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RIS Science Diplomacy News Alert is your fortnightly update on Indian and global developments in scientific research, technological advancements, and G-20, global challenges, science diplomacy, policy and governance. The archives of this news alert are available at https://fisd.in/en/alerts-archives. Please email your valuable feedback and comments to science.diplomacy@ris.org.in.

CONTENTS

SCIENCE AND TECHNOLOGY

GLOBAL

Swedish Company Develops the World's First Living Computer
Chang'e 6 Lunar Sample Return Mission Prepares for Final Leg of its Journey
Scientists Engineer Plant Microbiome
UK, Japan Scientists Use AI to Create Powerful Superconducting Magnet

INDIA

IIT Jammu, IIT Mandi Study Finds the Presence of Carcinogenic Pollutants in Himachal Pradesh Groundwater
ISRO Chief Inaugurates New Propellant Facility at HAL
IIT Madras-NASA Team Identifies Superbug Aboard the International Space Station
IISc Researchers Develop New Method to Remove Heavy Metals from Water

GLOBAL CHALLENGES

Satellite Data Could Improve Earthquake Early Warning: New Study Reveals
New Biosensor Can Help Identify Cancer Biomarkers
New AI-enabled Wearable Can Monitor Gut Health
New Study Identifies Significant Decrease in HCFC Levels in the Atmosphere

RESOURCES AND EVENTS

Bonn Climate Change Conference Starts
CSIR-NIScPR Organises Workshop on Science Communication
UN Celebrates World Oceans Day
UNESCO Releases State of the Oceans Report 2024
G7 Leaders Agree to Pursue Inclusive and Trustworthy AI

SCIENCE POLICY AND DIPLOMACY

Armenia Signs Artemis Accords
WMO Adopts Four High-level Ambitions on the Cryosphere
Agreement Reached on International Health Regulations
G20 Digital Economy Working Group Meeting Discusses Cybersecurity

SCIENCE & TECHNOLOGY

GLOBAL

Swedish Company Develops the World's First Living Computer

Scientists from Sweden have reportedly created the world's first "living computer". The breakthrough was pioneered by FinalSpark, a company that focuses on biological neural networks to develop various solutions. Fashioned out of human brain tissue, the living computer is made up of 16 organoids, which are "tiny, self-organising three-dimensional tissue cultures made from stem cells". Much like a semiconductor chip, these organoids are capable of exchanging information with each other. They are trained to communicate with each other through a method that rewards them with dopamine, a chemical, when a task is completed successfully. This was administered through shining a light on the part of the organoid.

Chang'e 6 Lunar Sample Return Mission Prepares for Final Leg of its Journey

The Chang'e 6 mission which was launched by China in May, has successfully completed the first phase of its journey. On June 1, the Chang'e 6 mission lander touched down in the South Pole-Aitken Basin on the far side of the Moon. The mission intends to be the first to bring back lunar samples from the Moon's far side. The lander-ascender lifted off from the lunar surface on June 3, before docking with the mission orbiter on June 5, transferring the collected lunar samples to the return module. The samples are expected to return to Earth by June 25, with the return module slated to land in China's Inner Mongolia Autonomous Region. The Chang'e 6 mission also included collaboration with the European Space Agency (ESA) with three payloads made in Europe being carried on board the lander. These were the Swedish-made Negative Ions at the Lunar Surface (NILS) payload, the French Detection of Outgassing RadoN (DORN) instrument and the Italian passive laser retro-reflector payload. The Chang'e 6 marks China's fourth lunar lander and its

second sample return mission. Earlier, the Chang'e 5 had returned samples from the Moon's near side in 2020

Scientists Engineer Plant Microbiome

In a first, a multinational team of scientists have created the microbiome of a plant. This achievement is expected to help boost the presence of bacteria that are good for plant health while allowing for a reduction in the use of pesticides. Microbiomes essentially refer to "the variety of bacteria, fungi, viruses and other microorganisms that live alongside plants". They influence processes including metabolism and the functioning of the immune system in living beings. According to the scientists who were part of the research, the microbiome which has been "created for rice could be applied to other plants and unlock other opportunities to improve their microbiome".

