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SCIENCE & TECHNOLOGY

GLOBAL

Health Effects of Chronic Radiation Exposure

The nuclear reactor accident at Chernobyl in 1986, released radioactive material into the air, leading Soviet authorities to evacuate thousands of people from the surrounding area. In the first genetic study of any large mammal in the area around Chernobyl, DNA collected from feral dogs living near the power plant today reveals that they are the descendants of dogs that were either present at the time of the accident or that settled in the area shortly afterwards. Over the course of three years researchers collected blood samples from around 300 dogs living at the power plant and around the mostly deserted city of Chernobyl. DNA analysis of the canines revealed that they were not newcomers to the area. By comparing the dogs' genetic profiles to those of other free-roaming dogs in Eastern Europe, the team found that the canines in the vicinity of the power plant have been isolated from other dog populations for decades. The dogs living closest to the power plant are genetically distinct from their kin living just a few kilometres away, showing that they were able to survive and breed, even while living near the reactor.

Vitamin D to Prevent Dementia

Researchers at the University of Calgary's Hotchkiss Brain Institute in Canada and the University of Exeter in the UK explored the relationship between vitamin D supplementation and dementia in more than 12,388 participants of the US National Alzheimer's Coordinating Center, who had a mean age of 71 and were dementia-free when they signed up. Of the group, 37 per cent (4,637) took vitamin D supplements. The team found that taking vitamin D was associated with living dementia-free for longer, and they also found 40 per cent fewer dementia diagnoses in the group who took supplements. Across the entire sample, 2,696 participants progressed to dementia over ten years; amongst them, 2,017 (75 per cent) had no

exposure to vitamin D throughout all visits prior to dementia diagnosis, and 679 (25 per cent) had baseline exposure. Vitamin D has some effects in the brain that could have implications for reducing dementia, however so far, research has yielded conflicting results. Our findings give key insights into groups who might be specifically targeted for vitamin D supplementation. Overall, we found evidence to suggest that earlier supplementation might be particularly beneficial, before the onset of cognitive decline. While Vitamin D was effective in all groups, the team found that effects were significantly greater in females, compared to males. Similarly, effects were greater in people with normal cognition, compared to those who reported signs of mild cognitive impairment -- changes to cognition which have been linked to a higher risk of dementia. The effects of vitamin D were also significantly greater in people who did not carry the APOEε4 gene, known to present a higher risk for Alzheimer's dementia, compared to non-carriers.

Chemical Imaging Could Help Predict Efficacy of Radiation-therapy

Scientists from the University of Michigan and two universities in Italy have demonstrated that an imaging system that uses special nanoparticles can provide a real-time, high-resolution chemical map that shows the distribution of chemicals of interest in a tumor. It could lead to a way to help clinicians make better recommendations on cancer therapy tailored to a particular patient -- precision medicine. They demonstrated an in vivo chemical imaging method generalizable to any chemical of interest. The researchers used a method for "chemical imaging" of tissues called photo-acoustic chemical imaging, or PACI. The team tested their system in mice that were implanted with tissue from a biopsy of a patient's tumor, called a xenograft. Patient-derived xenografts recapitulate the genetic and biological characteristics of the patient's tumor. PACI employs nanoparticles that have been developed in the past decades that can be injected into the mouse to target the tumor and sense a particular chemical of biomedical interest, such as oxygen, sodium or potassium. When this nanosensor is activated by infrared laser light that is able to penetrate into the tumor tissues, an ultrasound signal is generated that can be used to map the concentration and distribution of that particular chemical. The PACI method could be used in a mouse xenograft to repeatedly follow the characteristics of a particular patient's tumor to evaluate the chemical environment of the tumor over time. In this research, PACI has been employed in patient-derived xenografts. The ultimate goal would be the ability to make the chemical maps in patients directly.

New Technology to Detect Active TB

Researchers at the Wayne State University have discovered new technology that will quickly and easily detect active Mycobacterium tuberculosis (TB) infection antibodies. The team has developed a novel non-sputum based technology and has discovered several novel immune-epitopes that differentially bind to specific immunoglobulin (IgG) in TB-infected subjects. The levels of epitope-specific IgG in serum can differentiate active TB from LTBI subjects, healthy controls and other respiratory diseases. This technology can be used as a simple serum assay non-sputum based serological POC- TB test, which is highly specific and sensitive to differentiate active TB from LTBI. With a simple test active TB can be differentiated from LTBI and other respiratory diseases. The research team has applied a patent application on its technology and is actively seeking companies interested in investing.

