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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

[Biochip Could Detect Multiple Viruses, Cancers, or Toxins in Minutes](#)

Researchers at Stanford University have shown how to conduct thousands of rapid molecular screenings simultaneously, using light to identify target molecules snared on top of an array of tiny silicon blocks. The team used an optical detection approach that relies on metasurfaces, arrays of tiny silicon boxes—each roughly 500 nanometers high, 600 nanometers long, and 160 nanometers wide—that focus near-infrared light on their top surface. This focusing makes it easy for a simple optical microscope to detect the shift in the wavelength of light coming from each silicon block, which varies depending on what molecules sit on top. To test the idea, the researchers tethered single-stranded gene fragments 22 nucleotides long to the silicon boxes and immersed the array in a buffer solution. When they added the complementary DNA strands to the solution, the strands quickly bound to the tethered ones, shifting the wavelength of light emitted from the surface of each box. This device could detect the presence of as few as 4000 copies of target genes per microliter, a concentration typically present in a nasal sample from a person infected with SARS-CoV-2. The technique could enable detection of viral infections without first having to amplify the genetic material from a patient, and could have wider applications. A company has been formed to commercialize the new detectors, specifically aimed at detecting minute levels of proteins and other molecules that cannot readily be amplified to make them easier to detect.

[Novel Peptoid Molecules to Fight Viruses](#)

Researchers at NYU have shown how a group of novel peptoid molecules inactivates several viruses, including Zika and chikungunya. Peptoids, which have similar chemical backbones to peptides, are better able to break through virus membranes and are less likely to degrade. The researchers investigated seven peptoids for antiviral effects against four viruses: three enveloped in membranes (Zika, Rift Valley fever, and chikungunya) and one without (coxsackievirus B3). The team found that the peptoids inactivated all three enveloped viruses -- Zika, Rift Valley fever, and chikungunya -- by disrupting the virus membrane, but did not disrupt coxsackievirus B3, the only virus without a membrane. Moreover, chikungunya virus containing higher levels of phosphatidylserine in its membrane was more susceptible to the peptoids. Preclinical studies are going on to evaluate the potential of these molecules in fighting viruses and to understand if they can overcome the development of resistance. The peptoid-focused approach could help in treating a wide range of viruses with membranes that can be difficult to treat, including Ebola, SARS-CoV-2, and herpes.

Continuous-flow Manufacturing of Essential Antibiotic Cefazolin

University of Tokyo researchers have manufactured cefazolin using a continuous-flow method which is cheaper, quicker, less wasteful and more flexible in terms of how much drug can be produced when it is needed. Cefazolin is so important to human health that it has been designated an essential medicine by the WHO. It is used to cure a broad range of ailments such as urinary tract, respiratory and joint infections, and to prevent infection after surgery. The team used two connected reactors to produce cefazolin from readily available commercial raw materials. The raw materials and reagents, which facilitate the reaction, were pumped into the first reactor, which looks like a coiled thin metal tube, before moving into a second reactor where another raw material was added. From there flowed the cefazolin. It was a challenge for the team to optimize the environment inside the reactors, i.e., the temperature, transfer speed and mixing ratio of reagents, etc., to be able to obtain a high-purity product at the end, particularly due to the complex structure of cefazolin. According to the researchers, this method was substantially superior to conventional batch manufacturing and could even be optimized further. Many compounds can be synthesized by continuous-flow methods, such as for agricultural use, and the realization of a low-carbon society.

Bacteria that Can Detect Tumor DNA

Scientists from the University of California San Diego and their colleagues in Australia have engineered bacteria that can detect the presence of tumor DNA in a live organism. Their innovation, which detected cancer in the colons of mice, could pave the way to new biosensors capable of identifying various infections, cancers and other diseases. They used *Acinetobacter baylyi*, a bacterium which has the elements necessary for both taking up DNA and using CRISPR to analyze it. The researchers designed, built and tested *Acinetobacter baylyi* as a sensor for identifying DNA from KRAS, a gene that is mutated in many cancers. They programmed the bacterium with a CRISPR system designed to discriminate mutant from normal (non-mutated) copies of KRAS. This means that only bacteria that had taken up mutant forms of KRAS, as found in precancerous polyps and cancers, for example, would survive to signal or respond to the disease. The researchers are now adapting their bacteria biosensor strategy with new circuits and different types of bacteria for detecting and treating human cancers and infections.

