

If you can't see this message [view it in your browser](#).



**FORUM FOR INDIAN
SCIENCE DIPLOMACY**

SCIENCE DIPLOMACY NEWS ALERTS | 01-15 APRIL 2021 | ISSUE 59

www.fisd.in

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

GLOBAL

[Low-cost solar-powered water filter removes lead, other contaminants](#)

[Borophane has useful properties making it a versatile material](#)

[A novel cell therapy for type I diabetes mellitus](#)

[Cancer-killing virus therapy shows promise against inoperable skin cancers](#)

[An on-off switch for gene expression has huge potential](#)

COVID-19 (WORLD)

[New portable pocket-sized test to diagnose COVID-19](#)

[Interleukin-33 involved in immunity to Sars-CoV-2](#)

[Antibody binding-site conserved across COVID-19 virus variants](#)

[Cells exposed to COVID-19 vaccine have similarities to coronavirus spikes](#)

[Antifungal and antidepressant drugs impairs SARS-CoV-2 infection in vitro](#)

COVID-19 (INDIA)

[High Level Public Health teams to states for COVID-19 control](#)

[Nationwide mass awareness campaign to bust myths about COVID-19 vaccination](#)

[COVID-19 vaccination at workplaces](#)

[India stops export of Remdesivir and Remdesivir APIs](#)

[India approves Russian-made Sputnik V for emergency use](#)

[Clinical trials of India's first mRNA based vaccine approved](#)

[More foreign vaccines cleared for use in India](#)

INDIA – SCIENCE & TECHNOLOGY

[Novel technique for tracking solar eruptions](#)

[National Policy for Rare Diseases, 2021](#)

[NITI Aayog Launches Programme for Science-based Deep-Tech Startups](#)

[Self-propelled railway track scavenging vehicle can replace manual scavenging](#)

[Kota farmer develops mango variety that bears fruits round the year](#)

[DRDO develops Advanced Chaff Technology to safeguard naval ships.](#)

[Alternative for Conventional Lithium-ion Batteries](#)

[Farthest Gamma-ray emitting active galaxy with narrow emission lines discovered](#)

IN BRIEF

[All-in-one device uses microwave power for defense, medicine](#)

[New Aluminium and Zinc batteries promise sustainable energy storage](#)

[mRNA for treating brain diseases](#)

[Making cleaner, greener plastics from waste fish parts](#)

[Safe, cheap technology for disinfection of packed eggs](#)

[New method expands the world of small RNAs](#)

[Discovery to creating heat-tolerant crops](#)

[Oral delivery of insulin medication](#)

[Carbon dots from human hair boost solar cells](#)

[Toward a reliable oral treatment for sickle cell disease](#)

[India's 1st Floating Storage and Regasification Unit \(FSRU\)](#)

RESOURCES AND EVENTS

[India's National Super Computing Mission](#)

[A millet de-huller brings value-added products in rural India](#)

[Indian CSF & Sheep Pox Vaccines commercialised](#)

[CSIR-CMERI developed technologies for North East development](#)

[IISc, Prorigo develop patent management software](#)

SCIENCE POLICY AND DIPLOMACY

[Biden proposes \\$250 billion investment in research](#)

[Emerging economies express grave concern over EU plans for a carbon border tax](#)

GLOBAL

Low-cost solar-powered water filter removes lead, other contaminants

A team from Princeton University has created a device to purify water, using a gel that at room temperature, soaks up water but leaves contaminants - like lead, oil and pathogens - behind. When heated to 33 degrees Celsius, the gel pushes the water out of its pores. To collect the purified water from the sponge, one simply places it in sunlight. The gel maintains its ability to filter water for at least ten cycles of soaking and discharge with no detectable reduction in performance. The gel consists of a honeycomb-like structure that is highly porous, consisting of long chains of repeating molecules, known as poly(N-isopropylacrylamide), that are cross-linked to form a mesh. Within the mesh, some regions contain hydrophilic water attracting molecules while other regions are hydrophobic or water-repelling. At room temperature, the chains are long and flexible, and water can easily flow via capillary action into the material to reach the water-loving regions. But when the sun warms the material, the hydrophobic chains clump together and force the water out of the gel. The team is exploring ways to make the technology widely available with the help of Princeton Innovation, which supports University

researchers in the translation of discoveries into technologies and services for the benefit of society.

[Borophane has useful properties making it a versatile material](#)

US scientists have created a 2D material called borophane, a sheet of boron and hydrogen a mere two atoms in thickness. When borophene, an unstable hexagonal sheeted structure of boron atoms similar to graphene, is mixed with hydrogen, the product suddenly becomes much more stable and attractive for use in nanoelectronics and quantum information technology. The research team grew borophene on a silver substrate then exposed it to hydrogen to form the borophane. Though borophane material is only two atoms thick, its structure is quite complex because of the many possible arrangements for the boron and hydrogen atoms. They found a borophane nanosheet on a silver substrate to be quite stable, and which could potentially be easily integrated with other materials in the construction of new devices for optoelectronics, devices combining light with electronics.