Approach to Enhance Drug Delivery for Brain Tumours in Children

Mount Sinai Health System and Memorial Sloan Kettering Cancer Center researchers have developed a new drug delivery approach that uses nanoparticles to enable more effective and targeted delivery of anti-cancer drugs to treat brain tumors in children. The technology allows for the enhanced delivery of anti-cancer drugs to the specific locations of brain tumors while sparing normal brain regions. It delivers lower doses of the drug in a more effective manner to the specific sites of tumor within the brain, while sparing the bone toxicity that is seen in younger patients. The researchers made use of a normal mechanism that the immune system uses to traffic white blood cells to sites of infection, inflammation, or tissue injury. Rather than randomly sending immune cells throughout the body, there is a homing mechanism on activated blood vessels that immune cells use to go where they are needed. The researchers used this unique homing feature, which is also found within brain tumor blood vessels, to target their drug-loaded nanoparticles to the site of the disease and not the normal brain regions. Using the new drug delivery platform in a genetically relevant mouse model of medulloblastoma, the research team was able to enhance the efficacy of an anti-cancer drug that could potentially be useful for a subset of medulloblastoma patients, but which is currently limited by the bone toxicity it secondarily creates in children. The researchers anticipate that continued investigation and development of this method to harness and improve the transport of materials across the blood-brain barrier and other sites will be instrumental for improving the efficacy of several classes of approved and experimental therapeutics. This drug delivery platform can be used to treat cancers in the brain and other sites of the body, as well as other inflammation-related diseases in the central nervous system and elsewhere.

DNA Repair Discovery Could Improve Biotechnology

A team of researchers from Michigan State University's College of Veterinary Medicine has made a discovery that may have implications for therapeutic gene editing strategies, cancer diagnostics and therapies and other advancements in biotechnology. A large protein kinase called DNA-PK can help repair DNA double-stranded breaks in one of two ways. For breaks with missing information, it can target enzymes that can fill in missing nucleotides -- sort of like a needle and thread stitching the DNA back together. They revealed two different DNA-PK complexes, called dimers. While many molecular geneticists already suspected that DNA-PK helps hold DNA ends together during the rejoining process, many wondered why there would be two dimers, instead of just one. For "dirty" ends, DNA-PK recruits enzymes that can cut off the damaged DNA so that the ends can be rejoined. The team also discovered that repair efficacy depends on equilibrium between the two dimers.

Supercharged Bacteria with Immunity to Viral Infections

US researchers have modified a strain of Escherichia coli bacteria to be immune to natural viral infections while also minimizing the potential for the bacteria or their modified genes to escape into the wild. The work promises to reduce the threats of viral contamination when harnessing bacteria to produce medicines such as insulin as well as other useful substances, such as biofuels. Currently, viruses that infect vats of bacteria can halt production, compromise drug safety, and cost millions of dollars. The researchers said their work suggests a general method for making any organism immune to viruses and preventing gene flow into and out of genetically modified organisms (GMOs). Such biocontainment strategies are of increasing interest as groups explore the safe deployment of GMOs for growing crops, reducing disease spread, generating biofuels, and removing pollutants from open

environments. The method involves modifying genetic building blocks, or codons to change what those codons tell an organism to make, by adding modified tRNAs. This change blocks virus replication. This technology prevents horizontal gene transfer from genetically modified organisms into natural organisms and the modified organism cannot survive in nature if it escapes. This work opens up the possibility of codon reprogramming as a tool for coaxing bacteria to produce medically useful synthetic materials that would otherwise require expensive chemistry. A patent application has been filed related to this work.

INDIA

Vaibhav Fellowship for the Indian Diaspora

Union Minister Dr Jitendra Singh launched VAIBHAV Fellowship scheme for the Indian Diaspora abroad on National Science Day. The Vaibhav Fellowship aims at improving the research ecosystem of India's Higher Educational Institutions by facilitating academic and research collaborations between Indian Institutions and the best institutions in the world through mobility of faculty/researchers from overseas institutions to India. The applicant should have obtained a Ph.D/M.D/M.S degree from a recognized University. Moreover, the applicant must be a researcher engaged in an overseas academic / research / industrial organization with a proven track record of research & development and plan to work for a minimum of 1 month to a maximum of 2 months a year in a research institution / academic institution in India. Researchers from institutions featuring in the top 500 QS World University Rankings will be eligible for the fellowship. The call for applications for 'VAIBHAV Fellowship' will be notified through the Department of Science and Technology's website.

