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NEWS ALERT

Forum for Indian Science Diplomacy

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

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RESOURCES AND EVENTS

SCIENCE POLICY AND DIPLOMACY

GLOBAL

Production of Lithium-ion Batteries Simplified

The MIT spinout 24M Technologies has simplified lithium-ion battery production with a new design that requires fewer materials and fewer steps to manufacture each cell. The company says the design, which it calls “SemiSolid” for its use of gooey electrodes, reduces production costs by up to 40 percent. The approach also improves the batteries’ energy density, safety, and recyclability. The SemiSolid platform has been proven at the scale of hundreds of megawatts being produced for residential energy-storage systems. Another key draw of its battery design is that it can work with different combinations of lithium-ion chemistries.

Pain Relief without Side Effects and Addiction

An international team of researchers led by the Chair of Pharmaceutical Chemistry at Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) have found new substances that activate adrenaline receptors instead of opioid receptors and have a similar pain-relieving effect to opiates, but without the negative aspects such as respiratory depression and addiction. New findings are a milestone in the development of non-opioid pain relief. Optimizing the identified molecules, for which extremely high-resolution cryo-electron microscopic imaging was used, the researchers were able to synthesize agonists that produced high concentrations in the brain and reduced the sensation of pain effectively in investigations with animal models. None of the new compounds caused sedation, even at considerably higher doses than those that would be required for pain relief. The team is still undertaking basic research.

Hepatitis B Regimen Protect HIV Patients

Scientists have shown that a three-dose course of the hepatitis B vaccine HEPLISAV-B fully protected adults living with HIV who had never been vaccinated against or infected with the hepatitis B virus (HBV). Researchers tested a three-dose course of HEPLISAV-B among 68 adults living with HIV at 38 sites in the United States, South Africa, and Thailand. Following the initial dose of HEPLISAV-B vaccine 0.5 milliliter (mL) as an intramuscular injection,

study participants received additional doses at four weeks and 24 weeks. All participants achieved sero-protection with 88 per cent of participants achieving HbsAb levels greater than 1000 mIU/mLHigh antibody levels are thought to be associated with long-term vaccine durability. At eight weeks after the second dose, 94.4 per cent of participants achieved sero-protection; this percentage increased to 98.5 per cent by week 24 prior to the third dose. The most common side effects related to vaccination were injection site pain, malaise, fatigue, muscle aches and headaches. The international study will continue to examine the effects of two-dose HEPLISAV-B, as well as a three-dose regimen of another hepatitis B vaccine (ENGERIX-B, manufactured by GSK) among adult participants with HIV who were previously vaccinated against HBV but who did not achieve an adequate immunologic response.

AI Model Predict Human Response to Novel Drug Compounds

A research team at the CUNY Graduate Center has created an artificial intelligence model that could significantly improve the accuracy and reduce the time and cost of the drug development process. The new model, called CODE-AE, can screen novel drug compounds to accurately predict efficacy in humans. In tests, it was also able to theoretically identify personalized drugs for over 9,000 patients that could better treat their conditions. Researchers expect the technique to significantly accelerate drug discovery and precision medicine. CODE-AE significantly improves accuracy and robustness over state-of-the-art methods in predicting patient-specific drug responses purely from cell-line compound screens. The team's next challenge in advancing the technology's use in drug discovery is developing a way for CODE-AE to reliably predict the effect of a new drug's concentration and metabolization in human bodies. Researchers also noted that the AI model could potentially be tweaked to accurately predict human side effects to drugs.