UK, Japan Scientists Use AI to Create Powerful Superconducting Magnet

A collaborative effort from researchers at the King's College, London and three Japanese Universities have resulted in a powerful superconducting magnet with "a magnetic field 2.7 times stronger than that previously reported". The scientist employed a novel machine learning tool called BOXVIA to optimise the creation of the superconducting magnet in the laboratory. The tool reportedly helped fine tune parameters and improve performance. Notably, this resulted in the magnet having varying sizes of iron crystals, while researchers usually try to achieve a uniform size. This breakthrough can potentially help reduce the price of Magnetic Resonance Imaging machinery and enable a range of industrial applications.

INDIA

IIT Jammu, IIT Mandi Study Finds the Presence of Carcinogenic Pollutants in Himachal Pradesh Groundwater

A chemical hydrology led by researchers hailing from IIT Jammu and Mandi has revealed the presence of cancer-causing pollutants in groundwater in the Baddi-Barotiwala industrial area, Himachal Pradesh. The study proceeded on the basis of analysis of water samples to identify the sources of the contamination and assess the health risks emanating from the same. Along with geogenic uranium, the research study identified the presence of pollutants including zinc, nickel, lead, chromium and cobalt. Consuming this polluted water has purportedly led to an increase in the incidence of cancer and renal disease in the region during the 2013-2018 time period. The study recommends for the institution of improved effluent treatment methods and remediation to mitigate the threat to health.

ISRO Chief Inaugurates New Propellant Facility at HAL

A new state-of-the-art Propellant Tank Production and CNC Machining facility has been inaugurated at the Aerospace Division of the Hindustan Aeronautics Limited (HAL), Bengaluru. The facility was inaugurated by S. Somnath, Chairman, Indian Space Research Organisation (ISRO). The new facility is expected to play a key role in enhancing the launch capabilities of

ISRO. Currently, ISRO can only launch up to two LVM3 rockets in a year. However, the new facility can support up to six LVM3 launches in a year. The LVM3 is India's heavy lift launch vehicle which is meant for launching satellites to the geosynchronous transfer orbit and beyond. It can carry up to 8000 kg to the Low Earth Orbit and up to 4000 kg to the Geosynchronous Transfer Orbit.

IIT Madras-NASA Team Identifies Superbug Aboard the International Space Station

A joint study conducted by scientists at NASA and IIT Madras has found revealed key insights regarding mutation of microbes in a zero-gravity environment. According to the findings of the study, microbes mutate faster in extreme environments to cope with the harsh conditions. The findings are expected to help contain microbes in environments such as hospitals. The study focused on *Enterobacter Bugadensis*, a pathogen usually found in human beings' gastronintestinal tract and was located on the surfaces of the ISS. While the samples were collected by NASA, researchers from IIT Madras conducted the sequencing and modelling of about 211 assembled genomes.

IISc Researchers Develop New Method to Remove Heavy Metals from Water

Researchers from Indian Institute of Sciences, Bengaluru have developed a new method to remove heavy metals from ground water. The method purportedly entails three steps. In the first step, the contaminated water is passed through "a bed of chitosan-based adsorbent doped with iron and aluminium compounds". The electrostatic forces in this adsorbent bed captures heavy metals such as arsenic. A membrane separates the arsenic from the alkaline wash and concentrates the heavy metal during the second step. The third step employs microbes found in cowdung to methylate arsenic into less harmful organic forms. The field trials of the method have already commenced in rural areas in Karnataka and Bihar.

GLOBAL CHALLENGES

Satellite Data Could Improve Earthquake Early Warning: New Study Reveals

A new study has indicated that the analysis of satellite data could help predict the occurrence of earthquakes at least 19 days in advance. This represents a major step in earthquake early warning, for which accurate means currently don't exist. Professor Mehdi Akhoondzadeh, the lead author of the study analysed the chemical and atmospheric parameters during several months in the leadup to the earthquake that occurred in Turkey and Syria on 6 February 2023. The analysis was carried out based on the data collected by CSES-01, the Chinese seismo-electromagnetic satellite and the European Space Agency's swarm satellites. The satellite data essentially revealed patterns derived from "abnormalities in temperature and electron density throughout the Earth's system, including "water vapour, methane, ozone, CO, and AOD" present in the atmosphere". The study is expected to encourage research into more methods to use satellite data to improve earthquake predictions.

