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SCIENCE & TECHNOLOGY

GLOBAL

[Ultrasound Stickers Monitor Internal Organs](#)

MIT engineers have developed a small ultrasound sticker that can monitor the stiffness of organs deep inside the body. The sticker, about the size of a postage stamp, can be worn on the skin and is designed to pick up on signs of disease, such as liver and kidney failure and the progression of solid tumors. The sensor can send sound waves through the skin and into the body, where the waves reflect off internal organs and back out to the sticker. The pattern of the reflected waves can be read as a signature of organ rigidity, which the sticker can measure and track. The team has demonstrated that the sticker can continuously monitor the stiffness of organs over 48 hours and detect subtle changes that could signal the progression of disease. In preliminary experiments, the researchers found that the sticky sensor can detect early signs of acute liver failure in rats. The engineers are working to adapt the design for use in humans. They envision that the sticker could be used in intensive care units (ICUs), where the low-profile sensors could continuously monitor patients who are recovering from organ transplants.

[3D Printing Used to Develop Artificial Cartilage](#)

Researchers at the Vienna University of Technology used tiny spherical containers created with a high-resolution 3D printer. These containers are then filled with cells and assembled into the desired shape. The cells from different containers connect, the container itself is degradable and eventually disappears. A special high-resolution 3D printing process is used to create tiny, porous spheres made of biocompatible and degradable plastic, which are then colonized with cells. These spheroids can then be arranged in any geometry, and the cells of the different units combine seamlessly to form a uniform, living tissue. The new approach is not limited to cartilage tissue; it could also be used to tailor different kinds of larger tissues such as bone tissue.

[New Tool to Revolutionise CRISPR Gene Editing](#)

Researchers at the Center for Advanced Bioenergy and Bioproducts Innovation (CABBI) at University of Illinois Urbana-Champaign have developed a new tool to accelerate and optimize genome editing. With the recent development of CRISPR-COPIES researchers are further improving CRISPR's versatility and ease of use. The COmputational Pipeline for the Identification of CRISPR/Cas-facilitated intEgration Sites can identify genome-wide neutral integration sites for most bacterial and fungal genomes within two to three minutes. CRISPR-COPIES is a tool that can quickly identify appropriate chromosomal integration sites for genetic engineering in any organism. It will help in accelerating work in the metabolic engineering of non-model yeasts for cost-effective production of chemicals and biofuels. The researchers demonstrated the versatility and scalability of CRISPR-COPIES by characterizing integration sites in three diverse species: *Cupriavidus necator*, *Saccharomyces cerevisiae*, and HEK 293T cells. They used integration sites found by CRISPR-COPIES to engineer cells with increased production of 5-aminolevulinic acid, a valuable biochemical that has applications in agriculture and the food industry. For crop engineering, the tool can be used to increase biomass yields, pest

resistance, and/or environmental resilience. For converting biomass to valuable chemicals — for instance, by using the yeast *S. cerevisiae* — CRISPR-COPIES can be used to engineer cells with significantly greater yields.

Novel Nanosensors Make Diagnostic Procedures More Sensitive

The Fraunhofer Institute for Microelectronic Circuits and Systems IMS and Ruhr University Bochum, Germany, have developed a process that enables a new form of signal amplification for diagnostic tests. Through the advanced use of luminescent single walled carbon nanotubes in bioanalytics, test procedures can be carried out more sensitively, quickly and cheaply. The sensors can be used for enzymatic processes. Their adaptability to different reaction conditions opens up a wide range of applications for standard methods such as ELISAs, short for Enzyme-linked Immunosorbent Assay.

INDIA

India-made CART-T Cell Therapy Shows Promise

A Delhi-based patient was cured using India's CAR-T cell therapy, an indigenous cancer treatment, which was recently approved for commercial use by the Central Drugs Standard Control Organisation (CDSCO). In October 2023, CDSCO, India's drug regulator, approved the commercial use of NexCAR19, the first indigenously developed CAR-T cell therapy. NexCAR19 is developed by ImmunoACT, a company incubated at the Indian Institute of Technology Bombay (IITB) and Tata Memorial Hospital. It is designed to treat B-cell cancers, such as leukaemia and lymphoma. The therapy in India is known to genetically reprogram a patient's immune system to fight cancers like leukaemia and lymphoma. NexCAR19 is also available at a reasonable cost and meets the needs of patients in India's healthcare system. The therapy is now available in over 30 hospitals in more than 10 cities in India. Patients aged above 15, who are suffering from B-cell cancers are eligible for treatment.

