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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.

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SCIENCE & TECHNOLOGY

GLOBAL

New NASA Spacesuit Can Recycle Urine to Produce Drinking Water

NASA has designed a spacesuit that can recycle astronauts' urine to drinking water. The new spacesuit consists of a vacuum-based catheter and a filtration system with forward-reverse osmosis. The system can recycle urine to produce potable water in a matter of merely five minutes. The technology is primarily intended to improve astronaut hygiene and address physical discomfort caused from wearing a maximum absorbency garment featured in existing spacesuits. The new water recycling system can significantly aid NASA's bid to undertake long-duration space missions and establish a sustainable presence on celestial bodies including the Moon and Mars.

New Breakthrough: Dark Oxygen Produced at Ocean Depths

A new study has revealed key insights regarding how oxygen is produced at the depths of the ocean. The discovery resulted out of a study conducted by a team of scientists led by Professor Andrew Sweetman at the Scottish Society of Marine Sciences. The team analysed the metallic nodules at the Clarion-Clipperton Zone between Hawaii and Mexico. The metallic nodules purportedly produce oxygen when electric currents emanating from them electrolyse seawater. The discovery has challenged conventional scientific wisdom which has so far dictated that oxygen in the oceans is produced by marine plants utilising sunlight to facilitate photosynthesis. The new discovery is expected to create commercial prospects that deep-sea mining companies are keen on exploiting.

Drought-resilient Cotton: Boyce-Thompson Institute Researchers Discover Two Genes

Researchers at the Boyce-Thompson Institute, Cornell University, New York have discovered two genes: GhHSFA6B-D and GhDREB2A-A, which can significantly enhance the drought-resistance of cotton crops. As a part of the study, the researchers planted about 22 varieties of cotton in the Arizona desert, while exposing half of them to drought-induced stress. As per the details of the discovery published in the Plant Biotechnology Journal, it was the two genes that significantly helped cotton plants withstand drought and keep up fibre production. The finding could pave the way for similar breakthroughs that can enhance the cotton crops' resistance to drought.

New Device Can Cut Down AI Systems' Energy Consumption

Researchers at the University of Minnesota Twin Cities have developed a new device which can significantly cut down energy consumption by AI devices. The device which has been christened Computational Random-Access Memory (CRAM) draws upon research and development in Magnetic Tunnel Junctions and nanostructured devices. cuts down energy consumption by eliminating the need for data transfers between the memory and logical units. It in turn facilitates the processing within the memory array. CRAM in this manner can purportedly reduce AI systems' energy usage by about 2500 times.

INDIA

Pune Scientists Discover New Lactic Acid Bacteria

Scientists at the Agharkar Research Institute, Pune have reportedly discovered a new strain of lactic acid bacteria, MCC0200. The bacteria reportedly has traits including antioxidant properties as well as a tendency of strong adhesion to intestinal surfaces. The strain can reportedly pave the way forward for a number of applications in health including reduction in cholesterol and cardiovascular disease risk and improvement in gut health.

IISER Researchers Sequence Jamun Plant Genome

In a first, the researchers at the Indian Institute of Science Education and Research (IISER, Pune) have completely sequenced the genome of the Jamun plant (*Syzygiumcumini*). Colloquially known as the Indian blackberry, the plant is native to the Indian subcontinent and is considered to possess several medicinal benefits including anti-diabetic properties. It is also considered to have positive effects on cardiac and gastrointestinal health. New information gained from the genome sequencing is expected to help gain crucial insights that can help evaluate the efficacy of pharmaceutical drugs based on it.

Google to Launch New AI-based Agricultural Information Tool in India

Google announced its scheme to launch an AI-based agricultural information tool intended for Indian farmers. Developed in collaboration with the Anthro Krishi team and India's digital AgriStack, the Agricultural Landscape Understanding (ALU) utilizes uses high-resolution satellite imagery and machine learning to provide information on boosting crop yields and critical meteorological insights.

