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## NEWS ALERT

*Forum for Indian Science Diplomacy*

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## **CORONAVIRUS PANDEMIC**

### **[Far-UVC light safely kills airborne coronaviruses, study finds](#)**

Columbia University researchers have found that more than 99.9% of seasonal coronaviruses present in airborne droplets were killed when exposed to a particular wavelength of ultraviolet light that is safe to use around humans. Far-UVC light (222 nm wavelength) which cannot reach or damage living cells in the body can safely kill airborne influenza viruses. While conventional germicidal UVC light (254 nm wavelength) can be used to disinfect unoccupied spaces such as empty hospital rooms or empty subway cars, it is a hazardous to humans. In the study, researchers found that more than 99.9% of the exposed coronavirus had been killed by a very low exposure to far-UVC light. Based on their results, the researchers estimate that continuous exposure to far-UVC light at the current regulatory limit would kill 90% of airborne viruses in about 8 minutes, 95% in about 11 minutes, 99% in about 16 minutes, and 99.9% in about 25 minutes. Researchers are testing the efficacy of far-UVC light against airborne SARS-CoV-2. Preliminary data suggest that far-UVC light is just as effective at killing SARS-CoV-2 and is safe to use in occupied spaces like hospitals, buses, planes, trains, train stations, schools, restaurants, offices, theaters, gyms, and, in combination with other measures, like wearing face masks and washing hands, to limit the transmission of SARS-CoV-2 and other viruses.

### **[MegaLab ropes in ICT Mumbai as the second partner](#)**

The IIT Alumni Council, which is setting up the country's largest testing facility, 'The MegaLab' for all infectious diseases amid the coronavirus pandemic, has roped in the Institute of Chemical Technology (ICT) Mumbai as its second institutional partner. ICT will support in developing the RTqPCR 2.0 testing stack to be deployed in the MegaLab. The RTqPCR 2.0 stack to be deployed will have the ability to do multiple concurrent molecular diagnostic tests for COVID-19, tuberculosis, dengue, chikungunya, HIV, hepatitis, select cancers and some sexually transmitted diseases. It will also enable rapid thermocycling to

which the council has already tied up with. The MegaLab, which will be able to test 10 million people a month on reaching full capacity by September, will serve as the first key component of the national infrastructure for testing of infectious diseases. The MegaLab will meet the immediate need for mass testing and become a showpiece for indigenous technology such as AI-based digital X-ray systems, contactless isolation centre configurations, IOT systems for virtual hospitals, pool-testing algorithms for RTPCR, COVID-19 test buses and cabs, open indigenous technology stacks and ultra-compact indigenous ultrasound scanners with portable gene sequencing.

#### **NavRakshak PPE Suit Manufacturing Know-how licenced to Five MSMEs**

National Research Development Corporation (NRDC) has licensed the manufacturing know-how of a PPE Suit named as NavRakshak to five MSMEs to meet the ongoing country wide demand of quality PPE kits. These five manufacturers put together are planning to mass produce more than 10 million PPEs per year. The manufacturing know-how of NavRakshak PPE has been developed by the Indian Navy and tested and certified as per the prevailing ISO standards. It is cost effective as it does not require any major capital investment and can be adopted even by gown manufacturing units using basic stitching expertise. The technology and quality of fabric is so superior that there is no need of sealing around the seam of the PPE suit. The PPE fabric even does not require any lamination with polymer or plastic-like film. This enables the PPE to permeate heat and moisture from the skin of the user. It gives protection but does not compromise on comfort. This uniqueness of the PPE makes it way different from the existing PPEs which are being used during the ongoing COVID pandemic. The PPE suit is available in single-ply as well as double-ply versions as per the need of the end use conditions. It also comes with a head gear; face mask and shoe cover up to the mid-thigh level. A patent application has been filed for the NavRakshak PPE by the inventors through NRDC.

#### **Coronavirus breakthrough: dexamethasone is first drug shown to save lives**

An inexpensive and commonly used steroid can save the lives of people seriously ill with COVID-19, a randomized, controlled clinical trial in the United Kingdom has found. The drug, called dexamethasone, is the first shown to reduce deaths from the coronavirus cutting deaths by about one-third in patients who were on ventilators because of coronavirus infection, as per the RECOVERY trial, launched in March, in which 2,100 participants received the drug at a low-to-moderate dose of 6 milligrams per day for 10 days. The effect of dexamethasone was most striking among critically ill patients on ventilators. Those who were receiving oxygen therapy but were not on ventilators also saw improvement: their risk of dying was reduced by 20%. The steroid had no effect on people with less severe cases of COVID-19 - those not receiving oxygen or ventilation. Shortly after the results were released, the UK government announced that it had immediately authorized the use of dexamethasone for patients hospitalized with COVID-19 who required oxygen, including those on ventilators. Dexamethasone is widely available as a pill at low cost. The findings could also have implications for other severe respiratory illnesses.