IISER Develops 'BHoPAL' to Facilitate Drug Development

Researchers at the Indian Institute of Science Education and Research Bhopal (IISER Bhopal) have developed a technology named 'BHoPAL' for attaching chemical tags to proteins, an important process in the development of drugs. Through this technology, necessary chemical moieties can be linked to specific sites of a protein without harming the protein's efficacy. This technology is called 'Baylis Hillman orchestrated Protein Amino-thiol Labelling' (BHoPAL) which efficiently tags chemicals to proteins without compromising their function. Protein dysfunction results in major life-threatening diseases such as Alzheimer's disease, Parkinson's disease, etc. Hence, developing effective approaches to study proteins in cells is crucial for developing therapeutic approaches targeting them.

IREDA and IIT Bhubaneswar Collaborate in Renewable Energy Innovation

The Indian Renewable Energy Development Agency Ltd. (IREDA) and the Indian Institute of Technology Bhubaneswar have entered into a Memorandum of Understanding (MoU) to bolster innovation and research in the renewable energy sector. The collaboration aims to support joint research efforts, technology transfer, and the start-up ecosystem in renewable energy. It will also encompass capacity-building initiatives such as training programs, seminars, and workshops to enhance the skills. They strive to drive impactful research initiatives and propel the growth of the renewable energy sector.

New Method for Sodium Catalysed Synthesis of Carbon Nanotubes Developed

Researchers at the Institute of Advanced Study in Science and Technology (IASST) have pioneered a novel method for directly synthesizing CNTs on glass substrates at a temperature of 750 °C. The experiment is performed using the Plasma Enhanced Chemical Vapour Deposition Technique (PECVD), where plasma is generated using a specially designed spiral-shaped fused hollow cathode source. This process circumvents the need for elevated temperatures and eliminates the necessity for a transition metal catalyst. Furthermore, this synthesis is executed under atmospheric pressure, adding commendable cost-effectiveness to its advantages compared to counterparts in the field. It could help energy research, biomedical fields, and optoelectronics.

AIIMS Liverpool Collaborative Centre for Translational Cancer Research

The All India Institute of Medical Sciences (AIIMS), Delhi and University of Liverpool have entered into collaboration for “AIIMS Liverpool Collaborative Centre for Translational Research in Head and Neck Cancer – ALHNS”. The ALHNS is expected to build upon the pre-existing collaboration and links between the Liverpool Head and Neck Centre (LNHC), University of Liverpool and the Head and Neck Cancer Unit at AIIMS New Delhi. The ALHNS will impact the care of patients with head and neck cancer by combining resources at both institutions in order to develop joint research and education programmes. It is expected to enhance the quality of research and education. The ALHNS also aims to have commonly articulated strategic goals in order to deliver cutting edge medical innovation and personalised cancer treatments.

GLOBAL CHALLENGES

Ice Cores Provide First Direct Evidence of Rapid Antarctic Ice Loss

Researchers from the University of Cambridge and the British Antarctic Survey have uncovered the first direct evidence that the West Antarctic Ice Sheet shrunk suddenly and dramatically at the end of the Last Ice Age, around 8,000 years ago. The evidence, contained within an ice core, shows that in one location the ice sheet thinned by 450 metres in under 200 years. This is the first evidence in Antarctica for such a fast loss of ice. Scientists are worried that today’s rising temperatures might destabilize parts of the West Antarctic Ice Sheet in the future, potentially passing a tipping point and inducing a runaway collapse. The study sheds light on how quickly Antarctic ice would melt if temperatures continue to soar.

GEF Council Approves Biodiversity Fund

The Global Environment Facility’s 186 member governments have agreed to invest \$1.1 billion for international action on biodiversity, climate change, nature renewal, and pollution control, and met for the first time as Council of the new Global Biodiversity Framework Fund (GBFF). The GEF Council, meeting in Washington, DC, approved \$918 million for 45 projects and programs from the Global Environment Facility Trust Fund, including four blended finance initiatives involving the private sector and five Integrated Programs designed to tackle complex challenges in their entirety. Government representatives also endorsed \$203 million for 21 climate change adaptation projects funded by the Least Developed Countries Fund and Special Climate Change Fund, which are part of a family of funds that also includes the GEF Trust Fund, the Nagoya Protocol Implementation Fund and the Capacity Building Initiative for Transparency Trust Fund. The GEF is the only multilateral environmental fund that is mandated to work across an array of

challenges including biodiversity, climate change, desertification, and toxic chemicals including mercury. It was also selected last year to be a part of the financial mechanism to the new High Seas Treaty on biodiversity in areas beyond national jurisdiction, known as BBNJ.

