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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 science 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

CONTENTS

AI-powered contact-free health monitor and step-down ICU

Indigenously designed and manufactured high purity oxygen concentrator

Nation's first power-free CPAP device developed

3D-printed masks coated with anti-viral agents developed

INDIA – SCIENCE & TECHNOLOGY

Antigen developed by NII may revolutionise cancer treatment

Nanorod based oxygen sensor working at room temperature

Water treatment mechanism using hybrid cavitation technology

CSIR- CDRI signs agreement for developing drug for coronary and cerebral artery diseases

Novel technique can detect tropical cyclones for Bay of Bengal basin earlier than satellites

First CAR-T cell therapy conducted at Tata Memorial Center

Low cost waste-water treatment technology developed

IISc Bengaluru tops global ranking in research

3D seismic data can help apprehend precursors of marine geohazards

IN BRIEF

Scientists make powerful underwater glue inspired by barnacles and mussels

Super productive 3D bioprinter could help speed up drug development

Nanomaterials with laser printing developed

Microgel-coated mesenchymal stromal cells to reverse pulmonary fibrosis

China's fusion reactor maintains 120 Million Degree Celsius for over 100 seconds

Photocatalyticmicrorobotsdeveloped against microplastics

RESOURCES AND EVENTS

Climate change research being strengthened to prepare country for future

NITI Aayog releases SDG India Index and Dashboard 2020–21

US Senate approves Bill to counter China's influence

CO2 reaches its highest level in more than 4 million years

European Union Science Diplomacy Alliance launched

UNESCO Science Report 2021 calls for increased investment in science

SCIENCE POLICY AND DIPLOMACY

Mission Innovation launches a decade of clean energy innovation to accelerate achieving the Paris Agreement Goals

India and Australia review cooperation in farm sector

UN urges action on Climate and Biodiversity Crises

Horizon Europe opens for third country participation

Seoul Declaration on Green Growth adopted

GLOBAL

Fabrication of low-cost solar cells locks up greenhouse gases
A research team at the NYU Tandon School of Engineering has developed a process to increase the speed of p-doping process of organic hole-transporting materials within the photovoltaic cells by the use of carbon dioxide (CO2) instead of oxygen. The process involves bubbling a spiro-OMeTAD:LiTFSI solution with CO2 under ultraviolet light, which rapidly enhances electrical conductivity of the interlayer by 100 times compared to that of a pristine blend film, which is also approximately 10 times higher than that obtained from an oxygen bubbling process. The CO2 treated film also results in stable, high-efficiency perovskite solar cells without any post-treatments. Besides being fast and reproducible, the process makes the solar cells much more stable. This research offers an avenue for reacting large amounts of CO2 in lithium carbonate to improve next generation solar cells, while removing this greenhouse gas from the atmosphere.

Nanoparticle platform enables enhanced delivery of gene therapies
Scientists from Ireland have developed a platform that produces bespoke star-shaped polypeptide nanoparticles, which effectively deliver a range of therapies, including gene therapies. In preclinical work, to demonstrate the potential of this material, the

researchers used it to deliver a gene therapy that regenerated bone. The team loaded the material with DNA molecules that promote bones and blood vessels to regrow and placed these nanomedicines in a scaffold that could be implanted into a defect site and deliver the genetic cargo into infiltrating host cells. The gene-loaded scaffold accelerated bone tissue regeneration, with a six-fold increase in new bone formation compared to a scaffold alone. While more testing is needed before these therapies can be used clinically, the platform opens opportunities to design polypeptides to provide tailored solutions to gene delivery challenges.

New X-ray scanner can revolutionize cancer surgery, pathology, drug inspection

Engineers at Duke University have demonstrated a prototype X-ray scanning machine that reveals not just the shape of an object but its molecular composition, with applications in fields such as cancer surgery, pathology, drug inspection and geology. The technology is a hybrid X-ray system that combines conventional X-ray transmission radiography with X-ray diffraction tomography. The team used a coded aperture that allows X-rays travelling at many different angles to pass through its holes. Knowing the exact pattern being used to block the X-rays, a computer can then process the signal. The researchers built a prototype using off-the-shelf components regularly used in medical imaging.They scanned tissue biopsies to yield accurate clinical diagnosis, and also distinguished between the subtypes of tissue in and around the cancerous tissue. The scanner could also provide a real-time analysis of pharmaceuticals, of benefit to manufacturers, police forensics departments or public health campaigns.The scanner was capable of quickly analyzing rocks. Quadridox Inc., has been founded for translating the technology into products for rocks, pharmaceutical scans or bio-specimen analyses.