IISc Researchers Develop New Technique to Reduce Bias in AI-generated Images

Researchers at the Indian Institute of Sciences, Bengaluru have developed a new approach to address bias in AI-enabled image analysis. The research that led to the "distribution guidance for image generation" technique was carried out by a team led by Professor Venkatesh Babu at the Vision and AI Lab, Department of Computational and Data Sciences. The technique serves to reduce bias by ensuring that AI-generated images follow a "prescribed attribute distribution". The

code is open access for use by other researchers.

GLOBAL CHALLENGES

AI Performs Better Than Doctors in Prostate Cancer Detection

A new study published by the University of Los Angeles, California has indicated that AI systems might be better than doctors at detecting cancer in men. As per the results of the study, an AI system known as Unfold AI could detect prostate cancer with 87% accuracy, while human medical practitioners could only do so with 67% accuracy. Unfold AI which has already been cleared by the US Food and Drug Administration draws various parameters drawn from clinical data (biopsies, medical images and pathology) to generate "a 3D cancer estimation map". The map effectively also indicates the ideal course of treatment. Utilisation of similar systems is expected to enable timely detection, while potentially reducing the need for surgical or radiological interventions.

Blood Thinning Drug Can Be Employed as Anti-Venom, Mitigate Effects of Cobra Bite

A study undertaken by researchers at the University of Sydney has revealed the potential of Heparin, a common blood thinning drug to be employed in treating cobra bite victims. The tests conducted on mice as well as human cells revealed that the drug helped significantly reduce tissue damage. Heparin can reportedly counteract cobra venom's effect on a molecule called heparan sulfate which is found on cell surfaces. Moreover, heparin stays stable at room temperatures, unlike conventional anti-venoms and can even be administered using an auto injector and hence cater to the needs of individuals residing in remote areas. It may further help reduce the rate of amputations resulting from cobra bites.

Melting Ice Caps Leading to Longer Days, Reveals New Study

A new research study has explained how melting polar ice caps are causing longer days. The details of the study published in the Proceedings of the National Academy of Sciences pin the explanation on the effect of melting ice caps slowing down the earth's spin. Observational techniques and data utilized by the researchers further reveal that the water yielded from melting ice adding mass around the equator. The researchers compare this phenomenon with how a figure skater might slow down their spinning by extending their arms outward. The effect purportedly holds major implications for earth navigation and spacefaring.

RESOURCES & EVENTS

FAO Publishes Report on Sustainable Bioeconomy

The UN Food and Agriculture Organization (FAO) in collaboration with the German Ministry for Food and Agriculture has published a report titled "Aspirational Principles and Criteria for Sustainable Bioeconomy". The report firstly outlines principles as well as criteria which pertain to how various aspects of sustainability relate to activities envisaged under bioeconomy at the local and national levels. It further provides a reference list for issues which have to be addressed to implement bioeconomy strategies in "a sustainable and circular way". The criteria and principles serve to ensure inclusivity through aiding the transition to "a greener, fairer and more

profitable economy" which can move towards achieving sustainable development goals.

UNOOSA, Austria Hold Symposium on Space Applications for Climate Action

The Government of Austria and the UN Office of Outer Space Affairs held a symposium on "Climate action: transforming space-based technology projects into sustainable services that support policymaking" during 17-18 July 2024. Sessions at the symposium delved into how various space-based applications including earth observation could be employed to support climate action. Also in focus were aspects including capacity building in geoinformatics and various applications in water resource management, agriculture and the means of integrating climate science into space policies.