India's first Air-cooled Condenser

NTPC has commissioned India's first Air cooled condenser installed Super Critical plant to demonstrate its Commitment towards water conservation at the 1st Unit of 660 MW at North Karanpura, Jharkhand on 1st March. The Air Cooled Condenser (ACC) has almost 1/3rd water footprint as compared to a conventional Water Cooled Condenser (WCC). This would result in water saving of around 30.5 million cubic metres annually thus fulfilling the needs of around 1.5 million people in the region annually. The North Karanpura plant will have a total capacity of 1980 MW, 3 Units of 660 MW each. This plant is based on one of the Most efficient Supercritical Technology and being a pit head plant (10 Km from coal source) will supply economical power to the states of Jharkhand, Bihar, West Bengal, and Odisha. NTPC is currently meeting 24 per cent of country's demand through coal, gas, hydro, solar and wind plants.

BrahMos Missile with Indigenous Seeker & Booster

The launch of the BrahMos precision strike missile, which features an indigenous Seeker and Booster developed by the Defence Research and Development Organization (DRDO), on 5 March marked a significant milestone for the Indian Navy. A successful ship-based precision strike in the Arabian Sea was carried out by the Navy. The missile test was carried out from a Kolkata-class guided missile destroyer warship. BrahMos Aerospace is continuously working on increasing indigenous content in the missile. Supersonic cruise missiles with a speed of 2.8 Mach, or roughly three times the speed of sound, are manufactured by BrahMos Aerospace Pvt Ltd, which is a joint venture between India and Russia. The missiles can be fired from a variety of platforms, including ships, aircraft, submarines, and land. The missile's compact version, the BrahMos NG, is also being developed by BrahMos Aerospace. India and the

Philippines agreed to supply the missile for \$375 million in January of the previous year. India is also looking at South Africa, Saudi Arabia, the United Arab Emirates, and Egypt to sell the missiles.

Climate Change, Glacier Topography & Morphology Control Glacial Retreat

A team of scientists from Wadia Institute of Himalayan Geology (WIHG), Dehradun, Uttarakhand, India (An autonomous institute under DST, India), quantitatively evaluated the influence of the debris cover on the loss of ice mass in summer (summer ablation) and on terminus recession of glaciers. studied two glaciers with different characteristics --- the Pensilungpa Glacier (PG) in Suru River and the Drang-Drung Glacier (DDG) in Doda River basins of Zaskar in the Leh district of Ladakh for a comparative study of glacier fluctuations between 1971 and 2019. While a thick debris cover characterizes the PG, the DDG has a thin debris cover, and their comparative analysis helped them trace the influence of various factors on the mass balance process. They found that the glacier retreat rate is controlled by climate change and the topographic setting and morphology of the glacier. Their comparative study published in the journal Sustainability also confirms the possible influence of factors such as snout geometry, glacier size, elevation range, slope, aspect, debris cover, as well as the presence of supra and proglacial lakes other than the climate in the heterogeneous glacial dynamics and underlined the need to include these in glacial studies.

Breakthrough to Produce High Intensity Lasers

Indian Institute of Science Education and Research (IISER) Bhopal researchers have made a breakthrough in the field of low threshold gain lasers. They have developed a process by which tiny crystals of Cesium lead bromide may be manipulated to produce high-intensity with very low energy output. They have been working with nanocrystals of a material called Cesium lead bromide. Although this material has a high photoluminescence quantum yield, meaning it emits a lot of light for the energy put in, it suffers from a problem called Auger recombination. This is a phenomenon in which part of the energy is released as heat instead of converting into light. To overcome this problem, IISER Bhopal researchers developed a new technique called “facet engineering”. This technique involves changing the shape of the nanocrystals to reduce the gain threshold. The shape of the nanocrystals was changed. Through which they achieved a five-fold reduction in the gain threshold, which could make these nanocrystals much more useful in practical applications.

IISc & Siemens sign MoU to Promote Innovation in Healthcare

Medical technology major Siemens Healthineers and the IISc have signed an MoU to promote innovation in healthcare. Siemens Healthineers will also be laying the foundation stone for an innovation hub, to be set up at a cost of Rs 1,300 crore at Bommasandra Industrial Area. The intention of the collaboration is to promote innovation, and added that Siemens Healthineers collaborate in three areas -- universities, hospitals and with industries. The hub will be a part of Siemens Healthineers’ strategy 2025. It will be spread over 75,000 sqft and will be functional by 2025. The state-of-art facility will be an integral part of the global network of innovation, and India plays an important role as a growth market for Siemens Healthineers.

