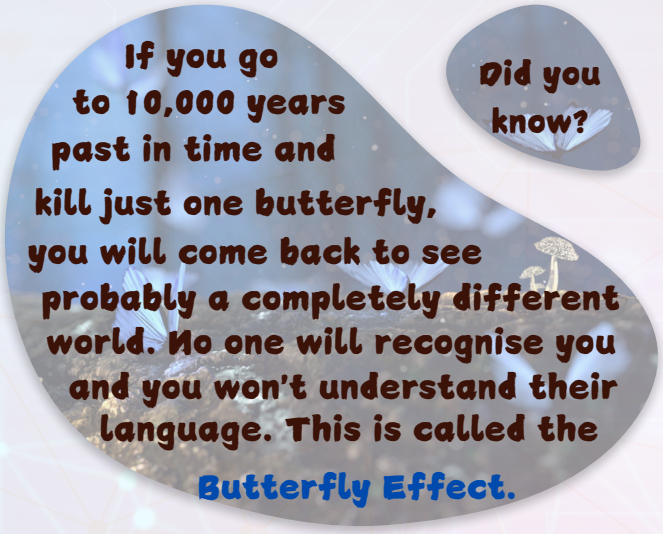
Can you guess how many pigments are responsible for vibrant colors of parrots? The only pigments that is present in parrot's plumage is psittacofulvins. This puzzled the scientists for long until last year when biologists at Washington University solved the mystery. If the group at the end of this highly conjugated molecule is aldehyde, it shows red color, while presence of carboxylic group makes it yellow. There presents an enzyme as well called ALDH3A2 which can convert aldehyde to carboxylic. Just by changing the amount to oxidation, the bird gets different colors. Red for aldehyde, yellow for carboxylic, yellow with structural blue gives green. So just by changing amount of red, and yellow, they can have so many colors.

Source: Science News

Source: The Indian Express

The Curious Case of Comb Jelly

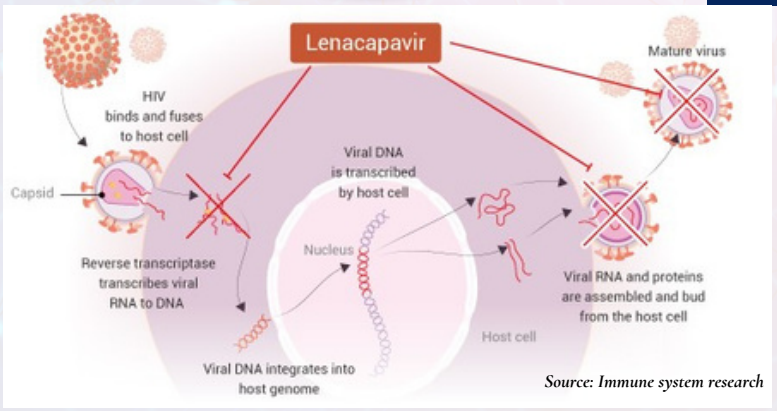
According to new study report published in Proceedings of the National Academy of Science, a marine invertebrate named Mnemiopsis leidyi belonging to the phylum ctenophora, have the remarkable ability to reverse its aging process. This interesting creatures can revert itself from adult stage to larval stage under extreme stress condition which challenge the traditional life cycle of birth, ageing and death that most of the living organisms follow. This unexpected finding provides a new insight into the biology of ageing and by studying its unique 'time travel' ability opens a new door to possibility of understanding human longevity.



Diamond Battery

A power source for thousands of years: UK scientists have developed a diamond battery powered by carbon-14, a radioactive material from nuclear waste, capable of generating continuous power by converting radiation into electricity without recharging for thousands of years. This battery using radioactive carbon-14 encased in diamond has the potential in space missions and medical devices.

Source: ev-riders



Source: Immune system research

New Drug for HIV

In 2024, Lenacapavir, a twice a year injectable HIV prevention shot, showed exceptional efficacy up to 100% in clinical trials outperforming the traditional daily oral PrEP pills like Truvada and Descovy. Unlike conventional antiretrovirals, Lenacapavir targets the structural protein of the virus called capsid and thereby prevents proper assembling, transport and replication within human cells. With its high efficacy and can be directly injected under the skin. Lenacapavir presents a transformative advancement in HIV prevention and has the potential to change the trajectory of HIV treatment.