COVID-19

COVID-19 (WORLD)

Tool to study virus evolution in the test tube developed

Scientists at University of Queensland have developed a technology to manipulate viruses synthetically allowing rapid analysis and mapping of new potential virus variants. The developed process used copies of fragments from the viral genetic material to assemble the functional viral genome in a test tube. The infection and disease caused by the ‘test tube’-made virus were evaluated in pre-clinical models to ensure that the technology was able to generate authentic viruses. Using this technique, changes in viruses like SARS-CoV-2 can be monitored to see which variants may not respond to certain vaccines and anti-viral treatments. This would also help in investigating whether potential variants are more or less virulent in mice, and find out which drugs and vaccines will be effective. However biosecurity issues might arise with this technology.

Non-optimal codons enable coronaviruses’ promiscuity

Israeli researchers have found that ‘promiscuous’ or multiple-host viruses utilize significantly non-optimal codons (the DNA sequences which encode amino acids of the protein) compared to single-host viruses. All of the coronaviruses adopt non-optimal codons to infect multiple hosts. However, instead of being weakly expressed, coronaviruses proteins have been observed to be highly expressed. This effect is provided by a special trick of coronaviruses which mitigates degradation and which dramatically increases their viral mRNA load during infections. The study suggested that non-optimal codon usage of coronaviruses should be taken into account in SARS-CoV-2 vaccine development, as it may have a further effect on the structure and stability of proteins encoded by SARS-CoV-2.

SMART researchers develop method for rapid, accurate detection of viruses
Researchers at Singapore-MIT Alliance for Research and Technology (SMART) have developed a new method for rapid and accurate detection of viral nucleic acids. The team developed RApidDIgitalCrispr Approach (RADICA) which allows absolute quantification of viral nucleic acids by utilising the sensitivity of isothermal amplification and specificity of CRISPR based detection in a digital format. The team extracted DNA/RNA of the sample and divided a 15 µL sample into thousands of independent partitions. In each partition, the DNA/RNA is amplified and identified by Cas12a protein, an enzyme that can turn the target signal into a fluorescent signal. This allowed absolute quantification by counting the number of partitions that have the target DNA/RNA lit up. The method can also be used to detect DNA/RNA targets of different viruses and adapted to devices commonly found in hospitals and service laboratories - providing a potential new way to tackle pandemics.

AI predicts how patients with viral infections will fare
Researchers at University of California San Diego School of Medicine used an artificial intelligence (AI) algorithm to sift through terabytes of gene expression data to look for shared patterns in patients with past pandemic viral infections, including SARS, MERS and swine flu. The algorithm generated sets of signature genes to help define patient' immune responses, measure disease severity, predict outcomes and test therapies for current and future pandemics. The data used to test and train the algorithm came from publicly available sources of patient's gene expression data detected in tissue or blood samples. Each time a new set of data from patients with COVID-19 became available, the team tested it in their model. They saw the same signature gene expression patterns every time. The algorithm's utility was validated using lung tissues collected at autopsies from deceased patients with COVID-19 and animal models of the infection. In the current pandemic situation, such information might guide treatment approaches for patients experiencing a cytokine storm by providing cellular targets and benchmarks to measure improvement.

Senolytics reduce COVID-19 symptoms in preclinical studies
Researchers at University of Minnesota have showed that COVID-19 exacerbates the damaging impact of senescent cells in the body. In preclinical studies, the senolytic drugs significantly reduced inflammation, illness, and mortality from COVID infection in older mice. The researchers experimented with older mice infected with viruses, including a coronavirus related to SARS-CoV-2 using a model they developed to show an amplified reaction, with increased senescent cells, inflammation, and nearly 100 percent mortality. When the researchers treated similar mice (before or after the infection) with senolytics - drugs that selectively remove senescent cells from the body, the result was the opposite. The anti-viral antibodies increased, while signs of inflammation and senescent cells significantly decreased along with mortality.