IISc Develops Alternate COVID Testing

Researchers at the Indian Institute of Science (IISc) have developed an alternative method of

Covid testing that can be used in areas that are resource-starved. Currently, real-time reverse transcription–polymerase chain reaction (real-time, or quantitative, RT-PCR) test is one of the fastest and most accurate ways to detect the Covid-19 virus, making it the most widely used across the world. They have found a way to eliminate the need for both these prerequisites in Covid testing. The researchers developed a new method of testing, called quantitative endpoint RPA (qeRPA). They make use of Recombinase Polymerase Amplification (RPA), an alternative method of testing, where reactions are monitored at room temperature. This removes the need for a thermal cycler. Researchers developed a model for RPA testing that provides consistent results with those done through real-time RT-PCR, without needing to make use of real-time monitoring. When tested, the researchers found that both -- testing using qeRPA and quantitative RT-PCR -- had consistent results. However, the use of qeRPA removed the need for a thermal cycler as well as real-time monitoring, while ensuring that testing could be done just as accurately. This method could be used to detect nucleic acids like DNA or RNA at diagnostic centres in resource-limited areas such as remote villages and in developing countries.

G-20 AND GLOBAL CHALLENGES

G20 RIIG on Sustainable Energy Technologies

The G20 Research and Innovation Group (RIIG) meeting on Materials for Sustainable Energy held on 2nd March 2023 at Ranchi discussed energy challenges and achieving carbon emission net-zero goals. Various facets of ‘Materials for Sustainable Energy’ were discussed under three sessions ---21st century challenges related to energy materials & devices, solar energy utilisation and photovoltaic technology, and materials and processes for green energy. A total 21 foreign delegates from 16 G20 member countries, invited guest countries and international organisations participated in the conference along with about 40 Indian experts. The Conference was coordinated by the Council of Scientific and Industrial Research (CSIR), New Delhi. Three more RIIG events will be held in Dibrugarh (Assam), Dharamshala (HP) and Diu on the themes ‘Circular-bio-economy’, ‘Eco-Innovations for Energy Transition’ and ‘Scientific Challenges and Opportunities towards Achieving a Sustainable Blue Economy’ respectively.

IN BRIEF

Enzyme that Converts Air into Electricity

Australian researchers have uncovered an enzyme sourced from a bacterium commonly found in soil is capable of transforming air into energy. The enzyme utilizes small amounts of hydrogen in the air to generate an electrical current. This breakthrough paves the way for the development of devices that can literally generate energy from thin air. The researchers extracted the enzyme responsible for using atmospheric hydrogen from a bacterium called *Mycobacterium smegmatis*. They showed that this enzyme, called Huc, turns hydrogen gas into an electrical current. Huc is extraordinarily efficient. Unlike all other known enzymes and chemical catalysts, it even consumes hydrogen below atmospheric levels – as little as 0.00005 per cent in the air. It is possible to store purified Huc for long periods. Huc is a “natural battery” that produces a sustained electrical current from air or added hydrogen. While this research is at an early stage, the discovery of Huc has considerable potential to develop small air-powered devices, for example as an alternative to solar-powered devices. The bacteria that

produce enzymes like Huc are common and can be grown in large quantities, meaning we have access to a sustainable source of the enzyme.

Algae Transformed into Functional Perovskites

Scientists at the Technische Universität Dresden have transformed single-cell algae into functional perovskite materials. The team has converted mineral shells of algae into lead halide perovskites with tunable physical properties. The new perovskites have unique nano-architectures unachievable by conventional synthetic production. The method can be applied to the mass production of perovskites with tunable structural and electro-optical properties from single-celled organisms. The team focused on *L. granifera*, a type of algae that uses calcite to form shells. Their spherical shells have a unique crystal architecture. The crystals are aligned radially which means that they spread out from the center of the sphere outwards. To transform the natural mineral shells of algae into functional perovskites, the team had to substitute chemical elements in calcite. During the transformation, scientists were able to produce different types of crystal architectures by altering the chemical makeup of the material. In that way, they could fine-tune their electro-optical properties. By converting the calcite shells to lead halides with either iodine, bromide, or chloride, the team could create functional perovskites that are optimized to emit only red, green, or blue light. The method developed by his team can be scaled up, opening up the possibility for the industry to take advantage of algae and numerous other calcite-forming single-celled organisms to produce functional materials with unique shapes and crystallographic properties.