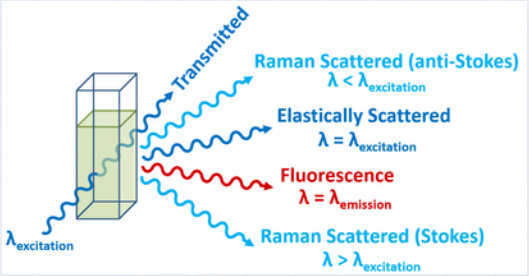
Building Resilient Quantum Networks

In a breakthrough study, Northwestern University physicists have proposed a strategy to stabilize quantum networks, which face a critical challenge: entangled quantum links disappear after each communication event. This creates an unstable, constantly shifting network that can easily collapse. The researchers' solution is to add a carefully calculated number of new connections—or "bridges"—after each communication. By doing so, the network remains connected, even as quantum links fall apart. This work reveals that a specific, optimal number of additional links (just the square root of the number of users) is needed to keep the network functioning efficiently. The findings could be instrumental in designing quantum communication systems capable of supporting lightning-fast computing and ultra-secure communications, paving the way for robust, high-performance quantum networks.

Source: Northwestern now

Know Your Scientist


Source: Britannica



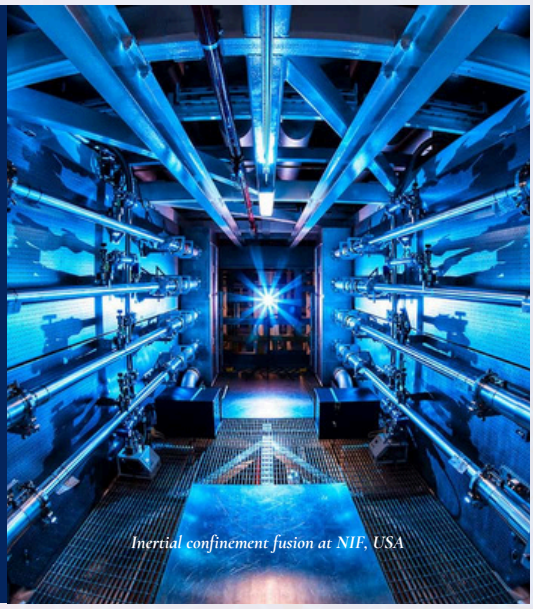
C.V. Raman (November 7, 1888, Trichinopoly, India —November 21, 1970, Bangalore) was an Indian physicist whose work was influential in the growth of science in India. He received Nobel Prize for Physics in 1930 for the discovery of Raman scattering. After earning a master's degree in physics at Presidency College, University of Madras, in 1907, Raman became an accountant in the finance department of the Indian government. He became professor of physics at the University of Calcutta in 1917. Studying the scattering of light in various substances, in 1928 he found that when a transparent substance is illuminated by a beam of light of one frequency, a small portion of the light emerges at right angles to the original direction, and some of this light is of different frequencies than that of the incident light. These so-called Raman frequencies are the energies associated with transitions between different rotational and vibrational states in the scattering material.

Students Column

Harnessing The Power of Sun

The sun, along with other mighty stars, are powered by a reaction known as nuclear fusion reaction. It works by fusing hydrogen nuclei under extreme temperature and pressure. Now mankind is trying to harness that energy here on the earth. Fusion is the future of energy generation. As of now, humanity has developed multiple ways of harnessing this energy, yet none of them produce more energy than the input energy, which means they couldn't make reaction self-sustaining until now. The National Ignition Facility from USA, which uses a laser driven Inertial Confinement system, achieved the the breakeven (produced more energy than the input). The experimental megaproject ITER (Internation Thermonuclear Experimental Reactor) in France, which is a partnership of multiple countries including India, is stated mission is to demonstrate the feasibility of fusion power as a large-scale, carbon-free source of energy. India has also started it's own fusion experiments through Aditya tokamak at Institute for Plasma Research, Gandhinagar. Now IPR is experimenting on SST-1 (Steady-state Superconducting Tokamak) and planning to build the SST-2, which is dubbed as the DEMO reactor and it will help India to achieve its goal of net zero carbon emission.