COVID-19 (INDIA)

New AI-driven platform to facilitate early-COVID interventions over Whatsapp
ARTPARK (AI & Robotics Technology Park) has developed a new AI driven platform called XraySetu, specifically designed to identify COVID-19 positive patients even from low-resolution Chest X-Ray images sent over Whatsapp. It also has semantic annotations of affected areas for review and localized heat-map to help doctors verify the results easily with other modalities. XraySetu has been tested and validated with over 125,000 X-ray images from National Institute of Health, UK, and over thousand X-rays from Indian COVID-19 patients, to find excellent performance with 98.86 percent sensitivity and 74.74 percent specificity. A Bangalore based HealthTech startup Niramai partnered with ARTPARK and IISc to provide a rapid COVID-19 screening method for rural doctors who have access to X-ray machines. Besides COVID-19, the platform can

also detect 14 additional lung-related ailments, including tuberculosis and pneumonia, alongside others. It can further be used for both analog and digital X-rays and has been successfully piloted by more than 300 doctors in rural areas over the last 10 months.

Clinical trials of Niclosamide, a repurposed drug for treatment of COVID-19

CSIR in collaboration with Laxai Life Sciences Pvt. Ltd., has initiated Phase-II clinical trials with the anti-helminitic drug Niclosamide for treatment of COVID-19. The safety profile of this drug has been tested over time and has been found safe for human consumption at different dose levels. Niclosamide was identified as a promising repurposed drug by a research group from King's College, London, who collaborated in this project. They believe syncytia or fused cells observed in the lungs of patients with COVID-19 probably results from the fusogenic activity of the SARS-CoV-2 spike protein and Niclosamide can inhibit syncytia formation. Also, a collaborative research between CSIR-IIIM, Jammu and NCBS, Bangalore has recently demonstrated that Niclosamide is also a potential SARS-CoV-2 entry inhibitor blocking the viral entry through pH dependent endocytic pathway.

Hybrid Multi-ply Face Masks developed

Parisodhana Technologies Pvt. Ltd, Hyderabad developed a hybrid multi-ply face mask, SHG-95 (Billion Social Masks). These face masks provide high particulate (>90 percent) and bacterial filtration efficiency (>99 percent). The face masks are prepared from purely hand woven cotton contact materials which ensure high breathability, have comfortable ear loops, and are convenient to be used even in tropical conditions. A special filtration layer in the masks are an added advantage. The cost of these hand washable and reusable face masks has been estimated to be around INR 50-75 per piece by the company.

AI-powered contact-free health monitor and step-down ICU

A Department of Biotechnology (DBT) funded start-up has developed contact-free monitoring of the vital parameters of the patients on a normal bed. The device records the micro-vibrations produced in the heart-beat and respiration cycle using Ballistocardiography when placed under a mattress. Using AI algorithms, the device can convert this data into vital signs like heart rate, respiration rate, and blood pressure. The device has 98.4 percent proven accuracy as a medical-grade product. The device also records Oxygen saturation and ECG using accessories. The data that is generated can also be accessed remotely on any smart phone via an app. The data can also be monitored on a central monitoring dashboard. It also features an AI-powered Early Warning System that sends proactive alerts to clinicians, thereby reducing the nursing staff's workload and improving patient outcomes. This innovation has already resulted in the upgrading of over 4,000 hospital beds for step-down ICUs across 35 districts in India.

Indigenously designed and manufactured high purity oxygen concentrator

An Indian startup Walnut Medical, Mohali has developed a 5L and 10L portable medical grade oxygen concentrators based on Pressure swing adsorption (PSA) technology with an oxygen purity of above 96 percent at a pressure of 55-75 kpa. Pressure swing adsorption technology separates single gases from a gas mixture. Walnut Medical Oxygen Concentrator has been tested for patient safety, electrical safety, electromagnetic compatibility (EMC), and as per International Safety Standards for Oxygen Concentrators. The complete mould design, development of all electronics, moulding, control system, sieve tower, and all related parts and accessories have been developed indigenously. Currently, the concentrators have been supplied to various government, defense, military hospitals in India and would be available for the general public through its distribution network across India.

Nation's first power-free CPAP device developed

Researchers at Indian Institute of Technology, Ropar, have developed a power-free device 'JivanVayu' which can be used as a substitute for a Continuous Positive Airway Pressure (CPAP) machine. The device functions without electricity and is adapted to both kinds of oxygen generation units like O2 cylinders and oxygen pipelines in hospitals. The device is designed to maintain a fraction of inspired oxygen of above 40 percent with a positive end-expiratory pressure of 5-20 cm H2O. Additionally, the device houses a viral filter at the air entrainment end with a viral capture efficacy of 99.99 percent. The device has been manufactured using 3D printing and has been tested mechanically. The device is designed for a 22mm CPAP closed circuit and can also be customized. Medical testing of the device would be conducted and the team is currently seeking industrial collaboration for its commercialization.