Innovative Breathing Technique Developed

Pulmonologists at the University of Cincinnati developed a new breathing device which not only improves symptoms of breathlessness and quality of life for people with COPD, it also offers benefits for people dealing with stress and anxiety and those practicing mindfulness, meditation or yoga. The device, called PEP Buddy, a hands-free device that is the size of a whistle. The device is simple, lightweight and easy to use. The device is designed to be worn around the neck with a lanyard for day-to-day use and inserted into the mouth when needed, during or after exertion. The study found 72 per cent of the participants had a significant impact in reducing their shortness of breath and improving their quality of life. Among those who would drop their oxygen levels during walking, 36 per cent of them did not drop oxygen levels when using PEP Buddy. This is the first mechanical device to show such an impact on oxygen levels in people with COPD. The next step in this research is to conduct a long-term study to see the impact on the use of rescue inhalers, emergency department visits and long-term symptoms and functional capacity in people with COPD. PEP Buddy may also be a promising addition to pulmonary rehabilitation programs for faster improvement and sustaining better outcomes. They are also exploring other uses of PEP Buddy in health care.

Harvesting Rare Earth Elements From Wastewater

German scientists have found that the biomass of some exotic photosynthetic cyanobacteria can efficiently absorb Rare Earth Elements (REE) from wastewater, for example, derived from mining, metallurgy, or the recycling of e-waste. The absorbed REEs can afterward be washed from the biomass and collected for reuse. The team measured the potential for biosorption of the REEs lanthanum, cerium, neodymium, and terbium by 12 strains of cyanobacteria in laboratory culture. They found that an uncharacterized new species of Nostoc had the highest

capacity for biosorption of ions of these four REEs from aqueous solutions, with efficiencies between 84.2 and 91.5 mg per g biomass, while *Scytonema hyalinum* had the lowest efficiency at 15.5 to 21.2 mg per g. Biosorption was found to depend strongly on acidity: it was highest at a pH of between five and six, and decreased steadily in more acid solutions. The process was most efficient when there was no ‘competition’ for the biosorption surface on the cyanobacteria biomass from positive ions of other, non-REE metals such as zinc, lead, nickel, or aluminum. Biosorption of REEs by cyanobacteria is possible even at low concentrations of the metals. The process is also fast: for example, most cerium in solution was biosorbed within five minutes of starting the reaction. This system has the potential to become economically feasible in the near future, as the demand and market prices for REEs are likely to rise significantly in the coming years.

Plug-and-play Mobile PV System

Austria-based Alternative Energy Projects (AEP) has unveiled its first complete mobile power plant. The “Solar-Box” is a 20-foot container with solar modules, an electricity storage unit, and a hydrogen storage system. The solution increases solar self-consumption and reportedly works both on-grid and off-grid. The container is priced at around €125,000. The output of the container solution starts at 94 kW and can be scaled up to large systems of more than 5 MW. Each container module can reportedly be transported to the desired location by common means of transport such as truck, ship, or train. Each container has 168 solar modules, each with 560 W of power, as well as an inverter with 100 kVA and a completely pre-wired AC cabinet. The containers weigh 12.5 tons. It takes between 30 to 45 minutes to unfold and assemble the PV plant. The plug-and-play architecture allows the power plant to be easily commissioned at its destination without high connection costs. The system has broad application potential, ranging from temporary power generation on green spaces to powering remote construction sites and industrial facilities, or providing emission-free power at events.

More Quiet, Efficient Electric Aviation

Researchers at Chalmers University of Technology, Sweden, have developed a propeller design optimisation method that paves the way for quiet, efficient electric aviation. They have succeeded in isolating and exploring the noise that occurs at the tip of the propeller blades, or “tip vortices”. By adjusting a range of propeller parameters, such as pitch angle, chord length and number of blades, the team found a way to optimise the propeller design and even out the trade-off effect between efficiency and noise. The method can now be used in the design process of quieter propellers for future electric aircraft. The team found that by using six blades designed using our optimisation framework, a propeller can be developed that is both relatively efficient and quiet. The propeller achieves a noise reduction of up to 5-8 dBA with only a 3.5 per cent thrust penalty, compared to a propeller with three blades.