Key Protein Structure of Hepatitis C Mapped

A team led by scientists at Scripps Research and the University of Amsterdam has mapped, at high resolution, critical proteins that stud the surface of the Hepatitis C virus (HCV) and enable it to enter host cells. It detailed key sites of vulnerability on the virus -- sites that can now be targeted effectively with vaccines. In the study, researchers found that they could use a combination of three broadly neutralizing anti-HCV antibodies to stabilize the E1E2 complex in a natural conformation. Broadly neutralizing antibodies are those that are able to protect against a broad range of viral strains, by binding to relatively non-varying sites on the virus in ways that interrupt the viral life cycle. The researchers imaged the antibody-stabilized protein complex using low-temperature electron microscopy. With the help of advanced image-analysis software, researchers were able to generate an E1E2 structural map of unprecedented clarity and extent at near-atomic scale resolution. The structural data also should allow us to discover the mechanisms by which these antibodies neutralize HCV.

COVID-19

COVID-19 (WORLD)

Intranasal COVID Vaccine for Animals

Researchers based their vaccine on the spike protein from the SARS-CoV-2 beta variant, separately encapsulating the antigen and an immune-stimulating adjuvant into nanoparticles known as artificial cell membrane polymersomes. They packaged the two components separately so that they could more easily change the spike component to one from another variant if needed. Intramuscular co-administration of the parts produced a strong immune response in both mice and hamsters. When the hamsters injected with the new vaccine were exposed to live virus, they still developed an infection. In contrast, intranasal coadministration in hamsters produced a strong systemic immune response. It also cleared viruses from the respiratory tract and prevented infection-associated lung damage. Regardless of how the vaccine was administered, it provided protection against multiple variants, including omicron. Based on these results, researchers are now recruiting participants for a Phase 1 clinical trial.

COVID-19 (INDIA)

Omicron Subvariant XBB Dominates in India

The Omicron subvariant XBB has acquired mutations and split into fitter strains. India has reported confirmed cases of XBB-driven COVID infection. According to Indian scientists, among the XBB group, XBB.3 has been responsible for most (63 per cent) infections, followed by XBB.2 (21 per cent), Xbb (11 per cent) and XBB.1.1 (0.4 per cent). The XBB strain is currently leading in India with maximum cases.

INDIA–SCIENCE & TECHNOLOGY

New Materials Can Help Move Towards Stable LEDs Emitting Bright Light

Scientists at the Centre for Nano and Soft Matter Sciences (CeNS), an autonomous research institute under the Department of Science and Technology (DST) found that simple plasma treatment of inorganic material of cesium lead halide nanocrystals can lead to enhanced stabilization many folds showing the promise of bright and stable LEDs. The mechanism of plasma treatment induced stability enhancement in inorganic perovskite nano-crystals could boost their emission. Plasma treatment induces the cross-linking of the organic molecules, oleylamine, present on the surface of the nanocrystals. This creates a stronger network of ligands, providing better encapsulation and higher PL intensity. They have also presented a novel anticounterfeiting application that uses the method of plasma treatment to fabricate covert double-layer security tags.

Robotic Hand for Paralytics Developed

Researchers from IIT-Delhi, in collaboration with AIIMS, have developed the first robotic hand exoskeleton device for rehabilitation of wrist and finger joints for stroke survivors. The device is based on a four-bar mechanical link, which can be controlled by patients through

muscle activity. It's customisable through a simple user interface. The exoskeleton can be used by patients according to their clinical symptoms. Active participation of the patient is ensured through muscle activity (electromyogram) and visual feedback. The clinical testing of phase-III was funded by ICMR under the centre of advanced research and excellence in disability and assistive technology. The device would be more compact, lightweight, and aesthetic compared with the one used during phase II trial.

Indian Researchers Use CAR-T Cells for Leukemia

Researchers at Tata Memorial Centre are carrying out safety trials for India's first indigenously made CAR-T cells. Last month, the group announced "encouraging" results of the Phase 1 trial for 10 patients with lymphoma and similar results for the safety trial for six patients of leukemia. Each of these patients had received three to five lines of therapy, including previous stem cell transplant, but in vain. The team found that it has low toxicity as compared to the western CAR-T cells. Moreover, none of the patients developed cytokine storms. Two 8-year-old children who underwent CAR-T infusion are cancer-free at the moment. The team is preparing for the second phase of the clinical trial in which 50 patients will be given CAR-T cells.