[A novel cell therapy for type I diabetes mellitus](#)

Researchers from the University of Tokyo developed a novel device for the long-term, safe and effective transplantation of human pancreatic beta-cells in type I diabetes mellitus (T1D). The researchers developed a millimeter-thick graft - lotus-root-shaped cell-encapsulated construct (LENCON) and packaged it with human iPSC-derived pancreatic beta-cells, so that the cells could survive, even in the millimeter-thick graft. Transplanting the construct in immunodeficient and immunocompetent diabetic mice showed that LENCON was able to maintain normal blood glucose levels for more than 180 days in the former mice, and was able to be removed without adhesion after more than one year of transplantation in the latter mice. This study demonstrates a novel option for cell therapy for T1D.

[Cancer-killing virus therapy shows promise against inoperable skin cancers](#)

Researchers at NYU have shown how oncolytic viruses can safely boost the action of widely used cancer therapies that help the body's immune defense system detect and kill cancer cells. The new Phase I study showed that injections of experimental coxsackievirus drug V937, along with pembrolizumab, an immunotherapy drug shrank melanoma tumors in nearly half (47 percent) of 36 men and women who received the therapy every few weeks for at least two years. Further clinical trials will involve patients with melanoma that has become widespread, as well as in patients whose tumors, if shrunken by the drug combination, could be more easily removed by surgery. Further experiments are needed to determine how V937 changes the molecular makeup of the tissues immediately surrounding tumors. Scientists have known since the 1800s that some cancer patients who suffered from infections, later tied to bacteria or viruses that cause measles and herpes, often experience tumor shrinkage.

[An on-off switch for gene expression has huge potential](#)

CRISPR-Cas9 gene editing system enables targeted changes to organisms' DNA, but leads to permanent changes to the cell's genetic material which are repaired by difficult to control natural cellular processes. Now, researchers from University of California San Francisco have found a new gene editing technology called CRISPRoff that allows control over gene expression with high specificity while leaving the sequence of the DNA unchanged. The method is stable enough to be inherited through hundreds of cell divisions, and is also fully reversible and uses "epigenetics" -- the way genes may be silenced or activated based on chemical changes to the DNA strand. The researchers created a tiny protein machine that, guided by small RNAs, can tack methyl groups onto specific spots on the strand. These methylated genes are then "silenced," or turned off, hence the name CRISPRoff. The researchers can reverse the silencing effect using enzymes that remove methyl groups, a method they called CRISPRon. The researchers found they could target the method to the

vast majority of genes in the human genome -- and it worked not just for the genes themselves, but also for other regions of DNA that control gene expression but do not code for proteins. Pluripotent stem cells with a silenced gene after being induced to turn into nerve cells called neurons, retained the silenced gene in 90 percent of the cells. They found that using CRISPRoff could be used to turn Tau expression down, which could lead to treatment for Alzheimer's. There are many other conditions this method could potentially be applied to. It can be transiently delivered as a DNA or as an RNA.

COVID-19

COVID-19 (WORLD)

[New portable pocket-sized test to diagnose COVID-19](#)

Scientists from the US have developed a new portable, pocket-sized test that can diagnose COVID-19 in minutes but also sequence the coronavirus to track the spread of mutations and variants. The test, called NIRVANA, can simultaneously test for other viruses such as influenza that might be mistaken for the coronavirus, and does not require an expensive infrastructure. It uses a gene-detection approach called isothermal recombinase polymerase amplification (RPA) coupled with real-time nanopore sequencing. The technology lets researchers copy longer stretches of DNA, and probe for multiple genes at the same time. The scientists designed NIRVANA to simultaneously test samples for COVID-19, influenza A, human adenovirus, and non-SARS-CoV-2 human coronavirus. The researchers noted that in just 15 minutes the device begins to report positive and negative results. Within three hours, the device finalizes results on all 96 samples -- including the sequences of five regions of SARS-CoV-2 that are particularly prone to accumulate mutations leading to new variants such as the B.1.1.7 variant. The team tested NIRVANA on 10 samples known to be positive for SARS-CoV-2, 60 samples of unknown SARS-CoV-2 status, as well as samples of municipal wastewater harbouring the SARS-COV-2 virus and others. In all cases, the assay was able to correctly identify which viruses were present. The sequencing data also allowed them to narrow down the origin of SARS-CoV-2 in positive samples, differentiating strains from China and Europe for instance. The small size and portability of the NIRVANA workflow, enables it to be used for fast virus detection at schools, airports or ports, and to monitor wastewater or streams for the presence of new viruses.