New Light on Gene Therapy for Blood Disorders

Researchers have found new ways of treating blood disorders, such as sickle cell anemia, through gene therapy. The new research shows that blood stem cells can be genetically engineered while still in the bone marrow, in a single treatment. This technology can be used to correct disease-caused mutations such as the single mutation that causes sickle cell anemia in ~7.5 million people worldwide, and it can be used to control stem cells using messenger RNA (mRNA). To do this we utilized a type of nanoparticle similar to the Pfizer COVID mRNA vaccine but designed it to find these stem cells specifically. The risks patients undergo for gene therapy highlights the need for improved treatments. In addition, eliminating the need for stem cell collection and treatment outside the body can cut costs for patients and improve access to critical gene therapies for many patients.

INDIA

India's Next Generation Magnetic Resonance Imaging (MRI) Scanner

India's first Indigenously developed, Affordable, lightweight, Ultrafast, High Field (1.5 Tesla), Next Generation Magnetic Resonance Imaging (MRI) Scanner was inaugurated in New Delhi. Indigenous MRI scanners will reduce the cost of MRI scanning and make it more accessible to the population. Under the National Biopharma Mission, Voxelgrids Innovations Pvt Ltd has developed a compact, lightweight, next generation MRI Scanner to solve the unmet need of the country. Rs 170 mn was spent for developing the world class MRI, of which Rs 120 mn was provided by DBT through BIRAC.

Bill to Establish the Anusandhan National Research Foundation Passed

The [Bill to establish the Anusandhan National Research Foundation](#) was introduced in the Lok Sabha on 4 August. It seeks to provide high level strategic direction for research, innovation and entrepreneurship in the fields of natural sciences including mathematical sciences, engineering and technology, environmental and earth sciences, health and agriculture. It will also promote scientific and technological interfaces of humanities and social sciences to promote, monitor and provide support as required for such research'. The bill proposes to establish the National Research Foundation with a budget of Rs. 500 bn during five years (2023-28). The Department of Science and Technology (DST) will be the administrative Department of NRF which will be governed by a Governing Board consisting of eminent researchers and professionals across disciplines. Since the scope of the NRF is wide-ranging, the Prime Minister will be the ex-officio President of the Board and the Union Minister of Science & Technology & Union Minister of Education will be the ex-officio Vice-Presidents. NRF's functioning will be governed by an Executive Council chaired by the Principal Scientific Adviser to the Government of India. NRF will forge collaborations among the industry, academia, and government departments and research institutions, and create an interface mechanism for participation and contribution of industries and State governments in addition to the scientific and line ministries. It will focus on creating a policy framework and putting in place regulatory processes that can encourage collaboration and increased spending by the industry on R&D. The bill will also repeal the Science and Engineering Research Board (SERB) established by an act of Parliament in 2008 and subsume it into NRF which has an expanded mandate and covers activities over and above the activities of SERB. The Upper House passed the Bill with a Voice vote on 9 August. It had been earlier passed by the Lok Sabha on 7th August 2023.

Satellite Bus Technology for Indian Private Industry

Enhancing private industry participation in the Indian Space sector, ISRO transferred the IMS-1 Satellite Bus Technology to M/S Alpha Design Technologies Pvt. Ltd. (ADTL). NewSpace India Limited (NSIL), the commercial arm of ISRO, facilitated the technology transfer through an agreement signed on August 2, 2023. ADTL is one of the two private players identified to receive the transfer of this technology through Interest Exploratory Note (IEN) published by NSIL. This transfer marks the beginning of satellite-bus technologies developed by ISRO being transferred to private industries. The IMS-1 satellite bus, developed by the U R Rao Satellite Centre (URSC/ ISRO), is a versatile and efficient small satellite platform designed to facilitate low-cost access to space. The bus serves as a dedicated vehicle for various payloads, enabling Earth imaging, ocean and atmospheric studies, microwave remote sensing, and space science missions while ensuring a quick turnaround time for satellite launches. IMS-1 bus, weighing

about 100 kg, accommodates a 30 kg payload. Solar arrays generate 330 W power with a raw bus voltage of 30-42 V. It offers a 3-axis stabilized with four reaction wheels with a 1 N thruster that provides +/- 0.1 degree pointing accuracy. It is a forerunner for IMS-2 bus technology, capable of improved features. IMS-1 bus is used in previous ISRO missions like IMS-1, Yuthsat and Microsat-2D.