Digbalay Sarma, B.Sc. 4th semester


Inertial confinement fusion at NIF, USA

S & T News

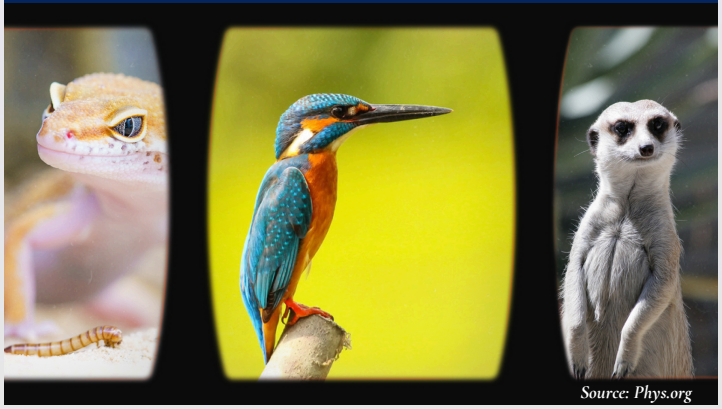

Source: Science Journal

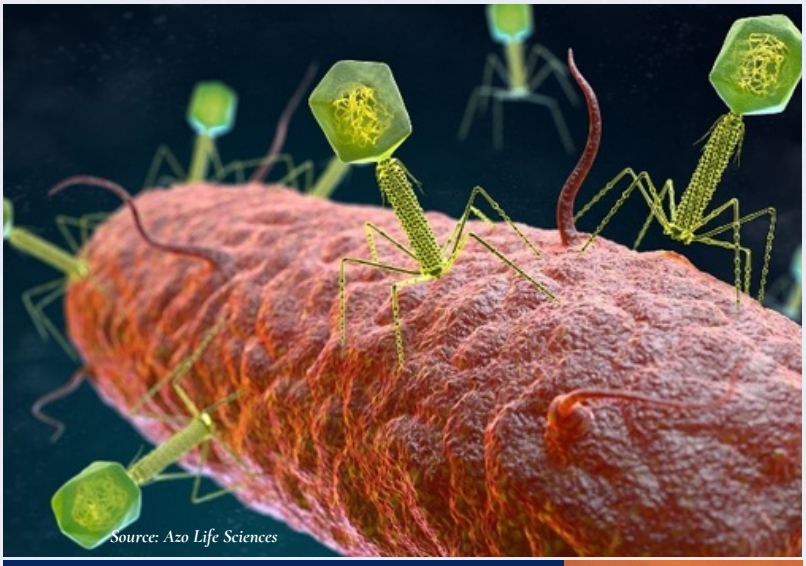
RNA-Based Pesticides Targeting Colorado Potato Beetles

In 2024, the U.S. EPA approved a new crop protection method using RNA interference (RNAi) to target the Colorado potato beetle. Developed by GreenLight Biosciences and marketed as Calantha, this spray specifically targets a gene unique to the beetle, killing it when the larvae ingest treated leaves. Unlike traditional insecticides, RNAi is safer for people, pollinators, and other species, offering a more sustainable alternative in the face of climate change, biodiversity loss, and growing populations.

Birds Developed Complex Brains Independently from Mammals

Recent studies reported that development of complex brain circuit in birds, reptiles and mammals are independent of each other although they share common ancestry. This statement challenges the traditional theory of evolution of brain development in chordates by showing that, a comparable functional similarity of brain is exist among these groups while the mechanism underlying embryonic formation and the types of cells that emerge have followed divergent evolutionary pathway.


Source: Phys.org


Source: Azo Life Sciences

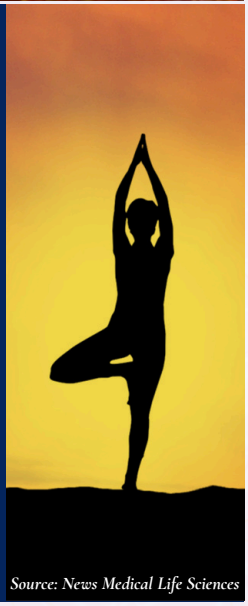
New Genomic Toolkit Accelerates Phage Therapy for Superbug Infections