[Interleukin-33 involved in immunity to Sars-CoV-2](#)

Researchers from Germany have conducted a study to learn more about immunity in people recovering from COVID-19 and found that Interleukin 33 was involved in the immune response when cells encountered SARS-CoV-2 for a second time. The team examined blood samples of 155 individuals who mostly had mild disease and measured the amount of antibodies against the SARS-CoV-2 spike protein. High levels of antibodies were found in the patients for more than two months after infection. Next, blood cells from participants who had antibodies were exposed to a portion of the virus to analyse the panel of molecules and it was found that the amount of Interleukin 33 was the closest match to the amount of antibodies people had, and to the activation of their memory T cells. This result might pave the way to better understand immunity to SARS-CoV-2 and also future success of the vaccination efforts

[Antibody binding-site conserved across COVID-19 virus variants](#)

Using a novel toolkit of approaches, Penn State scientists uncovered the first full structure of the Nucleocapsid (N) protein and discovered how antibodies from COVID-19 patients interact with the protein. The researchers used an electron microscope to image both the N protein and the site on the N protein where antibodies bind, using serum from COVID-19 patients, and developed a 3D computer model of the structure. They found that the antibody

binding site remained the same across every sample, making it a potential target to treat people with any of the known COVID-19 variants and also for advanced treatments and vaccines.

Cells exposed to COVID-19 vaccine have similarities to coronavirus spikes

Scientists in the UK characterised the SARS-CoV-2 spikes manufactured by the cells presented with the Oxford-AstraZeneca vaccine. For the first time the images of the protein spikes that develop on the surface of cells exposed to the Oxford-AstraZeneca vaccine were compared to the protein spike of the SARS-CoV-19 coronavirus, and using an imaging technique known as cryo-electron microscopy (cryoEM) they took thousands of images which they then combined to build up a clear picture of the resulting protein spikes on the cells. Further chemical analysis of the glycans that coat the newly developed protein spikes revealed that they bear a high resemblance to those surrounding the SARS-CoV-2 spikes. This is an essential feature of the vaccine as it means that it can deliver close mimics of the coronavirus spike region that are important in triggering the immune response needed to protect against COVID-19.

Antifungal and antidepressant drugs impairs SARS-CoV-2 infection in vitro

A team of researchers in Germany investigated the therapeutic potential of targeting the interface of SARS-CoV-2 with the host via repurposing of clinically licensed drugs and evaluated their use in combinatory treatments with virus and host-directed drugs in vitro. They found two currently available medications—itraconazole (an antifungal drug) and fluoxetine (an antidepressant) can effectively inhibit the virus that causes COVID-19 in laboratory cells. When either drug was used in combination with the antiviral drug remdesivir, the combination showed synergistic effects and inhibited the production of SARS-CoV-2 by more than 90%. These combinations are promising starting points for therapeutic options to control SARS-CoV-2 infection

COVID-19 (INDIA)

High Level Public Health teams to states for COVID-19 control

The Union Government has constituted 50 high level multi-disciplinary public health teams and deployed them to 50 districts across Maharashtra, Chhattisgarh and Punjab in view of the recent very large numbers of daily new COVID-19 cases and daily mortality being consistently reported by these States. The teams are being rushed to 30 districts of Maharashtra, 11 districts of Chhattisgarh and 9 districts of Punjab to assist the State Health Department and local authorities in COVID-19 surveillance, control and containment measures. The two-member high level teams consist of a clinician/epidemiologist and a public health expert and will monitor the overall implementation of COVID-19 management, especially in testing, including surveillance and containment operations; COVID Appropriate Behavior and its enforcement; availability of hospital beds, sufficient logistics including ambulances, ventilators, medical oxygen etc., and COVID19 Vaccination progress.

Nationwide mass awareness campaign to bust myths about COVID-19 vaccination

Indian National Young Academy of Sciences (INYAS) launched a multi-pronged nationwide campaign to carry out large scale immunization and manage the apprehensions against the vaccines in the common public by making people aware about the benefits of immunization through vaccines and abolishing the myths which deter people from taking the shots. The various approaches of the campaign include - release of documents containing myths and facts about vaccines in 11 languages; launching an android based application COVACNEWS (developed by INYAS) for ensuring information at the fingertips; pan-India info-graphic video and audio competition with motivation to transform information into better readable and

effective formats; and GYAN TEEKA webinar series dedicated to increase awareness about vaccines through eminent speakers and open statement on COVID-19 vaccination.

COVID-19 vaccination at workplaces

COVID-19 vaccination has been started at public and private workplaces across Indian states and Union territories with the aim to rapidly cover eligible beneficiaries above 45 years of age amid the second wave of infections. The vaccinations at private workplaces are paid services, and the price is capped at Rs. 250 per dose while sessions at government offices, organized by district health authorities are available free of cost. Only employees of a particular office aged 45 years or more will be eligible for vaccination at the workplace, and no outsiders including eligible family members are allowed for vaccination at the vaccination centre set up in offices.

India stops export of Remdesivir and Remdesivir APIs

Government of India has prohibited the exports of Injection Remdesivir and Remdesivir Active Pharmaceutical Ingredients (API) amidst surge of COVID-19 cases in the country. The decision was taken because there has been a sudden spike in demand for Injection Remdesivir used in the treatment of COVID-19, which is projected to increase further. Seven Indian companies are producing Injection Remdesivir under voluntary licensing agreement with M/s. Gilead Sciences, USA. They have an installed capacity of about 3.9 million units per month. In addition, Government of India has taken active steps to ensure easy access of hospitals and patients to Remdesivir.