ISRO's Heaviest Rocket Successfully Places 36 Satellites in Orbit

The Indian Space Research Organisation's (ISRO) heaviest rocket Launch Vehicle Mark 3 (LVM3 or GSL took off from the Satish Dhawan Space Centre SHAR, Sriharikota and has successfully orbited 36 satellites of the U.K. based OneWeb. The 43.5 metre LVM3 weighing around 644 tonnes carried 36 satellites weighing 5,796 kg. With this launch, LVM3 has made its entry into the global commercial launch service market. LVM3-M2 is the dedicated commercial satellite mission of NewSpace India Limited (NSIL), a Central Public Sector Enterprise (CPSE) under the Department of Space, Government of India. This mission is being undertaken as part of the commercial arrangement between NSIL and m/s Network Access Associates Limited (m/s OneWeb Ltd), a U.K. based company. OneWeb is a joint venture between India's Bharti Enterprises and the U.K. government. An hour after takeoff all the satellites separated successfully. The LVM3 was conceived primarily for launching geo-stationary satellites with a payload capacity of 4T, which can also be used for launching 6T payloads for LEO.

New Technology for Retrofitting Non-earthquake-resistant Buildings.

Researchers from the Indian Institute of Technology, Kanpur, have explored the extent to which retrofitting old buildings with semi-confined unreinforced brick masonry (SC-URBM) technology can solve the problem. They found that SC-URBM can significantly enhance the energy dissipation capacity and ductility of the retrofitted building without compromising its strength. Hence such buildings would have superior performance in comparison to URBM buildings during earthquakes. SC-URBM technology involves embedding of reinforced concrete (RC) bands through the partial thickness of the wall and can be implemented or retrofitted in old buildings. This technology for strengthening existing URBM buildings is not only architecturally aesthetic but can also be implemented easily by manpower available locally (masons).

IN BRIEF

French Delegation Discusses Jaitapur Nuclear Power Project

A Delegation from France discussed Indo-French collaboration in Nuclear Energy. The two sides discussed ways to speed up the setting up of the nuclear power reactors at Jaitapur site in Ratnagiri district of Maharashtra jointly. The Indian Government has already accorded 'In-Principle' approval for setting up six nuclear power reactors of 1650 MW each in technical cooperation with France in September 2008. The French company EDF last year submitted to Nuclear Power Corporation of India Ltd (NPCIL) its binding techno-commercial offer to build six European Pressurized Reactors (EPRs) at Jaitapur. In May, this year, a high-level team from EDF visited India and held detailed talks with NPCIL officials. The technical, financial and civil nuclear liability issues are to be resolved at the earliest by both sides before the scheduled visit of the French president Mr Emmanuel Macron in early 2023. NPCIL will be responsible for the construction and commissioning of the units, as well as obtaining all necessary permits and consents in India as the owner and future operator of the plant. This includes certification of the EPR technology by the Indian regulator. The present nuclear power capacity of 6780 MW is planned to be increased to 22480 MW by 2031 by progressive completion of approved projects.

Material that Can be Made like a Plastic but Conducts like Metal

Scientists with the University of Chicago have discovered a way to create a material that can be made like a plastic, but conducts electricity more like a metal. The material consists of nickel atoms in a string of molecular beads made of carbon and sulfur, which easily and strongly conducts electricity and is very stable. The material forms layers, in which electrons can still move. The new material can be made at room temperatures. The team is exploring different forms and functions that the material might make.

New Class of Porous Metal Nanoparticles

Researchers from Northwestern University have used tiny hollow particles termed metallic nanoframes and modified them with appropriate sequences of DNA, to synthesize open channel superlattices with pores ranging from 10 to 1,000 nanometers in sizes that have been difficult to access until now. This newfound control over porosity will enable researchers to use these colloidal crystals in molecular absorption and storage, separations, chemical sensing, catalysis, and many optical applications. 12 unique porous nanoparticle superlattices were identified with control over symmetry, geometry, and pore connectivity to highlight the generalizability of new design rules as a route to making novel materials. The ability to control pore size and connections between pores opens a range of potential uses, such as cloaking and superlensing, the imaging of super small objects with microscopy.