Artificial ‘Worm Gut’ to Break Down Plastics Developed

A team of scientists from Nanyang Technological University, Singapore (NTU Singapore) has developed an artificial ‘worm gut’ to break down plastics, offering hope for a nature-inspired method to tackle the global plastic pollution problem. By feeding worms with plastics and cultivating microbes found in their guts, researchers from NTU’s School of Civil and Environmental Engineering (CEE) and Singapore Centre for Environmental Life Sciences Engineering (SCELSE) have demonstrated a new method to accelerate plastic biodegradation. They have demonstrated a way to overcome challenges faced by *Zophobas atratus* worms by isolating the worm’s gut bacteria and using them to do the job without the need for large scale worm breeding.

Increased Transmissibility and Immune Escape of COVID’s New Variant

A study conducted by researchers from the University of Tokyo has unveiled alarming characteristics of the JN.1 variant of the SARS CoV-2, indicating not only heightened transmissibility but also resistance to immunity. The emergence of the JN.1 variant has triggered widespread concern due to its distinctive genetic makeup and increased infectivity. With over 30 spike protein mutations, including the Leu455Ser mutation known for immune evasion, JN.1 poses a significant challenge to existing preventive measures. Utilizing genomic surveillance data from France, the UK, and Spain, the researchers’ uncovered novel insights into the virological properties of JN.1. Their analysis revealed that the reproductive number of JN.1 surpassed that of other variants in the studied countries, indicating its potential to become the dominant lineage globally. It not only spreads rapidly but also exhibits resistance to immunity, posing a significant challenge to public health efforts. While initial experiments on rodent models demonstrated effective neutralization of both BA.2.86 and JN.1 variants, breakthrough infections in humans revealed JN.1’s resilience to neutralization compared to BA.2.86. Of particular concern is JN.1’s strong resistance to the XBB.1.5 vaccine, making it one of the most immune-evading variants identified to date. The study underscores the critical need for ongoing surveillance and comprehension of the evolving landscape of SARS-CoV-2 variants to inform effective public health responses.

French Research Centres Sign Commitment Declaration Towards Eco Transition and Sustainable Development

The sixteen signatory research centres in France concluded a commitment declaration for ecological transition and sustainable development. Institutions commit jointly to contribute through their research activities and in changes in their structure to face these challenges. The 16 signatories commitments include:

- programme and implement a research strategy taking into account all of its social and environmental impacts;
- support the production and spread of knowledge and innovation leading to solutions, in line with social challenges;
- design and lead the social responsibility policy of their entity;
- lead the transformation of their organisation by leveraging all their collective work;

- be a role model in the application of the government's ecological planification objectives by the institution;
- every year, share progress and actions of transition implemented in their institution;
- develop international partnerships and interdisciplinary work about sustainability stakes.

RESOURCES & EVENTS

SWATI Portal Launched to Represent Women in STEMM

The Principal Scientific Advisor to the Government of India Prof Ajay Kumar Sood launched "Science for Women-A Technology & Innovation (SWATI)" Portal, aimed at creating a single online portal representing Indian Women and Girls in STEMM (Science, Technology, Engineering, Mathematics & Medicine). Launching the Portal on the occasion of International Day of Women and Girls in Science at Indian National Science Academy (INSA), New Delhi, Prof Sood said, the database of SWATI Portal will serve in policy making to address the challenges of Gender-gap. The Portal is a complete interactive database; hosted and maintained by the National Institute of Plant Genome Research (NIPGR), New Delhi. The objectives of the SWATI Portal include to scale up the effort exponentially to include each and every Indian woman in science, across all career stages and subjects, spanning both Academia and the Industry enabling reliable and statistically significant long term research on the issues of equality, diversity and inclusivity in India; Inclusion of each and every Indian WiS, career stages, subjects, spanning both Academia and the Industry; Enabling reliable and statistically significant long term research on the issues of equality, diversity and inclusivity in India, developing active search engine and searchable database (Name, Affiliation, Area of Interest).