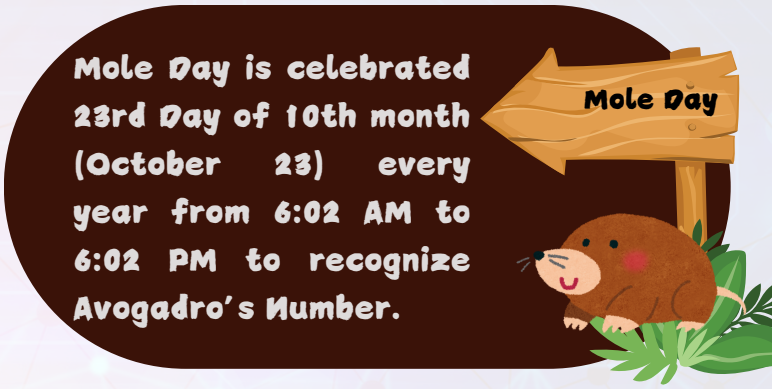
Scientists at Flinders University have launched Sphae, a free online genomic toolkit designed to accelerate the development of phage therapy—an emerging alternative to antibiotics. This powerful platform can assess the safety and suitability of bacteriophages for therapeutic use in under 10 minutes. With antibiotic-resistant infections on the rise, Sphae provides a rapid, scalable solution to identify phages capable of targeting deadly superbugs. The platform integrates high-throughput sequencing with advanced computational analysis, ensuring only the safest candidates are selected. Lead researcher Professor Robert Edwards highlights the potential of Sphae to revolutionize phage therapy and make personalized antibacterial treatments a reality. As global antibiotic resistance threatens millions of lives, innovations like Sphae are crucial to combating drug-resistant infections.

Lifestyle Over Genetics Decides Longivity

A new Nature Medicine study from Oxford Population Health finds that lifestyle and environmental factors have a greater impact on health and premature death than genetics. Analysing data from nearly 500,000 people, researchers found that smoking, socio-economic status, and physical activity influence mortality far more than genetic predisposition.

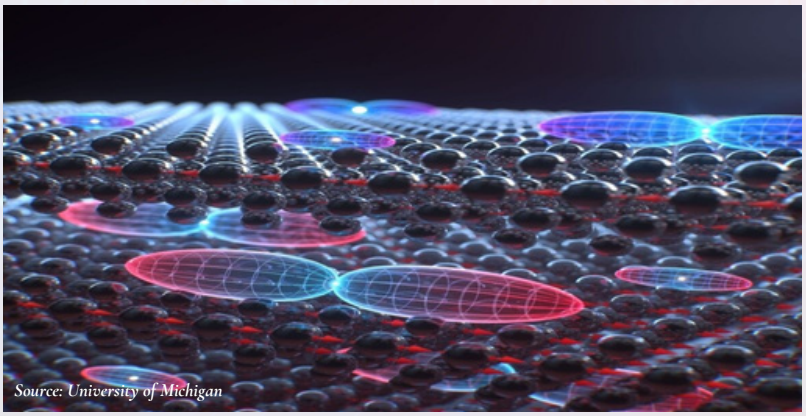
Professor Cornelia van Duijn senior author of the paper emphasised that genes matter for some diseases but improving lifestyle and living conditions could significantly reduce risks for heart, lung, and liver diseases. The findings highlight the need for stronger public health policies to promote healthier living.


Source: News Medical Life Sciences



Magnetic Control of Quantum Information

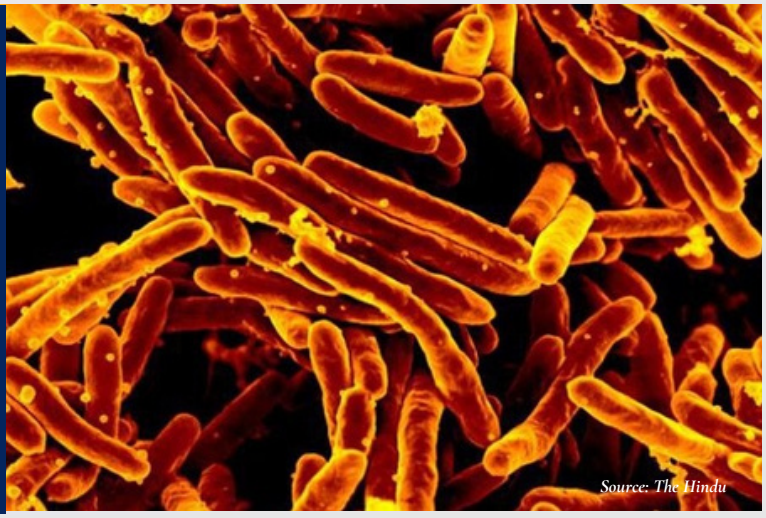
A team of researchers from University of Regensburg and University of Michigan has uncovered a groundbreaking property of chromium sulfide bromide (CrSBr) that could revolutionize quantum computing and sensing. This material exhibits the ability to trap excitons—quantum information carriers—into one dimension by leveraging its unique magnetic properties. At low temperatures, CrSBr's antiferromagnetic structure confines excitons to a single atomic layer and restricts them to a single line. This confinement helps prevent excitons from colliding and losing information, making them more stable for use in quantum devices. The material's ability to switch between magnetized and non-magnetized states offers a novel "tuning knob" for controlling the behavior of excitons, which can be manipulated to encode quantum information in a variety of forms—charge, photons, magnetism, and vibrations. This discovery opens the door for the development of quantum systems that integrate multiple quantum properties,