3D-printed masks coated with anti-viral agents developed

Pune-based startup ThinCr Technologies has developed 3D-printed face masks with anti-viral agents called viricides that kill viruses when they come in contact with them. Thincr with the help of Merck Life Sciences has developed virucidal coating formulations to coat the fabric layer, and the 3D printing principle was employed to achieve uniformity of coating. The material used for coating on the mask is a solution based on sodium olefin sulphonate, which eventually disrupts the outer membrane of the virus. Thincr Technologies India Pvt. Ltd. has applied for a patent for this product and has already commenced commercial scale manufacturing. They have already distributed 6,000 virucidal masks to four government hospitals in Nandurbar, Nashik and Bengaluru.

INDIA – SCIENCE & TECHNOLOGY

Antigen developed by NII may revolutionise cancer treatment

Researchers at National Institute of Immunology (NII), and Cancer Institute, Chennai translated new scientific discoveries into improved care for cancer patients by employing targeted Immunotherapy. The SPAG9 antigen developed by NII has received the trademark ASPAGNIITM. Currently, ASPAGNIITM is being used in dendritic cell (DC) based immunotherapy in cervical, ovarian cancer and will also be used in breast cancer. In this personalised intervention using immunotherapy, the patients expressing SPAG9 protein can be treated with a DC-based vaccine approach where patient's cells called monocytes from their blood are collected and modified into dendritic cells. These dendritic cells are primed with ASPAGNIITM and are injected back to the patient to help the 'fighter' cells, or T-cells, in the body to kill the cancer cells. DC-based immunotherapy is safe, affordable and can promote anti-tumor immune responses, thereby prolonging the survival of cancer patients.

Nanorod based oxygen sensor working at room temperature

A team of scientists at the Centre for Nano and Soft Matter Sciences (CeNS) have developed a nanorods-based oxygen sensor which works at room temperature with assistance of UV irradiation and can detect oxygen gas concentrations in places such as underground mines, at higher altitudes, inside aeroplanes and research labs. They used titanium oxide for the purpose. The team showed that the sensor gives the best sensitivity with low power consumption and works at room temperature. The fabricated sensors exhibited response and recovery times of around 3 sec and 10 sec, respectively, at 1000 ppm. The sensor works in oxygen concentrations ranging from 25 ppm to 1 million ppm (100 percent) with good stability. The superior sensing property is attributed to the enhanced electrical conductivity, excitons (combination of an electron and a positive hole) created, and desorption of water molecules (released through surface) from the sensor surface by UV irradiation, which facilitate increased interaction of oxygen molecules with chromium incorporated in titanium dioxide slanted nanorods array present in the sensor.

Water treatment mechanism using hybrid cavitation technology

Scientists at CSIR-National Chemical Laboratory, Pune have developed a novel hybrid technology called SWASTIIK (Safe Water and Sustainable Technology Initiative from Indian Knowledge base) that involves boiling of a liquid as a result of pressure reduction (cavitation) and natural oils having antimicrobial properties. The technique - hydrodynamic cavitation combines chemistry, biology, and chemical engineering along with natural resources in the form of natural oils and plant extracts. The team achieved complete elimination for gram-negative E. coli and gram-positive S. aureus bacteria and also antimicrobial-resistant bacteria/difficult opportunistic pathogenic bacteria typically in 5-10 minutes. Also, increased rates of disinfection using oil can drastically reduce the time of operation and consequently reduce cost as compared to other advanced treatment processes. This technology can provide safe water and also may have health benefits.

CSIR- CDRI signs agreement for developing drug for coronary and cerebral artery diseases

CSIR-Central Drug Research Institute (CDRI), Lucknow tied up with UP-based Marc Laboratories Pvt. Ltd., and signed an agreement for the development of a synthetic compound S-007-867. The compound significantly inhibits collagen mediated platelet activation and subsequently reduces the release of ATP from dense granules and thromboxane A2 via COX1 activation. Thus, it effectively maintains blood flow velocity and delays vascular occlusion and inhibits formation of blood clot without compromising hemostasis. In animal experiments, the compound elicited better antithrombotic protection than the standard of care with minimal bleeding tendency. The institute has recently obtained the permission to initiate the Phase I clinical trials for the drug. Prophylactic use of this compound could be useful for COVID -19 induced complications as well.