TDB-DST Supports TIEA Connectors for Commercialization of Indigenous Technologies

The Technology Development Board signed an agreement with Bangalore based M/s TIEA Connectors Pvt. Ltd. under the initiative 'Commercialization of Indigenous Technologies through Tech Start-ups'. The Board has pledged a support of Rs. 3.81 crore out of the total project cost of Rs. 8.19 crore for the project 'Commercialization of micro-electronic harsh environment connectors and terminals'. The start-up has graduated from the Indian Institute of Science, Bangalore incubator, the Society for Innovation and Development (SID-IISc). The funded project is for the development and commercialization of connectors with pitches measuring 2.8 mm, 2.5 mm, and 2.54 mm along with their corresponding terminals. The product supported is primarily intended for the growing niche market of electric vehicles and drones, as well as automotive and consumer electronics among others.

IMD and IISER Pune Sign MoU to Advance Understanding on Indian Climate

The India Meteorological Department (IMD) and the Indian Institute of Science Education and Research (IISER) have signed a memorandum of understanding (MoU) to utilise scientific expertise and create awareness on extreme weather and climate events and generate socially and scientifically useful knowledge on the Indian climate through various activities. The MoU will facilitate the development of joint research projects.

ISRO Trial for Manned Mission in September

ISRO scientists have been working on the country's human spaceflight mission. The first test vehicle mission – meant to test the crew escape system – has been planned for late August or September. The test vehicle is a single stage liquid propellant rocket meant to test all the systems of Ganganyaan at sub-orbital level before a complete uncrewed mission that will mimic the complete final human mission. The first test vehicle mission (TV-D1) will check the processes for aborting the mission mid-air, the parachute system that will bring the crew module down to sea, and the recovery of the crew members from the module after splashdown.

G-20 AND GLOBAL CHALLENGES

T20 Summit in Mysuru

The T20 Summit, a gathering of distinguished Task Force members and policy experts from around the world was held in Mysuru, India. It provided an opportunity to collectively showcase ideas and insights on the priorities of India's G20 Presidency including issues such as macroeconomics and trade, digital transformation, lifestyle for environment, green transition, global financial order, accelerating SDGs and reforming multilateralism. The final T20 communique and Task Force Statements were issued, including the key recommendations and policy proposals developed by the Task Forces – through a year-long process – for the G20 Leaders' Communique. The recommendations included - Setting up G20 Working Group on

Digital Public Infrastructure; and setting up a joint programme of the Environment and Climate Sustainability and Health Working Groups to improve health outcomes of humans, animals, and ecosystems.

IN BRIEF

New COVID-19 subvariant EG.5 "Eris"

A new COVID subvariant, EG.5, also referred to as Eris, has emerged and become the dominant strain in the United States. EG.5 now accounts for the largest proportion of COVID-19 infections in the country compared to any other variant, according to the U.S. Centers for Disease Control and Prevention. On Aug. 9, the World Health Organization classified EG.5 as a variant of interest as cases increase globally. The EG.5 variant quickly overtook the prevailing omicron XBB strains in the U.S. last month. EG.5 is a descendant of the omicron XBB sublineage of the virus (specifically, XBB.1.9.2). It has an extra mutation in its spike protein, according to a WHO risk evaluation report. The variant was first detected in February 2023. So far, EG.5 has been detected in 51 countries — the majority of sequences are from China, followed by the U.S., South Korea, Japan and Canada, per WHO. XBB.1.16, also called the “Arcturus” variant, remains the most prevalent strain of COVID-19 worldwide. WHO considers the public health risk posed by EG.5 to be “low” and similar to that of XBB.1.16 and other variants of interest. The data available do not indicate that EG.5 causes a more severe infection compared to other variants, the experts note.

Ethanol to Revolutionize Nanosensor Manufacture

Macquarie University researchers have developed a new technique to make the manufacture of nanosensors far less carbon-intensive, much cheaper, more efficient, and more versatile, substantially improving a key process in this trillion-dollar global industry. The team has found a way to treat each sensor using a single drop of ethanol instead of the conventional process that involves heating materials to high temperatures. The new technique bypasses this heat-intensive process, allowing nanosensors to be made from a much broader range of materials. The new method was discovered accidentally, but the method's effectiveness depended on painstaking work to identify the exact volume of ethanol used - five microlitres. The team has patents pending for the discovery, which has the potential to make a very big splash in the nanosensor world. The Method has been tested with UV light sensors, and also with nanosensors that detect carbon dioxide, methane, hydrogen and more -- the effect is the same.