COVID Nanobody Therapies

US researchers have found a less expensive way to isolate and identify these nanobodies. The findings will make it easier for scientists around the world to discover nanobodies that target SARS-CoV-2 or other viruses. The authors have already used this optimized method to identify multiple nanobodies that appear to work against key variants of the virus, including omicron. Nanobodies may work where larger antibodies fail, in part due to their compact size. Studies have shown that nanobodies can squeeze into parts of the SARS-CoV-2 virus that

larger antibodies cannot reach. Nanobodies also have unusually long shelf-lives, cost very little to mass-produce and, because of their unique physical properties, could theoretically be inhaled. The team used a recently discovered "yeast display method," which was potentially far less expensive and simpler, could also effectively screen a library of nanobodies that they had previously screened with the mass spectrometry technique. They found that their version of the yeast display method not only identified many of the same nanobody candidates as the other approach, but also identified numerous other candidates that they had missed. The relatively simple and low-cost could empower laboratories in low-resource areas to generate nanobodies against SARS-CoV-2, as well as other viruses.

RESOURCES & EVENTS

[More Rules for Space Junk and Moon Bases](#)

New space rules will need to come fast to support commercial space stations and moon settlements, and guard against swiftly-growing space debris. That was a key takeaway message NASA and other government departments delivered to the National Space Council's (NSpC) users' advisory group, a set of representatives from industry, education and non-profit ventures. Feedback from these meetings could eventually be used to form space policy for Earth and moon and beyond, given that U.S. Vice-President Kamala Harris chairs the space council. NASA deputy administrator urged fast review of space regulations to avoid "future barriers" to space exploration. Space law is an immensely complex business. Most space faring countries have signed on to the United Nations' Outer Space Treaty that governs international space activities. The treaty, however, was negotiated in the 1960s when government activities dominated the scene. More recently, members of the NASA-led Artemis Accords have also agreed to peaceful work in the 2020s and beyond, and to eventually establish new norms for lunar exploration. The users' advisory group's mandate includes suggestions for "government policies, laws, regulations, treaties" as well as "practices across civil, commercial and national security space sectors", among other matters.

[China Mobilizes Science to Spur Development and Self-reliance](#)

Science has been elevated in the Chinese national agenda following two high-level policy meetings of the Chinese Communist Party. During the concurrent Chinese People's Political Consultative Conference and National People's Congress, which ended on 13 March, government officials sent a strong message that science and technology are the driving forces in China's efforts to achieve self-reliance and high-quality development, say researchers who are watching events closely. The announced changes include the creation of a high-level body to oversee the country's science and technology efforts. Increased emphasis is being given to key technologies such as artificial intelligence (AI) and semiconductors, many of which have dual civilian and military uses. The move towards more centralized control over research that requires significant investment and coordination is driven by geopolitical tensions between the United States and China. A new permanent body called the Central Science and Technology Commission, is being set up which will delegate tasks to the existing Ministry of Science and Technology (MOST). The work of attracting talent from abroad will also move to be under the Ministry of Human Resources and Social Security. Science and technology funding is also expected to continue to rise. The government's expenditure on research and development is projected to reach 328 billion yuan (US\$48 billion) in 2023 — an increase of 2% on 2022 levels, according to a draft budget report. Overall, China's spending on R&D has increased

from 2.1 per cent to more than 2.5 per cent of gross domestic product (GDP) over the past five years. Funding will flow principally to areas in which China faces increasing pressure from the United States and other Western countries. These include AI, big data, energy storage, semiconductors, biotechnology and the clean-energy transition.

SCIENCE POLICY AND DIPLOMACY

India, Lithuania to Work Together on Deep Tech Startups, Semiconductors

India and Lithuania on Tuesday agreed to work in the areas of deep tech startups as well as forge lasting ties in manufacturing of semiconductor chips. A high-level Lithuanian delegation discussed ways and means to revive the 2010 agreement in the area of science and technology. Lithuania has robust know-how and capacities in life sciences, biotechnology and other STEM areas and keen to have cooperation between the two countries in high tech startups. "Teltonika" a Lithuanian firm is working with Taiwan for manufacturing of sophisticated chips and the company has a presence in India also and can take collaboration of chip making to a new height in years to come. The Department of Science & Technology has been negotiating a Science & Technology Agreement with Lithuania.