First-ever UN System-wide Strategy for Water and Sanitation Launched

The first-ever UN System-wide Strategy for Water and Sanitation" was launched during the annual High-level Political Forum (HLPF) on Sustainable Development was held in New York during 15-17 July, 2024. Held under the auspices of the ECOSOC, "Reinforcing the 2030 Agenda and eradicating poverty in times of multiple crises: the effective delivery of sustainable, resilient and innovative solutions" was identified as the theme for 2024. Numerous side events and special events and exhibitions were held as part of the forum. Among other things, ". Attention was also drawn to unique cooperation models such as the Experimental Lakes Area research project initiated by the International Institute for Sustainable Development. The project brings together scientists from across the ten countries of the African Great Lakes region.

IAEA to Launch Radiopharmacy Database

The International Atomic Energy Agency has revealed that it is currently building a database on radiopharmaceuticals "to facilitate research, collaboration and the sustainability of safe radiopharmaceuticals for clinical use". The IAEA defines radiopharmaceuticals as "drugs that contain, among other ingredients, radioactive forms of chemical elements called radioisotopes". They have a range of applications including imaging organs and treating cancer. The database serves to build connections among entities which produce radiopharmaceuticals while allowing an observer to gain insights with respect to evolving trends and supply chain gaps. The agency is currently in the process of collecting information through surveys sent to facilities producing radioisotopes and radiopharmaceuticals. Interested parties may also proceed to voluntarily submit surveys at the IAEA Radiopharmacy database website.

SCIENCE POLICY AND DIPLOMACY

Energy Storage Technologies: NITI Aayog Report Stresses on Testing Infrastructure, Skill Development

NITI Aayog has published a report laying a future roadmap for the development of energy storage technologies in India. The report details the current challenges which impede the development of the sector in India. It further recommends measures to be taken in areas including enhancing testing accuracy and the means to align energy storage technology development with India's goals to achieve net-zero carbon emissions by 2030.Further, the report recommends the establishment of standards and testing architecture and for training a skilled workforce.

UK, India Announce Technology Security Initiative

India and the United Kingdom (UK) have jointly launched the Technology Security Initiative. The initiative launched during the official visit of the UK's Foreign Secretary to India purportedly "sets out a new approach for how the UK and India work together on the defining technologies of this decade". Areas for cooperation identified include AI, advanced materials and semiconductors, telecom, quantum, critical minerals and health/biotechnology. According to the official statement, the National Security Advisors would carry the bilateral agreement forward while ensuring that the collective potential of UK-India critical technologies cooperation is fully harnessed.

Nuclear Energy Cooperation: USA, Singapore Ink 123 Agreement

The United States of America (USA) and Singapore have entered into an agreement to deepen cooperation in the civilian nuclear energy arena. The Agreement was signed during US Secretary of State, Anthony Blinken's visit to Singapore. Formulated in accordance with Section 123 of the US Atomic Energy Act, 1954, "outlines a comprehensive framework to deepen peaceful nuclear cooperation based on a mutual commitment to nuclear nonproliferation". The Agreement is expected to enter into force by the end of 2024 following Congressional approval in the USA.

USA-Brazil to Enhance Climate Change and Environmental Cooperation

The USA and Brazil inked a landmark agreement on climate change cooperation on the sidelines of the G20 Finance Track Ministerial meeting held in Rio de Janeiro, Brazil. Intended to strengthen the region's economy and address environmental challenges, the bilateral agreement outlines four areas of cooperation. These include: clean energy supply chains, high-intensity carbon markets, nature and biodiversity finance and multilateral climate funds.

Navigating New Horizons: UNEP, International Science Council Release New Report

The UN Environment Program in collaboration with the International Science Council (ISC) has released a report titled "Navigating New Horizons" which elaborates upon current challenges facing humanity. The report identifies eight critical shifts: environmental degradation, resource scarcity, AI and digital transformation, new conflicts, forced displacement, growing inequalities, misinformation and shifting governance as bringing about "a triple planetary crisis". It further outlines 18 "signals of change" that signify potential future challenges. Among other things, it notes that the thawing of permafrost in the Arctic could release ancient microbes and elaborates upon how these ongoing phenomena presents both risks and opportunities from the point of view of attaining Sustainable Development Goals.

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