Novel technique can detect tropical cyclones for Bay of Bengal basin earlier than satellites

Scientists from Indian Institute of Technology, Kharagpur, have devised a novel method using Eddy detection technique to investigate the formative stages and advance detection time of tropical cyclogenesis in the North Indian Ocean region. They used a coarser grid resolution of 27 km for identification and finer resolution of 9 km to evaluate the characteristics of eddy vortices. The study was conducted with cases of four post-monsoon severe cyclones and two pre-monsoon cyclones that developed over the North Indian Ocean. The team observed that the method could bring about the start of prediction with a minimum of four days (~ 90 h) lead time for cyclones developed during the pre-and post-monsoon seasons. The technique may have potential for early detection of tropical cyclogenesis in the atmospheric column prior to satellite detection over ocean surface.

First CAR-T cell therapy conducted at Tata Memorial Center

Chimeric Antigen Receptor T-cell (CAR-T) therapy, a type of gene therapy for blood cancer treatment, was successfully conducted at Tata Memorial Center (TMC), Mumbai in collaboration with Indian Institute of Technology, Bombay (IIT-B) for the first time in India. The CAR-T cells were designed and manufactured at the Bioscience and Bioengineering department of IIT-B, using lentivirus vector technology for inserting, modifying, or deleting genes in CAR-T cells. The TMC-IIT Bombay team has been supported by the state through the National Biopharma Mission to extend this project and conduct Phase I/II trials of CAR-T therapy. The design, development, and extensive pre-clinical testing has been carried out by IIT-B. Despite proven therapeutic potential for cancer patients, this gene therapy is still not available in India. A patient's CAR-T

cell therapy costs around INR 30-40 million.If the trials are successful, it may save millions of lives by making the treatment available in India at an affordable cost.

Low cost waste-water treatment technology developed

Jadavpur University professor developed a waste-water treatment module using a combination of electrocoagulation and electroflotation, adjoined with membranes in a single indigenous setup. It can break the highly stable oil-water emulsion through electric discharge and simultaneously separates oil from water with high efficiency. The turbulence created because of the hydrogen bubbling through the feed medium or the waste-water, resists the deposition of oil over the membrane. The recovered spent oil after oily wastewater treatment can be further used as an industrial burner oil, furnace oil, mould oil, hydraulic oil and so on. This prototype innovation has proceeded to level 6 of the Technology Readiness Level, and further industrial collaboration with Concepts International would enable scaling-up of the technology. The innovation is economically feasible for low-scale and medium enterprises, and has a good market potential.

IISc Bengaluru tops global ranking in research

The QS World University Rankings 2022 has ranked Indian Institute of Science (IISc), Bengaluru number 1 in the world for research achieving a perfect score of 100 on 100, the metric of citations per faculty (CPF) indicator. Indian Institute of Technology, Guwahati too emerged as a top research institution from India, being ranked 41st for CPF (which measures research impact) among the top 50 globally. The results are based on the distribution and performance of 14.7 million academic papers published between 2015 and 2019, and the 96 million citations received by those papers, and expert opinions of over 130,000 academic faculties and over 75,000 employers.

3D seismic data can help apprehend precursors of marine geo-hazards

Scientists from Wadia Institute of Himalayan Geology along with scientists from Norway and Switzerland used high-resolution 3D seismic data to unravel geomorphology of recurrent cases of movement of soil, sand, regolith, and rock downslope like a solid in Taranaki basin off New Zealand. With the help of 3D seismic data, the study offers a unique approach to comprehend the recurrent mass wasting processes and also understand how the seabed interacts with the bottom surface of marine sediments. The study will help understand different flow mechanisms associated with sediment movement over the seafloor. Understanding of these phenomena can help apprehend precursors of marine geo-hazards or the nature and physiography of the seafloor over which sediments can move.

IN BRIEF

Scientists make powerful underwater glue inspired by barnacles and mussels

Engineers at Tufts University have developed a new type of glue starting with the fibrous silk protein harvested from silkworms, and replicating key features of barnacle and mussel glue, including protein filaments, chemical crosslinking and iron bonding. The result is a powerful non-toxic glue that sets and works as well underwater as it does in dry conditions and is stronger than most synthetic glue products now on the market. Getting the right blend of silk fibroin, polydopamine, and acidic conditions of curing with iron ions was critical to enabling the adhesive to set and work underwater, reaching strengths of 2.4 MPa (megapascals; about 350 pounds per square inch) when resisting shear forces. This adhesive has the added advantage of being non-toxic, composed of all-natural materials, and requires only 1-2 mgs per square inch to achieve that bond – that’s just a few drops. The adhesive could be used in many industrial, consumer and marine applications.