UN High Seas Treaty Finalized

UN members have agreed on a High Seas Treaty to protect marine biodiversity and provide oversight of international waters. It is an important step for conservation that encourages international research collaboration without hindering science. The final wording of the agreement was hashed out by delegates of the United Nations Intergovernmental Conference on Marine Biodiversity of Areas Beyond National Jurisdiction (BBNJ) at the end of a two-week meeting in New York City. The final session, which lasted for 38 uninterrupted hours, finished long after expected, on 4 March. The Treaty will cover the high seas, which make up about two-thirds of the global ocean, or more than 70 per cent of Earth's surface. Some activities are regulated in these waters, including whaling, shipping and seabed mining, through mechanisms such as the UN Convention on the Law of the Sea. But, on the whole, the high seas have long been subject to few rules and regulations, particularly regarding the protection of biodiversity. The treaty will be formally adopted in the near future at a specially convened BBNJ session. The treaty creates various groups — including a scientific and technical body — to oversee regulations and react to changing conditions. It also emphasizes capacity building for research in lower-income nations, to ensure equitable access to science and to benefit from ocean discoveries. The issue of benefit sharing from 'marine genetic resources' was the biggest sticking point of the negotiations, which included molecules with pharmaceutical uses. But not all nations have the ability to harvest or study them, and delegates from developing nations want to suppress 'biopiracy' — wealthy nations harvesting materials from just outside their territories and reaping the benefits. The treaty states that monetary benefits from genetic resources "shall be shared in a fair and equitable manner" and used for "the conservation and sustainable use of marine biological diversity". A benefit-sharing committee established by the treaty, composed of 15 nominated experts, will decide what is fair. The agreement calls for scientists to add a "BBNJ standardized batch identifier" to genetic data and biological samples collected from marine life, and to notify a clearing house as to where those data are published, no later than one year after collection. The identifier will be attached to any patents or sales of marketed products that come from the original research. The treaty also establishes a mechanism to create marine protected areas (MPAs) in the high

seas. This keeps alive a pledge made last year at a biodiversity summit in Montreal that nations will protect 30 per cent of the world's land and seas by 2030. Importantly, the treaty allows for nations to establish MPAs by vote if they can't reach consensus. For any activities on the high seas that are expected to have a substantial effect, the treaty also calls for environmental-impact assessments. Nations will review these assessments and be in charge of approving the activities. Research cruises will simply have to make a public notification about where they are going and when. For text of the Treaty see

https://www.un.org/bbnj/sites/www.un.org.bbnj/files/draft_agreement_advanced_unedited_for_posting_v1.pdf. For details of the negotiations and background see <https://enb.iisd.org/sites/default/files/2023-03/enb25250e.pdf>.

India and Mexico Research Collaboration

India and Mexico signed a Memorandum of Understanding on research, technology and innovation collaborations with focus on several key technology areas like Aerospace, Electronics Instrumentation & Strategic Sectors; Civil, Infrastructure & Engineering; Ecology, Environment Earth & Ocean Sciences and Water; Mining, Minerals, Metals & Materials; Chemicals (including leather) and Petrochemicals; Energy (Conventional & Non-Conventional) and Energy Devices; Agri, Nutrition & Biotech and Healthcare. Three priority areas of Water, Lithium and Vaccines flagged by the Mexican side will be taken care of by India in the coming few months. Thematic meetings between scientists from CSIR and institutions in Mexico are planned focusing on Health, Energy, Aerospace and Environmental protection aspects. Foreign Minister of Mexico, Marcelo Ebrard thanked Prime Minister Narendra Modi for sending COVID Vaccines during the peak of the pandemic and he underlined that India was the first country to send Vaccines to Mexico, when many other advanced powers and friends showed initial reluctance.

India and Denmark Collaboration on Energy Systems

Towards expanding research projects in areas of climate change mitigation and enabling green transition, the Indian Institute of Technology Madras has announced a collaboration with Industry and Academia in Denmark on 1st March 2023. Four projects were disclosed in the presence of the Crown Prince of Denmark, Lars Aagaard, Minister for Climate, Energy and Utilities, Government of Denmark, among other stakeholders. The projects will accelerate technology development and collaborations with global partners to develop technology solutions that once deployed at scale in India will essentially become technology solutions for the world. A project was signed in the realm of Water to promote cooperation in engineering education and scientific research between Danfoss, Denmark and IIT Madras. Both institutions will undertake joint work on drinking water for coastal regions using renewable energy. IIT Madras will collaborate with Danish researchers on the following two projects awarded: ECoGrif [Efficient Cost saving Grid Friendly] Power and Tomorrow project! (Focused on Cement decarbonization)