New recycling process for 'junk' plastic waste

University of Wisconsin-Madison chemical engineers are turning low-value waste plastic into high-value products. The new technique uses pyrolysis, in which plastics are heated to high temperatures in an oxygen-free environment. The result is pyrolysis oil, a liquid mix of various compounds. Pyrolysis oil contains large amounts of olefins. The team recovered olefins from pyrolysis oil and used them in a much less energy-intensive chemical process called homogenous hydroformylation catalysis which converts olefins into aldehydes, which can then be further reduced into important industrial alcohols. These products can be used to make a wide range of materials that are higher value. These higher-value materials include ingredients used to make soaps and cleaners, as well as other more useful polymers. The next step for the team is

to tune the process and better understand what recycled plastics and catalyst combinations produce which final chemical products.

New paint gives extra insulation

Stanford University scientists have invented a new kind of paint that can keep homes and other buildings cooler in the summer and warmer in the winter, significantly reducing energy use, costs, and greenhouse gas emissions. The newly invented paints have two layers applied separately: an infrared reflective bottom layer using aluminum flakes and an ultrathin, infrared transparent upper layer using inorganic nanoparticles that comes in a wide range of colors. For keeping heat out, the paint can be applied to exterior walls and roofs. Most of this infrared light passes through the color layer of the new paints, reflects off the lower layer, and passes back out as light, not being absorbed by the building materials as heat. To keep heat inside, the paints are applied to interior walls, where again, the lower layer reflects the infrared waves that transfer energy across space and are invisible to the human eye. Specifically, up to about 80% of high mid-infrared light is reflected by the paints, doing most of the work of keeping heat inside during cold weather and outside during hot weather. The research team tested their paints and found were 10 times better than conventional paints in the same colors at reflecting high mid-infrared light.

RESOURCES & EVENTS

New Category of Ayush Aisa for Treatment under Indian Systems of Medicine

The Ministry of Home Affairs, Government of India has notified the creation of a new category of Ayush (AY) visa for foreign nationals for treatment under Ayush systems/Indian systems of medicine. The introduction of Ayush Visa fulfills the proposal for introduction of a special visa scheme for foreigners visiting India for treatment under Ayush systems/Indian systems of medicine like therapeutic care, wellness and Yoga. It will boost Medical Value Travel in India. Medical Value Travel has seen significant growth in India in recent years. Ayush based healthcare & Wellness economy is estimated to grow to \$70 billion by 2025.

Zaporizhzhya Nuclear Plant Changes Reactor Shutdown

The Zaporizhzhya Nuclear Power Plant in Ukraine has begun transitioning one of its 6 reactor units from a hot shutdown to a cold shutdown after a water leak was detected in one of its steam generators, said the International Atomic Energy Agency (IAEA). The purpose of placing reactor unit 4 in cold shutdown is to investigate the exact cause of the leak and carry out necessary maintenance to repair the affected steam generator. There was no radiological release to the environment, the IAEA noted, adding that over the next three days, the nuclear power plant will move unit 6 to hot shutdown to continue steam production. Unit 6 had been in cold shutdown since 21 April to facilitate safety system inspections and maintenance. The IAEA team on the site will closely monitor the operations for the transition between the shutdown states of Units 4 and 6. There were power disruptions after the 750kV power line disconnected twice on 10 August. The ZNPP had to rely on 330 kV backup line, to supply the electricity required, for example, to perform safety functions such as pumping cooling water for the plant; and there was no total loss of off-site power to the site and emergency diesel generators were not needed. The nuclear power plant has been experiencing major off-site power problems since the conflict

began in February 2022, exacerbating the nuclear safety and security risks facing the site currently located on the frontline. Meanwhile, IAEA teams at other Ukrainian nuclear power plants – Khmelnytsky, Rivne, and South Ukraine, as well as the Chernobyl site – reported air-raid alarms on 9 August. They added that the safety and security at the facilities were not affected.

