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## **SCIENCE & TECHNOLOGY**

### **GLOBAL**

#### **[AI Tool to Predict Onset of Alzheimer's Disease](#)**

University of Cambridge scientists have developed an artificially intelligent tool capable of predicting in four cases out of five whether people with early signs of dementia will remain stable or develop Alzheimer's disease. The new approach could reduce the need for invasive and costly diagnostic tests while improving treatment outcomes early when interventions such as lifestyle changes or new medicines may have a chance to work best. The team has developed a machine learning model able to predict whether and how fast an individual with mild memory and thinking problems will progress to developing Alzheimer's disease.

#### **[Breakthrough Innovation in Battery Technology](#)**

Scientists at the University of Chicago have created an anode-free sodium solid-state battery. This brings the reality of inexpensive, fast-charging, high-capacity batteries for electric vehicles and grid storage closer than ever. The study demonstrates a new sodium battery architecture with stable cycling for several hundred cycles. By removing the anode and using inexpensive, abundant sodium instead of lithium, this new form of battery will be more affordable and environmentally friendly to produce. Through its innovative solid-state design, the battery also will be safe and powerful. This work is both an advance in the science and a necessary step to fill the battery scaling gap needed to transition the world economy off of fossil fuels.

#### **[Nanoparticle Vaccines Enhance Cross-protection against Influenza Viruses](#)**

According to a study by researchers in the Institute for Biomedical Sciences at Georgia State University, nanoparticle vaccines can produce pivotal cellular and mucosal immune responses that enhance vaccine efficacy and broaden protection to offer cross-protection against diverse influenza virus variants. To alleviate the significant public health burden of influenza epidemics and occasional pandemics, it's essential to enhance influenza vaccine cross-protection. The study highlights the importance of immunization orders and indicates that in a sequential immunization, an mRNA vaccine priming plays an important role in steering the Th1/Th2 immune responses. The intranasal PHC boost is crucial to the induction of mucosal immunity.

## **INDIA**

### **[India to Ratify BBNJ Agreement](#)**

The Union Cabinet, chaired by Prime Minister Narendra Modi, has approved India to sign the Biodiversity Beyond National Jurisdiction (BBNJ) Agreement. It marks a significant step towards the conservation and sustainable utilisation of marine biological diversity in areas beyond national jurisdiction. Often referred to as the 'High Seas', areas beyond national jurisdiction are the global common oceans open to all for internationally lawful purposes such as navigation, overflight, laying submarine cables and pipelines, etc. The Ministry of Earth Sciences will spearhead the country's implementation of the BBNJ Agreement.

### **[Indian Scientists Develop Tool for the Thirty Meter Telescope](#)**

India is a key partner in the TMT project, with India TMT Center at IIA leading the national collaboration. Researchers at the Indian Institute of Astrophysics (IIA) in Bengaluru and their collaborators have developed an automated code that can be used as an online tool to create a catalogue of Near Infrared (NIR) stars. The new online tool will create a comprehensive star catalogue for the Adaptive Optics (AO) system of the upcoming Thirty Meter Telescope (TMT), can enable this ground-based telescope-- one of the largest to be operational in the next decade, generate sharper astronomical images.

### **[New Technique Reveals Dynamics of Alzheimer's Progression](#)**

A team at the S.N. Bose National Centre for Basic Sciences is using a Covalent Magnetic Tweezer (CMT) fabricated in their lab, to study physical and chemical properties of protein molecules and action of chaperones on how these molecules fold and function. This approach has provided insights into the intricate dynamics of chaperone-assisted protein folding. Their findings have revealed novel mechanisms of molecular chaperones and provided insights into their functioning and implications for protein homeostasis and human diseases. The understanding of the physical basis of degenerative diseases like Alzheimer's and Parkinson's Disease at a molecular level, helps in designing drugs to target the mechanical roles of the chaperones, making it easier to prevent the progression of these diseases.