Sound Management of Chemicals and Waste

The Strategic Approach to International Chemicals Management (SAICM), created in 2006, was intended to serve such a role, but it effectively expired in 2020. SAICM is a voluntary, multistakeholder, multi-sectoral policy framework to promote chemical safety around the world. An intersessional process (IP) is seeking to reach an agreement on a new framework on

chemicals and waste that will guide global efforts in the years to come. The resumed fourth meeting of the IP (in Nairobi, Kenya, from 27 February - 3 March 2023). made substantial progress on implementation mechanisms for the new instrument, capacity building, stocktaking, measurability and modalities for considering new issues of concern, and worked on draft resolutions to be adopted at the Fifth International Conference on Chemicals Management (ICCM5) in Bonn, Germany, in September 2023. These include proposals for a new alliance on pesticides or negotiations on an international code of conduct on chemicals. Key portions of the draft instrument require further work before they are put before ICCM5, so the Bureau, in consultation with relevant stakeholders, decided to suspend the IP again and reconvene two days before ICCM5 starts, in the hopes of producing breakthroughs in the IP Consolidated Document. Approximately 500 delegates attended, representing governments, intergovernmental organizations, industry, civil society organizations and special constituencies including children and youth. A Consolidated Document—was reorganized and streamlined to better suit its intended purpose, with key provisions on special implementation programmes, national implementation of the instrument, regional cooperation, and promoting enhanced engagement with more stakeholders and economic sectors that use chemicals, all largely finished. Provisions on capacity building, stocktaking, and a measurability structure remain to be completed.

India Partners with Australia's Science Agency

India's flagship initiative, Atal Innovation Mission (AIM), and the country's think tank NITI Aayog have joined hands with the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia's national science agency, by signing a Letter of Intent to encourage joint cooperation to drive innovation activities in areas of national challenges and shared priorities of both countries. The move comes during the India visit of the Australian Prime Minister Mr. Anthony Albanese. The Letter of Intent calls for a greater collaboration in areas of mutual interest and strategic priorities and serves as a general framework for cooperation intended to facilitate the development of more program specific interventions. The core of the bilateral engagement is the India Australia Innovation and Technology Challenge (IA-ITC) - a program envisioned to bring together the innovation ecosystems of India and Australia to address our shared environmental and economic challenges by supporting cohorts of start-ups and SMEs on their commercialisation pathways and bring to market innovative tech-based solutions spanning across circular economy, energy transition and food system resilience etc. The program intends to leverage the complementary capabilities and resources of the innovation ecosystem of both the countries. The IA-ITC builds on the success of the India Australia Circular Economy (IACE) hackathon 2021, which witnessed university students, start-ups, and SMEs from both India and Australia develop innovative tech-based solutions for circularity in food system value chain. AIM and CSIRO are currently working on the design and development of the IA-ITC program delivery model to ensure the IA-ITC is sustainable, innovative, impactful and aligns with the strategic interests of both India and Australia. The official launch of the program is expected to be in July 2023.

MoU with US for Semiconductor Supply Chain and Innovation

A Memorandum of Understanding (MoU) on establishing semiconductor supply chain and innovation partnership under the framework of India – US Commercial Dialogue was signed

between the two countries following the Commercial Dialogue 2023 held in New Delhi during the visit of the US Secretary of Commerce, Ms Gina Raimondo. The MoU seeks to establish a collaborative mechanism between the two governments on Semiconductor Supply chain resiliency and diversification in view of US's CHIPS and Science Act and India's Semiconductor Mission (ISM), setup as an Independent Business Division within Digital India Corporation. ISM has all the administrative and financial powers and is tasked with the responsibility of catalysing the India Semiconductor ecosystem in manufacturing, packaging and design. The MoU signed aims to leverage complementary strengths of both countries and facilitate commercial opportunities and development of semiconductor innovation ecosystems through discussions on various aspects of semiconductor value chain. The MoU envisages mutually beneficial R&D, talent and skill development.

India and Sweden Sign a MoC on Research Networking

A Memorandum of Cooperation, MoC was signed between India and Sweden to strengthen cooperation and promote research networking between research institutions from both countries. It was signed between Science and Engineering Research Board and the Swedish Foundation for International Cooperation in Research and Higher Education, Stockholm, Sweden. The MoC aims to promote mobility funding opportunities in both countries. It will facilitate academic cooperation through mobility activities as well as through seminars, workshops and conferences. The partnership between India and Sweden will take forward joint Science and Technology efforts particularly in smart cities, artificial intelligence, quantum computer, transportation, and many more futuristic technologies.

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.