Super productive 3D bioprinter could help speed up drug development

Researchers at the University of California San Diego have developed a high-throughput bio-printing technology, which 3D prints with record speed i.e. it can produce a 96-well array of living human tissue samples within 30 minutes. The technology uses a digitally controlled micro-mirror array which projects entire 2D patterns onto the substrate as it prints layer by layer, so as to produce 3D structures much faster than other printing methods. The technology can accelerate the first steps of the drug development process by enabling the drug developers to rapidly build up large quantities of human tissues on which they could test and weed out drug candidates much faster.

Nanomaterials with laser printing developed

Researchers from the Max Planck Institute of Colloids and Interfaces developed a laser-driven technology to create nanoparticles out of materials such as copper, cobalt and nickel oxides. The researchers transferred material from a donor to an acceptor carrier. Solid polymer on the donor which consists of a thin carbon nitride film on a conductive electrode, is mixed with metal salts. Targeted laser irradiation transfers the salts to the acceptor along with the molten polymer. The brief high temperatures caused the salts to react within milliseconds and they transformed into metal oxide nanoparticles with desired morphology. Using this process, catalysts which generate hydrogen and other substances can be produced more efficiently.

Microgel-coated mesenchymal stromal cells to reverse pulmonary fibrosis

Researchers at the University of Illinois Chicago have shown that even after lung tissue has been damaged, it may be possible to reverse fibrosis and promote tissue repair through treatment with microgel-coated mesenchymal stromal cells (MSC) in mice models. The researchers engineered the microgel, which is as soft as healthy lung tissue, and incorporated a small protein called tumor necrosis factor-alpha, which acts as an inflammatory signal to encourage MSCs to synthesize collagenase. Collagenase is an enzyme that degrades excess collagen in fibrotic tissues and promotes the restoration of damaged tissues. To optimize the MSCs with the microgel, they also designed a microfluidic device to encapsulate individual cells rapidly and consistently in the thin gel. The results suggest a feasible approach to predictively program cellular functions for desired therapeutic outcomes.

China’s fusion reactor maintains 120 Million Degree Celsius for over 100 seconds

China's ‘artificial sun’ Experimental Advanced Superconducting Tokamak (EAST) device recently broke the world record as it achieved a plasma temperature of 120 million degree Celsius for 101 seconds and 160 million Celsius for 20 seconds. EAST is part of the International Thermonuclear Experimental Reactor (ITER) facility—a collaboration of 35 nations, also comprising India which aims to prove that fusion power can be produced on a commercial scale and is sustainable. The project aims to achieve through the first plasma in 2025, a key milestone toward full fusion power by 2035.

Photocatalytic microrobots developed against microplastics

Researchers from Czech Republic have developed self-propelled microrobots that can swim, attach to plastics and break them down. The robots with hybrid powers carry built-in photocatalytic ($BiVO_4$) and magnetic (Fe_3O_4) materials allowing a self-propelled motion under sunlight with the possibility of precise actuation under a magnetic field inside the macro-channels. The photocatalytic robots are able to efficiently degrade different synthetic microplastics, particularly polylactic acid and polycaprolactone. This proof-of-concept study using microrobots with hybrid wireless powers have shown for the first time the possibility of efficient degradation of ultra-

small plastic particles in confined complex spaces, and can impact research on microplastic treatments, with the final goal of diminishing microplastics as an emergent threat for humans and marine ecosystems.

RESOURCES AND EVENTS

Climate change research being strengthened to prepare country for future

Researchers from India are tracing the impact of climate change on the country, finding new ways to track the global problem, improving the projection of climate, its impact as well as vulnerability to prepare for the future. Centres of excellence (CoEs) in Climate Change in four Indian Institute of Technologies – Delhi, Bombay, Kharagpur and Madras, are working on improving climate projection models to make them more comprehensive and accurate. CoE-IIT Bombay focuses on irrigation practices, farmer's behavior, and vegetation- land and atmosphere interactions to improve model predictions and also develop agricultural vulnerability maps at the National level; CoE-IIT Madras has been developing suitable climate change adaptation measures for coastal infrastructure and utilization of water resources; CoE- IIT Kharagpur has been using the historic climate data for the Indian Ocean region to understand the temporal variability of wave height over the Bay of Bengal region. State Climate Change Cells/Centres in the 12 Himalayan states are undertaking vulnerability assessment, training programmes, public awareness, and institutional capacity building in the area of Climate Change science, impacts, and adaptation.