New Biosensor Can Help Identify Cancer Biomarkers

Researchers at the Kazanawa University have developed a novel method for detecting a certain biomolecule which serves as an indicator for several diseases. The biomolecule known as ADAR1 is one among the three adenosine deaminases (ADAR). These are essentially altered RNA

molecules that scientists have been studying as biomarkers for certain chronic diseases including cancer. The new method essentially entails an "electrochemical biosensor", DEPSOR to detect ADAR1. In addition to being cost effective, the biosensor can carry out its assessment using a small sample. The method further utilises newly identified aptameters (sequences of DNA, RNA or certain biomolecules that can attach itself to a target molecule) to detect ADAR1. The new method has been termed as "a promising means for monitoring cancer cell progression in clinical samples".

New AI-enabled Wearable Can Monitor Gut Health

Researchers at the University of Southern California have developed an AI-enabled system which can precisely track gastrointestinal health. The system includes a wearable coil which generates a magnetic field and a pill which consists of sensors. AI is utilised to pinpoint the location of the pill the gastrointestinal tract as the magnetic field interacts with the sensors. It further utilises "optical gas-sensing membranes to monitor 3D real-time concentrations of ammonia, a key indicator of bacteria associated with ulcers and gastric cancer". It can additionally gauge the levels of gases including hydrogen and methane which can point to the existence of anomalies. More details on the system have been published in the journal Cell Reports Physical Science.

New Study Identifies Significant Decrease HCFC Levels in the Atmosphere

A new study published in Nature Climate Change has noted a significant decrease in the levels of hydrochlorofluorocarbons (HCFCs) in the atmosphere. The reduction noted in the study has come about 5 years before the target year. HCFCs are ozone depleting substances which trap heat in the earth's atmosphere while causing "climate and radiative impacts" on the earth. The noted reduction in concentration of HCFCs represent a major success for global efforts being carried under the Montreal Protocol on Ozone Depleting Substances (1987). The state parties to the Montreal Protocol had agreed upon a phaseout of HCFC production and usage by 2040 vide the Copenhagen and Beijing amendments made in 1992 and 1999 respectively. The reduction noted in the study has come about 5 years before the target year.

RESOURCES & EVENTS

Bonn Climate Change Conference Starts

The annual meeting of the UN Framework Convention on Climate Change subsidiary bodies commenced in Bonn, Germany on 3 June 2024. Regarded as a key intermediary meeting in between the conferences of parties, the Bonn meeting is regarded as important in negotiating the modalities for implementing the Paris Agreement. During the conference, the Subsidiary Body for Scientific and Technological Advice (SBSTA) issued a note based on which negotiations on carbon markets featured in Article 6.2 and Article 6.4 can proceed. Divergences prevailed over aspects pertaining to authorisation procedures for emissions trading.

CSIR-NIScPR Organises Workshop on Science Communication

The National Institute of Science Communication and Policy (CSIR-NIScPR) organised a workshop on "Science and Technology Communication" in association with Global Health Strategies (GHS) at its Pusa campus, New Delhi. The CSIR-NIScPR is a constituent laboratory under the CSIR. Deliberations during the workshop focused on the means through which scientists and researchers can communicate their research and technical information through media and

social media. The workshop was attended by educators, scientists and science communicators hailing from various backgrounds.

UN Celebrates World Oceans Day

The UN celebrated the World Oceans Day on 8 June 2024 at its headquarters in New York. The occasion was marked with an acknowledgement of the need to "open minds, ignite senses and inspire possibilities towards the end of safeguarding marine life. Speaking at the event, UN Secretary-General, António Guterres highlighted how climate change, along with activities such as overfishing is bringing about a destruction of marine ecosystems around the world. "Now is the time for governments, businesses, investors, scientists and communities to come together in defence of our ocean," he stated.

UNESCO Releases State of the Oceans Report 2024

The Intergovernmental Oceanographic Commission, UNESCO launched a comprehensive report on oceans on 4 June 2024 in Iceland. The report resulted out of a global effort and includes contributions from over 98 experts hailing from 25 countries. It also includes reviews by 45 specialists and the international advisory board. The report describes the state of the ocean by elaborating "upon physical, chemical and biological parameters". It further discusses the major threats facing the ocean ecosystem today and provides "key insights on ocean literacy, indigenous and traditional knowledge".