### **[Major Breakthrough in Cybersecurity](#)**

The Quantum Information and Computing (QuIC) lab at Raman Research Institute, Bengaluru performed a photonic experiment to demonstrate violation of what are called the Leggett Garg Inequalities (LGI)-- -- a litmus test for "quantumness" in a system in a loophole free manner. These are temporal analogues of the popularly known Bell inequalities-- a set of mathematical expressions that compare the predictions of quantum mechanics with those of classical physics. The setup ensures a loophole-free violation of LGI, providing an additional advantage of generating loophole-free randomness. They've created a new, user-friendly way to generate truly unpredictable random numbers, which is crucial for stronger encryption in quantum communications. This new method offers the enhanced protection by using truly random numbers to generate keys that will be used to encrypt the passwords.

### **CSIR and MSSRF Sign MoU to Reach Out to Tribal and Vulnerable Communities**

The Council of Scientific and Industrial Research (CSIR) and the M. S. Swaminathan Research Foundation (MSSRF) entered an MoU to work together for livelihood generation among rural, tribal, and farming communities. The MoU was signed by Dr. N. Kalaiselvi, DG, CSIR and Dr. Soumya Swaminathan, Chairperson, MSSRF. Senior officials from CSIR and representatives of MSSRF witnessed the signing of the MoU. The MoU entails creating a framework and meaningful association for the transfer of affordable, proven and selected technologies with societal relevance available across the CSIR laboratories / institutes and mentoring the SHGs/NGOs/FPOs and other voluntary organizations selected by MSSRF for livelihood generation and empowerment of women, and, tribal population.

## **GLOBAL CHALLENGES**

### **New Study to Aid Future Conservation and Biodiversity Hotspots**

Researchers from Birbal Sahni institution of Palaeosciences (BSIP), an autonomous institute of Department of Science and Technology, used fossil pollen and carbon isotope data from the Eocene Thermal Maximum 2 (ETM-2), also known as H-1 or Elmo, a period of global warming that occurred around 54 million years ago, to quantify the terrestrial hydrological cycle during that period. Analyzing the pollen, they found that when atmospheric carbon dioxide concentration was more than 1000 ppm near the palaeo-equator, the rainfall decreased significantly, leading to the expansion of deciduous forests. It can help understanding the relationship between CO<sub>2</sub> and hydrological cycle and aid in the future conservation of biodiversity hotspots.

### **New Prophylactic Drug Found to be Effective in HIV Prevention in Women**

A recent clinical trial conducted in South Africa and Uganda has successfully demonstrated the efficacy of Lenacapavir, a new prophylaxis drug in preventing HIV infections in women. The drug has reportedly demonstrated a 100% success rate during a six-month time period in women who received injections on a semi-annual basis. A total of 5000 women were part of the trial in which the efficacy of Lenacapavir was compared with that of Truvada and Descovy, two existing Pre-existing Prophylactic (PrEP) drugs. While HIV was contracted by 16 women on Truvada and 39 women consuming Descovy, the patients consuming Lenacapavir were not infected. The researchers plan on expanding the clinical trials to various other demographics. The development could significantly help aid the world's fight against HIV/AIDS.

### **Washington Post Launches New Interactive Chatbot to Answer Questions on Climate Change**

The Washington Post has launched "Climate Answers" a new AI-enabled interactive chatbot to help users enhance their knowledge on climate change. The chatbot has reportedly been trained

based on the paper's own reportage on environment and climate change from 2016. The chatbot is intended as a means to facilitate interactive journalism, while focusing on reader engagement and personalisation through providing high quality information. The chatbot further streamlines access to climate reporting in a manner that creates awareness regarding the effects of climate change.

## **RESOURCES & EVENTS**

### **[World Science Diplomacy Summit Held in Barcelona](#)**

The World Science Diplomacy summit was held during 5-11 July 2024 in Barcelona. Known as the Davos of science diplomacy, the summit was held under the auspices of the UNESCO and co-organized by various entities including the SciTechDiploHub. The event included over 15 plenaries and 21 side events. The deliberations carried out at these events sought to identify the best means through which science and technology could be used to tackle global challenges such as climate change. Discussions also delved into how science diplomacy could be foster collaboration across geopolitical divides. During the summit, announcements were also made to establish science diplomacy centres in Africa and the middle east respectively. An announcement from UNESCO further picked the city of Barcelona as the site to hold the World Science Diplomacy Summit till the year 2028.