RESOURCES & EVENTS

OIC Signs an MoU with Russia

The Organization of Islamic Cooperation (OIC) and the Ministry of Science and Higher Education of the Russian Federation signed a memorandum of understanding to promote the development and consolidation of long-term and constructive relations in the fields of science and higher education. Under the signed MoU, the two sides will undertake and support joint projects and programs that will support interaction between scientific organizations and higher education institutions in various spheres of activity, including student training and joint educational and research projects in both OIC Member States and the Russian Federation. A joint Working Group will be established to oversee the implementation of the MoU, which will come into effect upon the completion of the internal approval process of both parties.

S20 Issues Communique on the Theme "Recover Together, Recover Stronger"

In preparation for the G20 2022 Summit, to be held in Bali, Indonesia, on November 15 and 16, 2022, the science academies of the G20 member countries have submitted a final statement to their respective governments to alert them on what they see as the most pressing current scientific issues. The statement recommends that the G20 governments tackle challenges in the priority issues that cover building resilient health systems, enhancing adaptive capacity of health systems to climate change, bolstering multi-disciplinary science and technology for pandemic preparedness and climate change, guaranteeing that people are at the center, and strengthening the nexus between data-research-policy-practice for climate change, pandemic preparedness, and economic recovery.

GM Mustard Cleared by GEAC

The Genetic Engineering Appraisal Committee (GEAC) has recommended the "environmental release" of the transgenic hybrid mustard DMH-11 for seed production and conduct of field demonstration studies with respect to its effects, if any, on honeybees and other pollinating insects. Scientists at Delhi University's Centre for Genetic Manipulation of Crop Plants (CGMCP) have developed the hybrid mustard DMH-11 by crossing a popular Indian mustard variety 'Varuna' (the barnase line) with an East European 'Early Heera-2' mutant (barstar). DMH-11 is claimed to have shown an average 28% yield increase over Varuna in contained field trials. GEAC is a body responsible for appraisal of proposals relating to the "release" of GM organisms and products (ordinarily considered hazardous) into the environment. In this case, it has recommended the environmental release of DMH-11 "for its seed production and testing, prior to commercial release" and given the green signal for commercial cultivation by farmers, with production of seed material being the first step. The GEAC also set certain conditions - the approval is for a limited period of four years and is renewable for two years at a time based on a compliance report. The recommendation will now again go for the approval of the Environment Ministry. Though the GEAC had cleared the proposal in 2017, the Ministry had vetoed it and suggested that the GEAC should hold more studies on the GM crop. India has until date approved GM breeding technology only in cotton. Previous attempts at commercial release of GM brinjal were blocked by environmental activists.

SCIENCE POLICY AND DIPLOMACY

EU Countries Agree on COP27 Stance

EU environment ministers on 24 October agreed their negotiating position for the COP-27 climate conference in Sharm el Sheikh. The discussions centred around two controversial points: how to update Europe's ambition considering the 'Fit for 55' package currently under discussion, and wording around global efforts to phase out coal. On coal, the final EU text calls on all Paris Agreement signatories "to close the book on unabated coal through a phasedown and ending inefficient fossil fuel subsidies to accelerate their energy transition". On the EU's own climate pledge, the final text highlights "the aim to conclude negotiations of these essential elements" of the 'Fit for 55' package "by the end of 2022". The EU is now considering a significant push in 'Fit for 55' negotiations ahead of COP-27. EU legislators will also push forward on the reform of the EU's carbon market (EU ETS) and a law to reduce emissions from land use and forestry (LULUCF) during the first week of COP-27.