India approves Russian-made Sputnik V for emergency use

The Drug Controller General of India (DCGI) has approved the restricted emergency use of the Sputnik V vaccine in India, which has been developed by Gamaleya Institute, Russia. The vaccine has been registered in India under the emergency use authorisation procedure based on results of clinical trials in Russia as well as positive data of Phase II and Phase III clinical trials conducted in India in partnership with Dr. Reddy's Laboratories. The Gam-COVID-Vac combined vector vaccine developed in Russia, comprises of two components I and II, which are not interchangeable. The vaccine should be administered intramuscularly in two doses of 0.5 ml each with an interval of 21 days. The vaccine has already been approved in thirty countries across the world.

Clinical trials of India's first mRNA based vaccine approved

The clinical trials of India's first mRNA based COVID-19 vaccine, HGCO19 developed by Pune-based biotechnology company Gennova Biopharmaceuticals Ltd. has been approved for clinical trials. HGCO19 has demonstrated safety, immunogenicity, neutralization antibody activity in the rodent and non-human primate models and its trial on humans has been approved. Gennova, in collaboration with HDT Biotech Corporation, USA has developed this vaccine along with support from the Department of Biotechnology, India. Gennova has initiated the process to enroll healthy volunteers from the Phase I/II clinical trials.

More foreign vaccines cleared for use in India

The government on 13 April announced that vaccines that have been granted emergency approvals by US, UK and Japanese regulators, and those listed by the World Health Organization (WHO), may be granted emergency use approvals in India. The decision will

facilitate quicker access to foreign vaccines in India. India has technically waived the pre-condition to conduct phase 2-3 trials at Indian sites. Any vaccine manufacturer whose Covid-19 vaccine has received approval for restricted use by the foreign national regulators USFDA, EMA, UK MHRA or PMDA Japan, or which are listed in WHO (Emergency Use Listing), can come directly to India and get emergency approval for the vaccine. It has introduced a special condition, under which foreign manufacturers have to assess the first 100 beneficiaries for seven days for safety outcomes before it is rolled out for further immunization programmes in India. After approval, a parallel bridging clinical trial will continue and the manufacturers have to submit the safety data to the regulator. The policy change enables India to import foreign vaccines for Covid-19; and local manufacturers to import these vaccines in bulk from foreign companies, and utilize their domestic infrastructure to fill these in India.

INDIA – SCIENCE & TECHNOLOGY

[Novel technique for tracking solar eruptions](#)

Scientists from Aryabhata Research Institute of observational sciences (ARIES), Nainital, in collaboration with Royal Observatory of Belgium, have developed a new technique to track the huge bubbles of gas threaded with magnetic field lines that are ejected from the Sun, disrupting space weather and causing geomagnetic storms, satellite failures, and power outages. They have developed an algorithm, Coronal Mass Ejection's Identification in Inner Solar Corona (CIISCO) to detect and track the accelerating solar eruption in the lower corona, a region where the properties of such eruptions are less known. CIISCO has been successfully tested on several eruptions observed by space observatories, including Solar Dynamics Observatory and Solar-Terrestrial Relations Observatory, PROBA2/SWAP launched by NASA and ESA, respectively. CIISCO will be implemented on the data available from India's first solar mission Aditya-L1, to provide new insight into the CME properties in this less explored region.

[National Policy for Rare Diseases, 2021](#)

Dr. Harsh Vardhan, Union Health & Family Welfare Minister approved the "National Policy for Rare Diseases 2021" on 30th March 2021. The Draft Policy for Rare Diseases was put in public domain on 13th January 2020 on which comments/views were invited from all stakeholders and examined in depth by an Expert Committee. The Rare Diseases Policy aims to lower the high cost of treatment for rare diseases with increased focus on indigenous research with the help of a National Consortium to be set up. Increased focus of research and development and local production of medicines will lower the cost of treatment for rare diseases. The policy also envisage creation of a national hospital based registry of rare diseases and focuses on early screening and prevention through primary and secondary health care infrastructure. The Policy also aims to strengthen tertiary health care facilities for prevention and treatment of rare diseases through designating 8 health facilities as Centre of Excellence which will be provided support for upgradation of diagnostics facilities. Financial support up to Rs. 2 million is proposed for treatment of those rare diseases that require a one-time treatment (diseases listed under Group 1 in the rare disease policy). The Policy also envisages a crowd funding mechanism for treatment of rare diseases.