NITI Aayog releases SDG India Index and Dashboard 2020 - 21

Niti Aayog has released the SDG India Index and Dashboard 2020–21, developed in collaboration with the United Nations in India. It tracks the progress of all States and Union Territories (UTs) on 115 indicators of the National Indicator Framework (NIF).The SDG India Index computes goal-wise scores on each of the 16 SDGs for each State and UT, with scores between 0–100. The country's overall SDG score improved by 6 points—from 60 in 2019 to 66 in 2020–21. This progress reflects exemplary country-wide performance in Goal 6 (Clean Water and Sanitation) and Goal 7 (Affordable and Clean Energy). While in 2019, ten States/UTs belonged to the category of Front-Runners (score in the range 65–99) twelve more States/UTs moved into this category in 2020–21. As another milestone in SDG localisation, the Index is presently being adapted and developed by NITI Aayog at the level of districts for the upcoming North Eastern Region District SDG Index.The full SDG India Index report can be accessed here: https://wgz.short.gy/SDGIndiaIndex

US Senate approves Bill to counter China's influence

On June 8th, 2021, the Senate passed the United States Innovation and Competition Act (USICA). It will now go to the House where it is expected to pass and be signed into law. This legislation was first introduced last year \as the Endless Frontier Act (EFA). EFA was dramatically expanded in the past weeks to include several additional provisions. EFA is now a division within the expanded package renamed as the USICA, which is a $200 billion proposal aimed at countering China's influence domestically and abroad.USICA has gained bipartisan support.The bill proposes an expanded role for the federal government in "strategic sectors" – including semiconductors, drones, wireless broadband, and artificial intelligence – with increased funding, supervision, and regulation of various industries.It also further expands the use of trade provisions in order to restrict the flow of Chinese goods and services and to bolster President Biden's Buy American agenda.

CO2 reaches its highest level in more than 4 million years

A new peak level for global atmospheric carbon dioxide of 419 parts per million by

volume (ppmv) was reached this year. This appears to be the highest in 4.5 million years and is driving global warming. In 1958, when modern measurements began, atmospheric CO2 was at 316 ppm. Three centuries ago, in the pre-industrial age, it was 280 ppm. The May, 2021 average rose by 1.8 ppm over May, 2020, slightly less than the annual growth rate for 2017 and 2011. Atmospheric CO2 concentrations fluctuate year by year, and averaged a growth of about 2.5 ppm a year from 2010 to 2019.

European Union Science Diplomacy Alliance launched

The European Union Science Diplomacy Alliance has been launched by 16 participating institutions. It builds on three Horizon 2020 funded projects: EL-CSID – European Leadership in Cultural, Science and Innovation Diplomacy, S4D4C – Using Science for/in Diplomacy for Addressing Global Challenges, and InsSciDE – Inventing a Shared Science Diplomacy for Europe. The members of the Alliance will support research, training and networking to advance science, technology and innovation diplomacy in Europe and beyond to address global challenges. The Alliance will facilitate interactions and dialogue, training, institutional capacity building and coordination of joint funding to enhance their collective impact. The Alliance is open to members who are legal entities based in Europe and who self-commit to mobilize resources and support each other in the achievement of shared objectives. Non-EU based legal entities can affiliate as "Global Networking Partners". A board of "Advisory Partners" will be created by invitation only to include representatives of international institutions.

UNESCO Science Report 2021 calls for increased investment in science

The UNESCO Science Report, 2021 titled 'The race against time for smarter development' has been published. The report is published once every five years and provides an overview of science policy and trends in science governance. Written by 70 authors from 52 countries, the report presents data on R&D spending, research personnel, scientific publications and patents. The latest edition tracks progress towards the UN's 2030 Sustainable Development Goals and the rapid progress of the Fourth Industrial Revolution. It also tracks the impact of the COVID-19 pandemic on global research and innovation. The report highlighted that spending on science worldwide increased (+19 percent) between 2014 and 2018, as did the number of scientists (+13.7 percent). But, just two countries, the United States and China, account for nearly two-thirds of this increase (63 percent) while four out of five countries lag far behind, investing less than 1 percent of their GDP in scientific research. The report calls for an increase in investment in science in the face of a growing crisis.