Source: University of Michigan

Indian Scientists Develop Low-Cost TB Detection Device

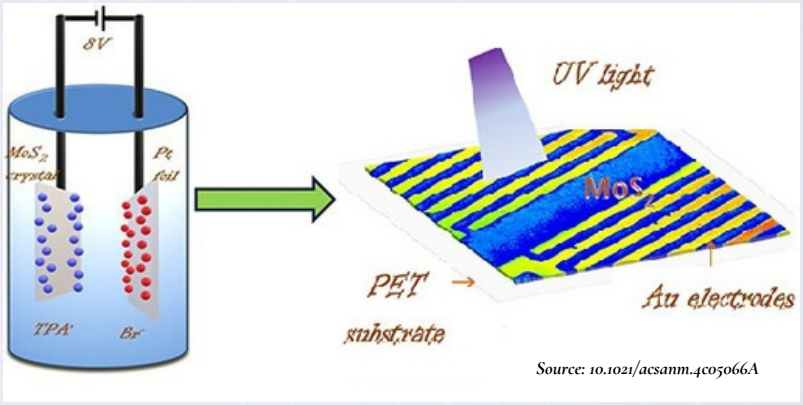
Researchers at the Indian Institute of Science (IISc) have developed a low-cost, portable device to detect tuberculosis (TB), offering a potential breakthrough in rapid diagnosis. Led by Bhushan J. Toley, the team created the Fluorescent Isothermal Paper-and-Plastic Nucleic Acid Amplification Test (FLIPP-NAAT), which amplifies TB DNA from patient samples and provides results using a simple fluorescence-based method.

With an estimated cost of under ₹300 per test—compared to ₹1,800 for the current GeneXpert test—FLIPP-NAAT aims to improve accessibility in India, which has the highest TB burden globally. While initial trials show promise, researchers are working to reduce false positives and integrate a rapid DNA extraction step before large-scale deployment.