Arctic Multilateralism Under Strain

The ninth Arctic Circle Assembly (ACA) was held in Reykjavík, Iceland, on 13-16 October, with discussions on environmental pressures, But the February 2022 Russian invasion of Ukraine had its impact. Two Arctic states, Finland and Sweden, are now seeking membership in NATO. The Arctic Council, where Russia currently holds the chair position, remains in a de facto state of suspension. Seven members of the organization, now commonly referred to as the "A7," opted in March to implement a "pause," suspending contact through the organization with Moscow. Although many at the ACA were quick to point out that much Council work was still taking place at a lower level and avoiding Russian participation, there is nonetheless concern about the long-term impact of the split on the Arctic Council's future. Non-Arctic states who are formal observers in the Council and who have been dependent upon the organization to enhance their own Arctic interests, including Asian governments like China, India, Japan, Singapore, and South Korea, are affected by the dispute. Some have attempted to press on with individual Arctic policy platforms. India released its Arctic White Paper in March this year, and S.Korea is planning on updating its own Arctic strategy in December. Among the "Asia-Arctic" States, China's Arctic diplomacy has been affected by this situation. The Polar Silk Route initiative had been launched with great ambition five years ago as a Sino-Russian initiative, adjacent to the greater Belt and Road, but since then the PSR has repeatedly run into political and financial obstacles, further exacerbated by Chinese firms' recent worries about being caught in the same network of sanctions targeting Russian companies. A hardening U.S. stance on China's Arctic presence is yet another growing obstacle. There is a growing tendency in the US to frame both Russia and China as joint challengers to Arctic security despite the considerable differences between the two powers in both policy and capabilities. The U.S. National Strategy for the Arctic Region paper published this month emphasized these aspects. The differences between the United States and China surfaced during the final plenaries at the Arctic Circle. China's Special Representative on Arctic Affairs, Gao Feng said that as the Council operates by consensus, it would be difficult from a legal angle for the chair of the group to be transferred from Russia to Norway, an event scheduled to take place in May 2023 without Moscow's participation.

Report Warns About 2.5°C Warming

The UNFCCC's second synthesis of countries' nationally determined contributions (NDCs) under the Paris Agreement on climate change finds that while countries are reducing global greenhouse gas (GHG) emissions, their combined climate pledges could put the world on track for around 2.5°C of warming by the end of the century. At the same time, the world is starting to aim for net-zero emissions. The NDC synthesis report (FCCC/PA/CMA/2022/4) integrates information from the 166 latest available NDCs communicated by 193 parties to the Paris Agreement and recorded in the NDC registry as at 23 September 2022. The report finds current commitments will increase emissions by 10.6 per cent by 2030, compared to 2010 levels. While this is an improvement over last year's assessment, which indicated emissions were on a path to increase by 13.7 per cent by 2030, compared to 2010 levels. These efforts are insufficient to limit the global average temperature rise to 1.5°C above preindustrial levels by century's end. Unlike last year's analysis, the 2022 report shows that emissions are no longer expected to increase after 2030. However, they are not demonstrating the rapid decline necessary to meet the goals of the Paris Agreement. According to the Intergovernmental Panel on Climate Change (IPCC), GHG emissions need to be cut 43 per cent by 2030, compared to 2019 levels to avoid the worst impacts of climate change. At the same time, net-zero targets were set by 62 countries, though many net-zero targets "remain uncertain and postpone into the future critical action that needs to take place now."

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NOTE TO OUR READERS AND STAKEHOLDERS:

SCIENCE DIPLOMACY COURSE

RIS announces the next edition of its Science Diplomacy Course starting from 24 January to 3 February 2023. This course is supported by the ITEC programme of the Ministry of External Affairs, Government of India and is open to participation by qualified nationals from partner countries. For more details of the previous course please see https://www.ris.org.in/en/capacity-building/itec-science-diplomacy. For enquiries, please Email science.diplomacy@ris.org.in.

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