[NITI Aayog Launches Programme for Science-based Deep-Tech Startups](#)

In a major push towards deep technology and driving the country to become a digitally transformed nation, Atal Innovation Mission (AIM), NITI Aayog has launched AIM-PRIME (programme for Researchers on Innovations, Market-Readiness & Entrepreneurship), a programme to promote and support science-based deep-tech startups & ventures across India. AIM has joined hands with Bill & Melinda Gates Foundation (BMGF) to launch this

programme which will be implemented by Venture Centre - a non-profit technology business incubator hosted by CSIR-NCL. The first cohort of the programme is open to technology developers (early-stage deep tech start-ups, and scientists/ engineers/ clinicians) with strong science-based deep tech business ideas. The programme is also open to CEOs and Senior incubation managers of AIM Funded Atal Incubation Centres that are supporting deep tech entrepreneurs. The programme is catalyzed by the office of the Principal Scientific Advisor, and the Pune Knowledge Cluster. Details on the AIM-PRIME programme are available at <https://aim.gov.in/primeprogram.php>

Self-propelled railway track scavenging vehicle can replace manual scavenging

A team from National Institute of Technical Teachers' Training and Research (NITTTR), Bhopal, has developed a Multifunctional Railway Track Scavenging Vehicle. This self-propelled Road cum Rail vehicle equipped with dry and wet suction systems, air and water spraying nozzles, control system, and road cum rail attachment is multifunctional and easy to operate. Once the dry and wet suction is over, the water nozzles start spraying water jets to clear off any human waste or semi-solid garbage present on the track floor and sprays disinfectants on the track to get rid of flies, rats, and other insects. Both dry and wet garbage are collected in different tanks, and discharged at appropriate local municipal garbage collection points. The vehicle can be used as a material/ garbage transport vehicle from track to road and also as maintenance/inspection vehicle and for disinfectant spraying. In non scavenging mode, it can also be used as a transportation and inspection vehicle. The vehicle has low maintenance cost, compact size, reverse and forward movement, and continuous and intermittent action. It has been patented.

Kota farmer develops mango variety that bears fruits round the year

A farmer from Kota, Rajasthan has, after 15 years of effort, developed an innovative mango variety which is a regular and round-the-year dwarf variety of mango called Sadabahar, which is resistant to most major diseases and common mango disorders. The fruit is sweeter in taste, comparable to langra and being a dwarf variety, is suitable for kitchen gardening, high-density plantation, and can be grown in pots for some years too. Besides, the flesh of the fruits, which is produced round the year, is deep orange with sweet taste, and the pulp has very low fiber content. The innovative attributes of the variety have been verified by the National Innovation Foundation (NIF), India, and an on-site evaluation of the variety has been done by ICAR - Indian Institute of Horticultural Research (IIHR), Bangalore, and a field testing at SKN Agriculture University, Jobner (Jaipur), Rajasthan. It is in the process of being registered under the Protection of Plant Variety and Farmers Right Act and ICAR-National Bureau of Plant Genetic Resources (NBPGR), New Delhi.

DRDO develops Advanced Chaff Technology to safeguard naval ships.

Defence Research and Development Organization (DRDO) has developed an Advanced Chaff Technology to safeguard naval ships against enemy missile attack. Three variants of this critical technology developed are for short, medium and long range uses. Indian Navy conducted trials of all three variants in the Arabian Sea on Indian Naval Ship and found the performance satisfactory. Chaff is a passive expendable electronic countermeasure technology used worldwide to protect naval ships from enemy's radar and Radio Frequency (RF) missile seekers. The technology uses very low quantity of chaff material in the air to act as decoy to deflect enemy's missiles for safety of the ships. The technology is being given to the industry for production in large quantities.

Alternative for Conventional Lithium-ion Batteries

A team from IIT Hyderabad has developed a 5V Dual Carbon Battery utilizing self-standing carbon fiber mats as both electrodes (cathode and anode). This new model avoids the requirement of toxic, costly, and heavy transition metals and is environmentally benign. It may cut down the overall battery cost by 20-25%. The use of carbon as electrode active material as well as current collector replacing heavy metals brings in the aspects of lightness and flexibility. The fabricated 5.0 voltage (nominal voltage 4.6 V) cell provides an energy density of 100-watt hour per kilogram approximately and can be extended up to 150-watt hour per kilogram with further modifications. The research team believes these cells may find potential uses in high voltage applications, sophisticated battery-run medical devices, regenerative braking systems in electric vehicles, and stationary grids.

[Farthest Gamma-ray emitting active galaxy with narrow emission lines discovered](#)

Scientists from ARIES, Uttarakhand in collaboration with researchers from other institutions, discovered a new active galaxy called the Narrow-Line Seyfert 1 (NLS1) galaxy, which is about 31 billion light-years away. The scientists studied around 25,000 luminous Active galactic nuclei (AGN) from the Sloan Digital Sky Survey (SDSS), a major optical imaging and spectroscopic survey of astronomical objects in-operation for the last 20 years and found a unique object that emits high-energy gamma rays located at a high redshift (more than 1). For the research, they used one of the largest ground-based telescopes in the world, the 8.2 m Subaru Telescope located at Hawaii, USA. They helped establish a new method to find high redshift NLS1 galaxies that were not known previously by comparing different emission lines in their spectra. The scientists would further exploit the capabilities offered by the ARIES Near-Infrared Spectrometer commissioned on 3.6 m Devasthal Optical Telescope (DOT) at ARIES to find more such gamma-ray emitting NLS1 galaxies at much larger redshifts.