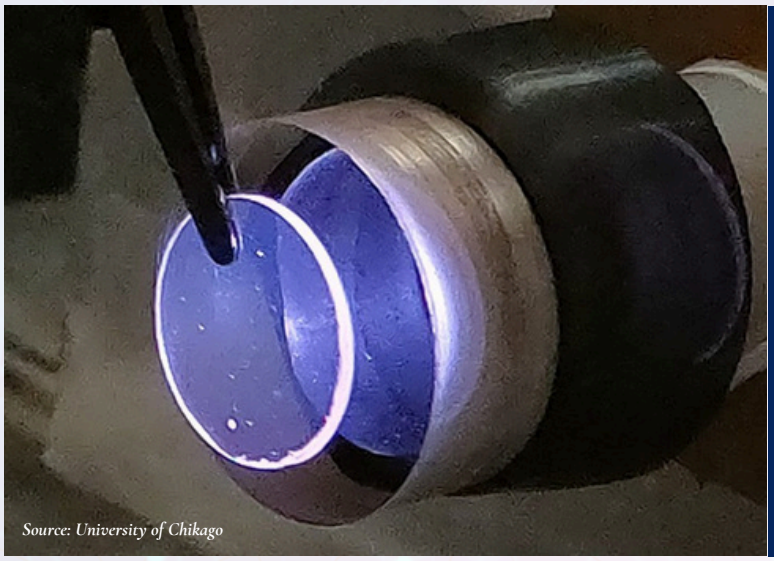

Source: The Hindu

Nanosheets for Nitrogen-Dioxide Detection

A team from University College Cork developed a novel NO_2 sensor using electrochemically exfoliated 2D molybdenum disulfide (MoS_2) on flexible polyethylene terephthalate (PET) substrates. Unlike traditional sensors, this sensor detects a wide range of NO2 concentrations at room temperature, with an experimental LOD of 150 ppb and a theoretical LOD of 1.9 ppq. It showed a 90% response to 1 ppm of NO_2 in 10 minutes, with UV irradiation reducing recovery time from 20 minutes to under 2 minutes. Traditional Si/SiO_2-based sensors are unsuitable for wearable tech, making this innovation a significant advancement.



Source: 10.1021/acsanm.4c05066A


Source: University of Chikago

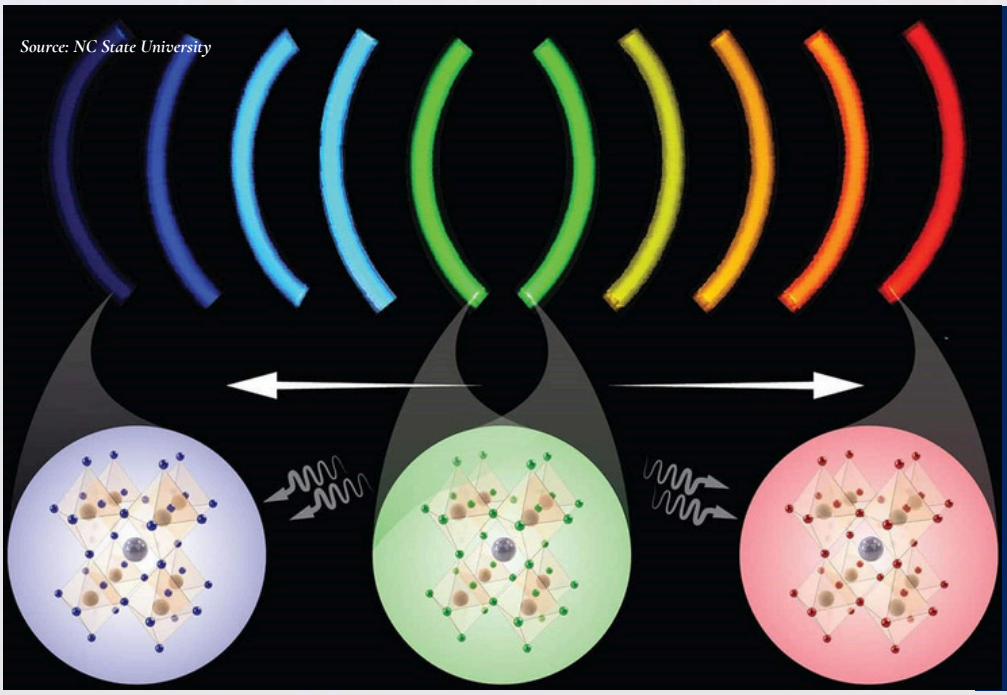
Revolutionizing Memory with Atomic Defects

In a groundbreaking study, researchers at the University of Chicago's Pritzker School of Molecular Engineering have unlocked a new method for storing vast amounts of data using atomic defects within crystal structures. By manipulating these tiny defects, which are essentially missing atoms in a crystal lattice, the team has demonstrated the potential to store terabytes of data in a space no larger than a millimeter cube. This innovation merges quantum-inspired techniques with classical computing, bridging the gap between quantum systems and non-quantum storage methods. This new approach promises to revolutionize data storage, allowing for dramatically increased capacity while maintaining a compact form, and could pave the way for the next generation of ultra-efficient memory devices.

Band-Aid for Plants

Scientists have developed a bacteria-based "Band-Aid" that significantly enhances plant wound healing and regeneration. The study found that bacterial cellulose, already used in human medicine, helps plants recover faster from injuries and improves cloning efficiency in lab experiments, Published in Science Advances. Researchers discovered that the cellulose contains plant hormones that accelerate tissue repair and growth. The findings could have major agricultural applications, from improving grafting techniques to preserving cut plant material. While further research is needed, experts see great potential for enhancing plant health and resilience.