SCIENCE POLICY AND DIPLOMACY

Future Circular Collider Proposed

CERN Researchers have proposed to build a new, even larger atom smasher. The \$17 billion Future Circular Collider (FCC) would be 57 miles (91 kilometers) long, dwarfing its predecessor, the 16.5-mile-long (27 kilometers) Large Hadron Collider (LHC), located at the European Organization for Nuclear Research (CERN) near Geneva. Physicists aim to use the FCC's increased size and power to probe fringes of the Standard Model of particle physics, the current best theory that describes how the smallest components of the universe behave. By smashing particles at even higher energies (100 tera electron volts, compared with the LHC's 14), the researchers hope to find unknown particles and forces; discover why matter outweighs antimatter; and probe the nature of dark matter and dark energy, which make up 95 percent of the universe. The new Collider is seen as a driver of innovation, because we will need new advanced technologies, from cryogenics to superconducting magnets, vacuum technologies, detectors, instrumentation — technologies with a potentially huge impact on our society and huge socioeconomic benefits. To unlock these new frontiers, physicists at CERN will use the sevenfold increase in beam energy of the FCC to accelerate particles to even higher speeds. CERN will likely look for additional funding from non member states for the project. The FCC would be more expensive than both the LHC and LIGO [Laser Interferometer Gravitational-Wave Observatory] combined and it has less discovery potential. Member states will meet in 2028 to decide its future.

India and Australia to Cooperation in Space Sector

Industry bodies from India and Australia signed a Memorandum of Understanding (MoU) on February 7. The MoU between the Satcom Industry Association-India (SIA-India) and the Space Industry Association of Australia (SIAA) signed during the 'DefSat Conference & Expo' aims to further cooperation between space sectors of both the countries. It has established a platform for the exchange of expertise and the formulation of best practices in critical areas of space and defence. The MoU was inked in the presence of the Indian Chief of Defence Staff General, Anil Chauhan and the Australian High Commissioner to India, Philip Green. Recent developments between India and Australia in the space sector, include collaborative satellite projects, data sharing for weather monitoring, and joint research initiatives. Initiatives like Australia's ISI fund, aimed at space sector partnerships, align with their shared vision. It enables the creation of business-to-business partnerships, facilitates capacity building, promotes skill development, and drives research and development initiatives.

CERNquadbots Complete its First Radiation Protection Test

A four-legged robotic solution has completed its first successful radiation protection test inside CERN's largest experimental North area. Called the CERNquadbots, the robot identifies potential radiation leakages in environments challenging to navigate both for humans and other robots employed at the research centre. The team is now developing advanced control algorithms to enable its long-term deployment in the experiment caverns, like that of the ALICE detector, which is dedicated to heavy-ion physics. In time, the robodogs will be able to navigate almost the entire area of the experiment caverns. By doing so, they'll be able to monitor the state of the caverns, the environmental conditions, as well as potential water, fire or other leaks.

China Opens Qinling Antarctic Station

China on February 7 inaugurated its Ross Sea scientific research station, starting operations in an outpost in a part of the Antarctic due south of Australia and New Zealand for the first time. The Qinling station will be staffed year-round with quarters sufficient to house as many as 80 people in the summer months. It is situated near the permanently inhabited U.S. McMurdo station. China has four other research stations in other parts of Antarctica that it previously built from 1985 to 2014 - Zhongshan, Taishan, Kunlun and Great Wall - with two of them also year-long stations like Qinling. It aims to enhance humanity's scientific knowledge of Antarctica and promote peace and sustainable development in Antarctica.

MoU to Collaborate for AI-led Development

The Government of Maharashtra and Google have signed a Memorandum of Understanding (MoU) to collaborate and drive innovative and scalable solutions in key sectors including agriculture, healthcare, sustainability, education, and startups. The MoU will allow the government to leverage Google's AI leadership and technology expertise to unlock new possibilities in land record management, disease detection, urban environment resilience and AI upskilling. Under the MoU, Google will collaborate with the government by offering startups mentorship, networking, and demo days with Google experts and industry leaders covering areas across technology, product development, business strategy, etc. The government will leverage their technology to help drive progress across critical areas such as skilling, healthcare, agriculture, and sustainability. Select startups will also have the opportunity to connect with investors to showcase their solutions. Google will also support AI-focused events designed to

solve local challenges and foster innovation and problem solving within the community. These initiatives aim to bridge the skills gap, enhance the learning experience, and drive innovation within government services.

We welcome your comments and valuable suggestions. Please write to us for receiving publications, updates and notices regarding seminars, conferences etc. Contact us at science.diplomacy@ris.org.in