IN BRIEF

[All-in-one device uses microwave power for defense, medicine](#)

A team from Purdue University have used composite based nonlinear transmission lines (NLTLs) for a complete high-power microwave system, eliminating the need for multiple auxiliary systems. It can create directed high-power microwaves that can be used to disrupt or destroy adversary electronic equipment at a distance. The same technology also can be used for biomedical devices for sterilization and noninvasive medical treatments. The researchers created a novel device using composite-based NLTLs as complete high-power microwave systems, encompassing high-voltage pulse and high-power microwave formation. The Purdue device combines the elements of traditional NLTLs into a composite-based system and eliminates typical bulky auxiliary equipment. The system is charged using a DC high-voltage supply and discharged using a high-voltage, gas-based switch. The system eliminates the need for external pulse generation and is more rugged due to the solid-state construction.

[New Aluminium and Zinc batteries promise sustainable energy storage](#)

Cornell University researchers have found a new technique for incorporating aluminum in rechargeable batteries that could provide a safer and more environmentally friendly alternative to lithium-ion batteries. The researchers used a substrate of interwoven carbon fibers that forms a strong chemical bond with aluminum. When the battery is charged, the aluminum is deposited into the carbon structure via covalent bonding between aluminum and carbon atoms. While electrodes in conventional rechargeable batteries are only two dimensional, this technique uses a three-dimensional - or nonplanar - architecture and creates a deeper, more consistent layering of aluminum that can be finely controlled. The aluminum-anode batteries can be reversibly charged and discharged one or more orders of magnitude more times than other aluminum rechargeable batteries under practical conditions.

[mRNA for treating brain diseases](#)

Tokyo Medical and Dental University (TMDU) researchers have reported a way of delivering mRNA to produce a therapeutic protein that protects neurons in the brain in rats. Brain-derived neurotrophic factor (BDNF) is a protein that enhances the survival and function of neurons. However, the BDNF molecule is too large to cross the brain's protective barrier and is rapidly removed from the central nervous system, making it difficult for BDNF to use as a treatment. The researchers designed a delivery system containing BDNF messenger RNA (mRNA), using an mRNA nanomicelle. The mRNA therapy was tested on rats that had experienced brain ischemia. The nanomicelles were found to increase the survival of hippocampal neurons, and long-term therapeutic benefits were observed 20 days after ischemia. This research could have a significant impact on the development of practical clinical treatments.

[Making cleaner, greener plastics from waste fish parts](#)

Polyurethanes, a type of plastic, are widely used materials but are made from crude oil, toxic to synthesize, and slow to break down, environmentally damaging. Researchers from Canada have developed a safer biodegradable alternative polyurethane derived from fish waste. The team used oil extracted from the waste from Atlantic salmon and added oxygen to the unsaturated oil in a controlled way to form epoxides, molecules similar to those in epoxy resin. After reacting these epoxides with carbon dioxide, they link the resulting molecules together with nitrogen-containing amines or amino acids such as histidine and asparagine to form the new material. The material appears to be biodegradable as well. The material's properties and possible uses are being studied.

[Safe, cheap technology for disinfection of packed eggs](#)

Russian researchers have developed an inexpensive, safe, and reliable surface disinfection technology for packed eggs, which helps to kill bacteria, including salmonella, on eggshells. Packed eggs are disinfected with a compact electron beam accelerator for 50 nanoseconds (one-billionth of a second) delivering a dose of 5kGy. This dose disinfects the container and eggshells but does not affect the physical properties of the protein, yolk and shell, or their composition. Disinfection does not affect the quality of meat and the volume of chicks. Hatching of chickens from clean eggs takes about six hours less, reducing production costs. The small size of the accelerator makes it easy to integrate into existing lines for control and packaging of eggs in poultry farms. The technology, according to scientists, can also be used to disinfect the surface of eggs of other birds, as well as products with peels or other natural packaging (seeds, bananas, oranges, mangoes).

[New method expands the world of small RNAs](#)

Scientist at the University of California, has developed a new RNA-sequencing method - 'Panoramic RNA Display by Overcoming RNA Modification Aborted Sequencing' (PANDORA-seq) that can help discover numerous modified small RNAs that were previously undetectable. With PANDORA-seq, unprecedented microRNA's dynamics similar to those of embryonic stem cells were found, when somatic cells were reprogrammed to induce pluripotent stem cells, generated by adult cells. PANDORA-seq can be widely used to profile small RNA landscapes in various physiological and disease conditions to facilitate the discovery of key regulatory small RNAs involved in these conditions. This discovery would also help in understanding how tRNA-derived small RNA are generated, how they function in stem cells, and how they orchestrate cell fate decisions during development.

[Discovery to creating heat-tolerant crops](#)

Researchers at UC Riverside have identified a gene that helps plants sense heat. The team

used a mutant Arabidopsis plant completely insensitive to temperature, and modified it to once again become reactive. Since plants react to shifts of even a few degrees in weather, examining the genes of this twice-mutated plant revealed the new gene, RCB, whose products work closely with HEMERA (first heat sensing gene identified by the same team two years ago) to stabilize the heat-sensing function. Knocking out one of the two genes would make the plant insensitive to heat. This result can further lead to modifying temperature responses in plants for a heat tolerant plant with longer flowering time and a longer growth period.