Source: Science News


Source: NC State University

Revolutionizing Quantum Dot Manufacturing with Light

Researchers at North Carolina State University have developed a light-based method to precisely tune the optical properties of perovskite quantum dots, making the process faster, more energy-efficient, and environmentally friendly. Traditional methods for tuning quantum dots are energy-intensive and can compromise material quality. The new technique uses light in a microfluidic system to control reactions in small solution volumes, allowing for precise adjustments of the quantum dot bandgap across the color spectrum. This breakthrough offers a more sustainable and efficient way to produce high-quality quantum dots for use in advanced optoelectronic devices.

World Record by Tiny Fern: Largest Genom Discovered

A small fork fern, Tmesipteris oblanceolata, has been identified as having the largest known genome, surpassing all other organisms, including humans. Researchers reported in iScience that the fern's genome contains 160 billion nucleobases, over 50 times the size of the human genome and 7% larger than the previous record holder, Paris japonica.

Despite its tiny size—just 15 centimeters long—the fern carries an enormous amount of genetic material, raising questions about how such large genomes evolve and function. Scientists believe studying its DNA could provide insights into genome expansion and plant evolution.

Tmesipteris oblanceolata (the small green plants), one of six fork fern species from New Caledonia assessed in a new study, has a record-breaking genome that contains 160 billion bases.

Source: Nature

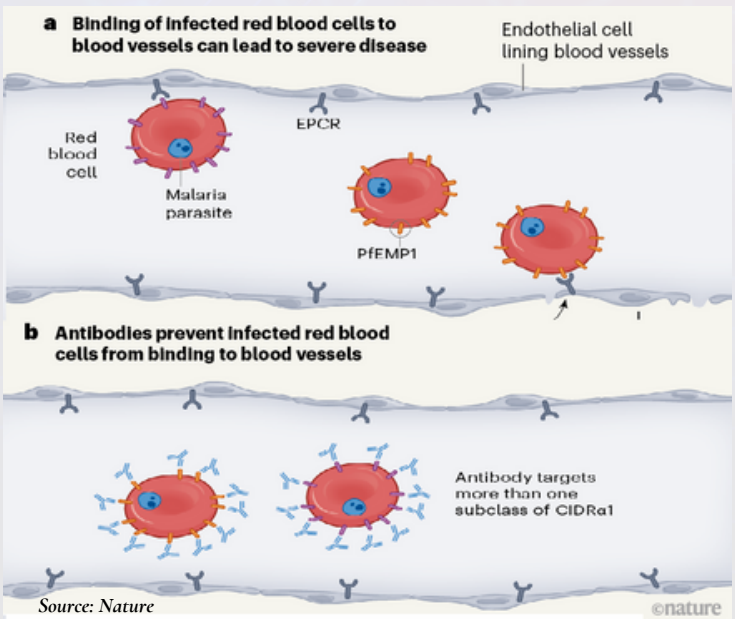
Source: New Atlas

AI Inspired from Collision of Galaxies

Torque Clustering is a pioneering AI algorithm that moves beyond traditional supervised learning, enabling machines to autonomously identify patterns in data without human intervention. Inspired by the physical concept of torque and gravitational interactions during galaxy mergers, this unsupervised learning method can efficiently process vast datasets across fields like biology, finance, and medicine. Its ability to adapt to diverse data types, handle varying complexities, and achieve exceptional accuracy sets it apart from existing methods. Torque Clustering marks a significant step toward the development of truly autonomous AI, with the potential to redefine industries and drive the evolution of general artificial intelligence.

Human Antibody to Fight Malaria

A significant breakthrough in the fight against malaria has been achieved with the identification of human antibodies that target proteins responsible for severe disease. Using organ-on-a-chip technology, researchers demonstrated that these antibodies prevent infected red blood cells from adhering to vessel walls, a critical step in the development of severe malaria. Crucially, the antibodies neutralize a conserved region of the PfEMP1 malarial protein, circumventing its variability and providing valuable information about acquired immunity. This international collaborative study, published in Nature, highlights the potential for new vaccines and treatments.



Source: Nature

Snaps of our last year activities

National Science Day-2024

Workshop on Vermicomposting

Workshop on Mushroom Cultivation

Workshop on Chemdraw

World Environment Day-2024

Workshop on Photography

We sincerely thank our principal for her support and suggestions; all the faculties of science stream for contributing contents of the newsletter and students for their active participation.

Published by: *Science forum, G. L. Choudhury College, Barpeta Road, Assam-781315*