### **[MeiTY Organises India AI Summit](#)**

The Ministry of Electronics and Information Technology, Government of India held the India AI Summit at Bharat Mandapam, New Delhi during 3-4 July 2024. The summit was organised as a part of India's efforts to steer global AI governance as the lead chair of the Global Partnership for Artificial Intelligence (GPAI) for 2023-24. During the summit, India sought to bring to the negotiating table a number of issues including: democratisation of AI resources, trustworthy and responsible AI and the role of the Global South. India reportedly negotiated with the countries of the Global North to make GPAI the international apex body for all matters related to AI governance. In addition to executive council meetings involving representatives of the GPAI member-states, nine expert sessions focusing on various areas including collaborative AI, digital health, digital agriculture, data ecosystem and the future of work were held on the sidelines of summit.

### **[CII Releases Report on Critical Minerals and Metals](#)**

The Confederation of Indian Industry has released a "Report on Advanced Materials, Critical Minerals and Metals" at the Global Summit on Advanced Materials, Critical Minerals and Metals, held at the India Habitat Centre, New Delhi. The report identifies nine materials namely: graphene, titanium and its alloys, ceramics, biomaterials and implants, composites, recycling materials, critical minerals and rare earth elements, steel, semiconductors and aluminium as critical for addressing India's strategic needs. The report also highlights the importance of "sustainable sourcing, recycling and innovation for long-term availability and reduced environmental impact".

### **[UNCTAD Digital Economy Report on Environmental Costs of Digitalisation](#)**

The UN Commission for Trade and Development has released its annual digital economy report for 2024. The report discusses the environmental costs of digitalisation on the world in general and developing countries in particular. While noting that digitalisation is taking a heavy environmental

toll on the planet, the report states that an unfair burden is placed on the developing world, which also reaps fewer benefits. The report urges for “a global shift towards a circular digital economy, focusing on circularity by design through durable products, responsible consumption, reuse and recycling, and sustainable business models”.

## **SCIENCE POLICY AND DIPLOMACY**

### **UNESCO Includes 11 New Sites to the World Network of Biosphere Reserves**

The UNESCO recently added 11 biodiversity reserves to the World Biosphere Reserves which “cover all major representative natural and semi-natural ecosystems”. The new reserves are located in Dominican Republic, Gambia, Italy, Mongolia, the Philippines, the Republic of Korea, and Spain. Two transboundary reserves in Belgium-Netherlands and Italy-Slovenia respectively have also been included. Director-General Audrey Azoulay highlighted the importance of these designations amid a global biodiversity crisis and climate change. Biosphere reserves are identified and nominated by national governments to the UNESCO’s Man and Biosphere Programme for recognition. These serve as vital sites for fostering scientific research, biodiversity conservation, and sustainable development. With these additions, the World Network of Biosphere Reserves now totals 759 sites in 136 countries, covering 7.4 million square kilometres and impacting approximately 275 million people worldwide.

### **Kazakhstan Joins the International Lunar Research Station Project**

Kazakhstan has inked a memorandum of understanding to join International Lunar Research Station (ILRS) project led by China and Russia. Under the ILRS, China and Russia plan on establishing a permanent presence on the moon by the 2030s. Kazakhstan is the 12<sup>th</sup> country to join the project. The inking of the MoU was done as a part of the broader China-Kazakhstan space partnership under which both countries are exploring the potential to make commercial use of each other’s spaceports.

### **Social Justice in Science and Technology: Science 20 Approves Recommendations**

The G20 Science and Technology engagement group, known as the Science20 has submitted a list of recommendations to state leaders after concluding its summit on 2 July 2024. The recommendations broadly pertain to five areas: AI, bioeconomy, energy transition, health and social justice. With respect to AI, the Science20 approved recommendations to collectively create, share and manage scientific data sets and steer AI development based on shared ethical principles that can ensure innovation and respect for human rights. The engagement group further urged the G20 nations to view the bioeconomy paradigm as one of the major means to tackle climate change. Ensuring access to vaccines, capacity building and combating misinformation were among the key recommendations included within the health vertical. Meanwhile, “the development of inclusive and equitable approaches to digital development” and the facilitation of universal infrastructure development were highlighted as a major means to ensure social justice.

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](mailto:science.diplomacy@ris.org.in)