UN Secretary-General Creates Scientific Advisory Board

The United Nations Secretary-General António Guterres has announced the creation of a new Scientific Advisory Board to advise UN leaders on breakthroughs in science and technology and how to harness the benefits of these advances and mitigate potential risks. The Advisory Board will comprise seven eminent scholars alongside the Chief Scientists of United Nations System entities, the Secretary-General's Envoy on Technology, and the Rector of the United Nations University. The Board will be associated with a network of diverse scientific institutions from across the world. The primary objective of the Board is to provide independent insights on trends at the intersection of science, technology, ethics, governance and sustainable development. Through their collaborative efforts, the Board and its Network will support United Nations leaders in anticipating, adapting to and leveraging the latest scientific advancements in their work for people, planet and prosperity.

First WHO high-level global summit on traditional medicine

The World Health Organization (WHO) is convening the Traditional Medicine Global Summit on 17 and 18 August 2023 in Gandhinagar, Gujarat, India. Co-hosted by the Government of India, the Summit will explore the role of traditional, complementary, and integrative medicine in addressing pressing health challenges and driving progress in global health and sustainable development. High-level participants will include the WHO Director-General and Regional Directors, G20 health ministers and high-level invitees from countries across WHO's six regions. Scientists, practitioners of traditional medicine, health workers and members of the civil society organizations will also take part. The Summit will explore ways to scale up scientific advances and realize the potential of evidence-based knowledge in the use of traditional medicine for people's health and well-being around the world. Scientists and other experts will lead technical discussions on research, evidence and learning; policy, data and regulation; innovation and digital health; and biodiversity, equity and Indigenous knowledge. In preparation for the Summit, a WHO global workshop on biodiversity, indigenous knowledge, health, and well-being was held in Brazil from 25 to 28 July.

SCIENCE POLICY AND DIPLOMACY

India at BRICS Health Ministers Meeting

Dr Mansukh Mandaviya, Union Minister of Health and Family Welfare participated virtually in the BRICS Health Ministers Meeting being held in Durban, South Africa. India supports South Africa's initiative to strengthen cooperation in the field of Integrated Early Warning systems as it shall enhance preparedness for future health crises. India also welcomed Russia's initiative for BRICS Collaboration in Nuclear Medicine and expressed support to constitute an International Expert Forum on Nuclear Medicines. Dr Mandaviya also reiterated India's ongoing commitment to the BRICS TB Research Network Initiative, acknowledging the

progress since its launch, and expressed that this shall strengthen our efforts in ending TB by 2030.

ASEAN-India S&T Meeting

The Meeting of The Governing Council of ASEAN-INDIA Science and Technology Development Fund (GC-AISTDF-8) highlighted the importance of India's ASEAN technology partnership for present and future. The India ASEAN Science and Technology partnership encompasses all aspects of Research and Innovation, essential for both nations to achieve new heights together. Through the ASEAN-India Science and Technology Development Fund (AISTDF) and the Plans of Action for Peace, Progress, and Shared Prosperity, the collaboration extends to various areas like blue economy, healthcare, climate action, and sustainable development. The aim is to leverage science and technology to bridge disparities between urban and rural areas, with a specific focus on developing affordable technologies. During the meeting, the ongoing joint cooperation initiatives between ASEAN and India were discussed. The commitment to furthering cooperation in science, technology, and innovation between India and ASEAN reflects a shared vision to address pressing challenges and drive growth and development in the region.

India eyes SMRs but focuses on large reactors

Minister of State Jitendra Singh has told the country's parliament that Small Modular Reactors (SMR) is a promising technology in industrial decarbonisation especially where there is a requirement of reliable and continuous supply of power. India is considering steps for development of SMR, to fulfil its commitment to Clean Energy transition. Detailed technical discussions are currently under way to plan a roadmap for studying the feasibility and effectiveness of deployment of such reactors. However growth of nuclear power capacity through large size reactors is still the primary goal. A [report on the role of small modular reactors in the energy transition](#) issued earlier this year by the government's NITI Aayog public policy think-tank found that successful deployment of SMR technology must leverage private sector investment. The Government of India is exploring the options of collaborating with other countries and taking up indigenous development of SMRs, Singh told the Lok Sabha. Provisions of Atomic Energy Act, 1962 are being examined to allow participation of private sector and start-ups.

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

NOTE TO OUR READERS AND STAKEHOLDERS:

RIS Science Diplomacy Programme (fisd.in) is glad to present a new version of Science Diplomacy News Alerts, following India's assumption of the Presidency of the G20. A new section G20 and global challenges has been added. We request your cooperation to review the Alerts and improve its content. For this purpose, please complete the form at <https://forms.gle/o4d869FxaM9t3KNw7>, and submit it. Your support and cooperation is appreciated.