Among other things, the report makes important observations including the importance of considering local solutions for climate change mitigation and adaptation, and on unequal distribution of access to knowledge. The report also includes projections as key findings. The rate of ocean warming is noted to have doubled in the past two decades. The report also estimates that the ocean acidity will reach 170% by 2100. The report is intended to stimulate action envisaged under existing international mechanisms including the Agenda 2030, Convention on Biodiversity and the Sendai Framework for Disaster Risk Reduction. The next edition of the report is scheduled to be launched in 2026.

G7 Leaders Agree to Pursue Inclusive and Trustworthy AI

Leaders of G7 countries deliberated upon matters pertaining to AI ethics and governance during a one-and-a-half-hour session held on 14 June 2024. Consensus was reached on promoting "safe, secure and trustworthy AI", while the leaders also agreed to pursue digital transformation in an inclusive and human-centric manner. The statement further reflected the G7 nations' intent to adopt a risk-based approach to AI policy formulation and improve the interoperability between varying AI governance approaches. The G7 Toolkit for Artificial Intelligence in the Public Sector, which seeks to help governments utilise AI to deliver public services while safeguarding human rights was also adopted. Among others, Pope Francis as well as Indian PM Narendra Modi addressed G7 leaders on the importance of AI ethics.

SCIENCE POLICY AND DIPLOMACY

Armenia Signs Artemis Accords

Armenia has become the 43rd country to sign on to the US-led Artemis Accords. Mkhitar Hayrapetyan, Armenia's minister of high-tech industry signed the Accords at a ceremony held at

the NASA headquarters. “By signing these accords, Armenia joins a community of nations dedicated to advancing the frontiers of human knowledge and capability in space,” Hayrapetyan stated after signing the Accords. Opened for signatures in 2020, the Artemis Accords entails a set of principles that embody practices and a code of conduct that its signatories participating in the exploration of space and celestial bodies are expected to follow.

WMO Adopts Four High-level Ambitions on the Cryosphere

The executive council of the World Meteorological Organization (WMO) adopted four high level ambitions for the cryosphere during its 78th session held in Geneva from 10 June 2024 to 14 June 2024. Cryosphere is a term used to refer to the frozen parts of the Earth’s geography such as the north and the south pole. The session expressed concerns over the impacts of accelerating ice melt due to climate change. The four ambitions include: Improvement of community resilience and preparedness to face the impact of cryospheric changes; Global collaboration to limit and reduce the impact of cryospheric losses; Improving access to indigenous knowledge and data sciences while ensuring they serve as the basis of policy and Making known the importance of the cryosphere and the consequences of its changes. The executive council also agreed upon “increasing engagement and coordination upon Antarctica”.

Agreement Reached on International Health Regulations

The World Health Assembly consisting of over 194 state parties have arrived at an agreement on “a package of critical amendments to the International Health Regulations (2005)”. This development has occurred amid frustration springing from divergences between developed and developing countries preventing the conclusion of an international pandemic treaty. In this regard, the state parties have agreed to conclude the treaty by 2025. In the interim period, the agreement on IHRs are expected to help countries’ bolster their preparedness to face future health emergencies. “Today’s strengthening of the IHR provides powerful momentum to complete the Pandemic Agreement, which, once finalized, can help to prevent a repeat of the devastation to health, societies and economies caused by COVID-19”, stated WHO Director-General Dr Tedros Adhanom Ghebreyesus.

G20 Digital Economy Working Group Meeting Discusses Cybersecurity

The G20 Digital Economy Working Group held a meeting at the city of São Luís, the capital of Maranhão, Brazil. The meeting was attended by representatives hailing from all the G20 nations. Deliberations at the meeting focused on issues revolving around cybersecurity and particularly on “four priority axes: universal and meaningful connectivity; information integrity; digital government; and artificial intelligence”. The discussions further highlighted the need to boost cooperation in the area of cybersecurity and collaborating to mitigate threats by sharing best practices and exchanging experiences.

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