Oral delivery of insulin medication

An insulin oral delivery system that could replace traditional subcutaneous injections has been developed by researchers from different countries at NYD, Abu Dhabi. The researchers used layers of nanosheets with insulin loaded in between layers to protect it, to develop gastro-resistant imine-linked-covalent organic framework nanoparticles (nCOFs) that exhibited insulin protection in the stomach as well in diabetic test subjects, whose sugar levels completely returned to normal within two hours after swallowing the nanoparticles. The system is biocompatible, highly stable in the stomach, specific, and able to deliver the right amount of insulin based on the diabetic subject's blood sugar levels. This system overcomes the insulin oral delivery barriers and is a step forward in treating diabetes.

Carbon dots from human hair boost solar cells

Researchers at Queensland University of Technology have used carbon dots to improve the performance of solar cells. They turned hair scraps into carbon nanodots by breaking down the hairs and then burning them at 240 degrees celsius, to turn them into flexible displays. They then used the carbon nanodots on perovskite solar cells and found that the carbon dots deposited on perovskite solar cells improved power conversion efficiency and stability. To make the technology commercially viable, challenges for fabrication of efficient large area, stable, flexible, perovskite solar panels at low cost needs to be overcome.

Toward a reliable oral treatment for sickle cell disease

Researchers at Fulcrum Therapeutics, USA have found a small molecule with the potential to address the root cause of sickle cell disease by boosting levels of fetal hemoglobin, a healthy form that adults normally do not make. The drug could be formulated into a convenient daily tablet. The drug, called FTX-6058, attaches to a protein inside bone marrow stem cells and reinstates their fetal hemoglobin expression. A phase 1 safety trial in healthy adult volunteers last year showed an increase in fetal hemoglobin levels to around 25-30%. The team is currently designing a phase 2 clinical trial for people living with sickle cell disease. They are also in the process of characterizing the therapeutic molecule further, using genomic technologies and additional cell assay systems to fill in the details of exactly how it works. Beyond sickle cell disease, Fulcrum is also considering a clinical strategy to explore the use of FTX-6058 in people living with β -thalassemia, a blood disorder in which hemoglobin production is reduced.

India's 1st Floating Storage and Regasification Unit (FSRU)

India's first Floating Storage and Regasification Unit (FSRU) Höegh Giant- has arrived at Jaigarh Terminal in Maharashtra. An FSRU is a vital component required for movement of Liquefied Natural Gas (LNG) through seas. Jaigarh will be India's first FSRU based LNG receiving terminal and the first year around LNG terminal in the state of Maharashtra. It has storage capacity of 170,000 cubic metres and installed regasification capacity of 750 million

cubic feet per day (equivalent to about 6 million tons per year). Höegh Giant will deliver regasified LNG to the 56-kilometre long Jaigarh-Dabhol natural gas pipeline, connecting the LNG terminal to the national gas grid.

RESOURCES AND EVENTS

[India's National Super Computing Mission](#)

The National Super Computing Mission (NSM) has been launched to enhance the research capacities and capabilities in the country by forming a Supercomputing grid, with National Knowledge Network as the backbone. The NSM is setting up a grid of supercomputing facilities in academic and research institutions across the country which is partly being imported and built indigenously. The mission has also created the next generation of supercomputer experts by training more than 4500 experts. To expand the activities of the HPC training, four NSM Nodal Centres for training in HPC and AI have been established at IIT Kharagpur, IIT Madras, IIT Goa and IIT Palakkad. These centres conduct online training programs in HPC and in AI.

[A millet de-huller brings value-added products in rural India](#)

The Center for Technology Development (CTD), Department of Science & Technology (DST), Government of India, has adapted a Multi-feed millet De-huller developed by Tamil Nadu Agricultural University to enable simple adjustments that enable the use of the same machine to remove the husk of multiple millets such as Finger Millet, Barnyard Millet, and some other millets. This has simplified the traditional process of removing the husk from millets, raised the productivity, and delivered value-added millet flour at the village or cluster-of-villages level, from which further value-added products can also be made. The De-huller can de-husk 100 kg grain per hour with a yield of 90-95% and, together with the Grinder, provides a common facility for villagers to make flour either for consumption or sale at minimum double the price of de-husked millet. This technology generates considerable employment and income in rural areas.

[Indian CSF & Sheep Pox Vaccines commercialised](#)

Classical Swine Fever (CSF) is an important disease of pigs that causes 100% mortality. The ICAR-IVRI has developed a Cell Culture CSF Vaccine using the Lapinized Vaccine Virus from foreign strain. It costs around Rs 2/- per dose as against Rs. 15 to Rs. 25/- of Lapinized CSF Vaccine. Sheep pox is a severe viral disease in sheep for which a live attenuated Sheep Pox Vaccine was developed, using indigenous Sheep Pox Virus Strain [SPPV Srin 38/00] and is adapted to grow in the Vero cell line. The Vaccine is innocuous, safe, potent, and immunogenic for sheep aged more than six months of age. It has been evaluated both in-house and field. It protects the Vaccinated animals for a period of 40 months. Technology for both these vaccines has been transferred to M/s Hester Biosciences through Agrinnovate India Limited.