SCIENCE POLICY AND DIPLOMACY

Mission Innovation launches a decade of clean energy innovation to accelerate achieving the Paris Agreement Goals

Governments of twenty three nations have collectively launched bold new plans to catalyze action and spearhead a decade of innovation to drive global investment in clean energy research, development and demonstrations. The goal is to make clean energy affordable, attractive and accessible for all, to accelerate action towards the Paris Agreement and net zero pathways. Mission Innovation 2.0 which is the second phase of the global Mission Innovation initiative, launched alongside the Paris Agreement at the 2015 COP21 conference, will catalyze public-private action and investment through sector-specific missions that accelerate the development of clean energy solutions in critical areas. Mission Innovation 2.0 was officially launched virtually at the Innovating to Net Zero Summit, hosted by Chile on June 2, 2021. As part of the Innovation Platform, India launched the Mission Innovation CleanTech Exchange which will create a network of incubators across member countries. The network will provide access to

the expertise and market insights needed to support new technologies to access new markets globally.

India and Australia review cooperation in farm sector

India's Agriculture Minister and the Australian Minister for Agriculture, Drought & Emergency Management, held a virtual meeting to review bilateral cooperation in the field of agriculture. The two ministers met to follow up on the collaboration in the field of agriculture highlighted in the Comprehensive Strategic Partnership announced by Prime Ministers of India and Australia at their Summit on June 4, 2020. The partnership aims to use Australia's expertise in post-harvest management. Both the Ministers expressed satisfaction on the progress of giving market access to the respective Agricultural products and shared technical information with each other.

UN Urges action on Climate and Biodiversity Crises

A new report by the UN Environment Programme (UNEP) and the Food and Agriculture Organization of the UN (FAO), launched as the UN Decade on Ecosystem Restoration 2021-2030 gets underway, warns that humanity is using about 1.6 times the amount of services that nature can provide sustainably. Facing the triple threat of climate change, loss of nature and pollution, the world must deliver on its commitment to restore at least one billion degraded hectares of land in the next decade – an area about the size of China. Countries also need to add similar commitments for oceans. Global terrestrial restoration costs – not including costs of restoring marine ecosystems – are estimated to be at least USD 200 billion per year by 2030. The report outlines that every 1 USD invested in restoration creates up to USD 30 in economic benefits. Ecosystems requiring urgent restoration include farmlands, forests, grasslands and savannahs, mountains, peatlands, urban areas, freshwaters, and oceans. Communities living across almost two billion of degraded hectares of land include some of the world's poorest and marginalized. Ecosystem restoration contributes to the realization of multiple Sustainable Development Goals (SDGs), including health, clean water, and peace and security, and to the objectives of the three 'Rio Conventions' on Climate, Biodiversity, and Desertification.

Horizon Europe opens for third country participation

EU Member states have agreed on third country access to sensitive research projects enabling the European Commission to go ahead and publish the Horizon Europe work programme detailing calls for proposals, deadlines and budgets for the next two years. The agreement enables researchers from Israel, Switzerland, Britain and other non-EU countries to join the EU's quantum and space research projects.The Commission has yet to confirm the agreement. Eligibility to participate in 21 sensitive research calls could be extended to include legal entities established in associated countries which provide necessary assurances concerning protection of the EU's strategic assets, interests, autonomy or security. Associated countries would have to demonstrate they would provide the same level of protection as a member state could. All Horizon applicants will be prevented from exporting IP outside EU member states and associated countries. Calls that are part of the EU space programme, Copernicus and Galileo are only open to member states.

Seoul Declaration on Green Growth adopted

The 2021 Partnering for Green Growth and the Global Goals 2030 (P4G) Seoul Summit adopted a Declaration on 31 May, calling for inclusive partnerships in which governments, businesses, and civil society are part of collective solutions, for current and future generations to achieve inclusive green recovery and carbon neutrality by 2050.The meeting stressed the importance of public-private partnerships (PPPs) in five key thematic areas: water, energy, food and agriculture, cities, and the circular economy.

It also stated that the P4G platform is imperative to share knowledge and connect potential partners to catalyze the necessary actions. Medium-term actions and initiatives focused on innovation and exploring new ideas and technologies, including plans to employ green hydrogen as an alternate fuel source, exploring methods for greener steel production, carbon-neutral urban mobility, and integrating circular economy strategies in national planning. The meeting also stressed the importance of enabling policy environments to allow the private sector to transform to more sustainable business models and the need to overcome the financing gap to achieve the Sustainable Development Goals (SDGs).The Seoul Declaration, adopted during the Leaders' Dialogue, brought all these points together.

We welcome your comments and valuable suggestions. Please write to us for receiving publications, updates and notices regarding seminars, conferences etc.

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