[CSIR-CMERI developed technologies for North East development](#)

CSIR-CMERI, Durgapur has exhibited developed technologies such as Ginger-Turmeric Processing Technologies, Municipal Solid Waste Management, Solar Tree and Artifacts, Complete Water Purification Technologies (Arsenic-Iron-Fluoride) & solutions, Effluent Treatment Plant, Hybrid Mini-Grid among others. The exhibition led to exploratory discussions between officials from National Institute of Technology, Meghalaya for using these technologies in Meghalaya, incubation of Start-Ups, skill development and research collaboration.

IISc, Prorigo develop patent management software

Indian Institute of Science, Bengaluru, (IISc) and Prorigo Software Pvt. Ltd. have jointly developed a software named ProrIISc that helps automate the legal and bureaucratic part of the patent process for intellectual property. The software is customized for Indian academic needs and comes at a fraction of the cost of software developed outside India — which was the only choice available until now. Version 1.0 of the software has been released after about three years of testing and positive feedback. The software would automate the process, allowing the department to focus on translating the IP to industry.

SCIENCE POLICY AND DIPLOMACY

Biden proposes \$250 billion investment in research

US President Joe Biden has proposed spending \$250 billion on the U.S. research over the next several years as part of a plan to rebuild the country's infrastructure, create jobs, and outinnovate the rest of the world. It targets \$180 billion specifically for "R&D and the technologies of the future," along with an additional \$70 billion in research-related areas ranging from combating pandemics to bolstering innovation in rural areas. The National Science Foundation (NSF) would receive \$50 billion. Some \$40 billion would be spent to upgrade the nation's research facilities. Minority-serving institutions would also get \$10 billion more in research dollars, and an additional \$15 billion for up to 200 "centers of excellence." Some \$35 billion would be spent to develop technologies "that address the climate crisis and position the United States as the global leader in clean energy technology and clean energy jobs." Some \$15 billion would go to climate-related demonstration projects, ranging from carbon capture to quantum computing, and \$5 billion specifically for research. The plan also calls for a new entity, the Advanced Research Projects Agency-Climate, presumably within the Department of Energy. Some \$30 billion in Biden's plan represents "additional funding for R&D that spurs innovation and job creation, including in rural areas." Details at <https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/31/fact-sheet-the-american-jobs-plan/>

Emerging economies express grave concern over EU plans for a carbon border tax

European Union plans to impose taxes on carbon at its border are "discriminatory" and unfair to developing nations, ministers from Brazil, South Africa, India and China have warned. In a joint statement, the four Basic countries, "expressed grave concern regarding the proposal for introducing trade barriers such as unilateral carbon border adjustment". The EU has proposed to impose a levy on carbon-intensive products imported into the union from countries which do not have a price on carbon. Its supporters argue it is necessary to avoid carbon leakage, where producers of energy-intensive products like steel, cement and aluminum move out of the EU to countries with weaker environmental regulations. But ministers from large emerging economies described the proposal as "discriminatory and against the principles of equity and [common but differentiated responsibilities and respective capabilities]" – a UN term meaning that developed countries, which are historically responsible for causing the climate crisis, should do more to address it than developing ones. Critics of the proposal argue it is protectionism disguised as climate action which will damage the economies of countries poorer than the EU, at a time when they are struggling with the economic fallout from Covid-19 and can least afford it. An Indian expert raised concerns the proposed border levy would disadvantage Indian steel and iron-makers, damaging the economy and making it harder for the sector to transition away from fossil fuels.

RIS-FISD programme invites contributions for the next (July 2021) issue of its peer reviewed journal Science Diplomacy Review. For more details, see the call for paper:

[http://fisd.in/sites/default/files/Science Diplomacy Review_Call for Papers_July 2021 Issue_F.pdf](http://fisd.in/sites/default/files/Science_Diplomacy_Review_Call_for_Papers_July_2021_Issue_F.pdf)

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



Research and Information System for Developing Countries

Core IV B 4th Floor, India Habitat Centre, Lodi Road, New Delhi 110003, India

Tel:-011- 24682176, E-mail: science.diplomacy@ris.org.in

Website: www.fisd.in

Disclaimer:

Opinions and recommendations in the report are exclusively of the author(s) and not of any other individual or institution including FISD. This report has been prepared in good faith on the basis of information available at the date of publication. All interactions and transactions with industry sponsors and their representatives have been transparent and conducted in an open, honest and independent manner as enshrined in FISD Memorandum of Association. FISD does not accept any corporate funding that comes with a mandated research area which is not in line with FISD research agenda. The corporate funding of an FISD activity does not, in any way, imply FISD endorsement of the views of the sponsoring organization or its products or policies. FISD does not conduct research that is focused on any specific product or service provided by the corporate sponsor.

To unsubscribe please [click here](#)