#### **CSIR-CDRI's drug Umifenovir secures approval for Phase III Clinical Trial**

CSIR constituent lab CSIR-Central Drug Research Institute (CDRI) Lucknow, has received permission for carrying out Phase III randomised, Double blind, Placebo controlled trial of efficacy, safety and tolerability of antiviral drug Umifenovir. The Phase III Clinical Trials will

used for treatment of influenza and is available in China and Russia, and has recently come into prominence due to its potential use for Covid19 patients. To evaluate its efficacy in Indian patients, CSIR-CDRI has taken up the clinical trial. Further it has developed the process technology for Umifenovir in record time and licensed the economical process technology for manufacturing and marketing the drug to M/s. Medizest Pharmaceuticals Private Ltd. Goa, who have already received test license from DCGI. All the raw materials for the drug are indigenously available and if the clinical trial is successful, Umifenovir can be a safe, efficacious, affordable drug against COVID-19 and can be part of National Program against COVID-19. This drug has the potential for prophylactic use.

#### **SARS-CoV-2 saliva testing that omits the RNA extraction step**

Researchers at the University of Illinois Urbana-Champaign have found a new testing method that uses saliva, does not require RNA extraction, and can be scaled up quickly and inexpensively. It is operationally simple, utilizes readily available materials, and can be easily implemented by existing testing sites, thus allowing for high-throughput, rapid, and repeat testing of large populations. The researchers found that following heating at 95°C for 30 minutes, they achieved 100% identification of all SARS-CoV-2 in all samples. They also found that using TBE buffer with the saliva samples led to outstanding detection rates for RNA without RNA extraction. Using clinical specimens, they found that with duplicate testing of samples, the direct detection of salivary virus by RT-PCR had 100% sensitivity, specificity, positive predictive value, and negative predictive value.

#### **A highly sensitive and specific modified ELISA antibody test for COVID-19**

UK researchers have developed an enzyme-linked immunosorbent assay that can be used even when lower levels of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) specific-antibodies are present in serum and saliva samples including from individuals with asymptomatic infections and mild forms of the disease. They developed an enzyme-linked immunosorbent assay (ELISA) assay by optimizing different antigens and amplification steps and responses to two well-characterized viral proteins: the surface-exposed spike protein (S-protein), which is targeted by neutralizing antibodies, and the nucleocapsid protein (N-protein) as the most abundant viral protein. They found that combined detection of IgG, IgA, and IgM can enhance the detection of antibody responses in all cases of the disease. This work will aid in accelerating the development of sensitive ELISA diagnostic techniques to detect serum and saliva antibody responses in severe, mild and asymptomatic COVID-19. This can serve as an additional tool for appraising short and long-term humoral SARS-CoV-2 immunity and understanding the nature of natural and future vaccine-induced protective responses.

#### **Global in reach, local in practice: the story of COVID-19 research collaboration**

COVID-19 has ignited the scientific community in ways that no other outbreak has before. While the research is hugely international in scope and consequence, most of it is still being carried out locally, within single institutions, according to researchers at Ohio State University in Columbus. Research teams have involved fewer countries, since the beginning of the outbreak. The number of multiple-author scientific papers with collaborators from more than one country is currently low, due to much lower rates of inter-institutional collaborations arising from control measures. The lockdowns have closed off opportunities for new partnerships. However, worldwide collective funding drive on COVID-19 research

of the crisis is the consolidation of the strongest existing bilateral relationships. Despite the high political tension between China and the US, the rate of collaboration between the two science powers on COVID-19 is higher than for any two other countries in the world.

### **IIT-M study shows way to enhance cancer treatment**

Researchers at the Department of Biotechnology, IIT-Madras have shown ways in which traditional cancer therapies can be made more effective. The research team studied reactive oxygen species (ROS), which are highly reactive molecules such as hydrogen peroxide and hydroxyl radicals used in many common cancer therapies, including chemotherapy. The observations made by the team show ways to fine-tune anti-cancer therapies for better outcomes. ROS are molecules generated in the body during normal functioning, and are associated with many metabolic processes. The regulation of these species is important because if excess of it is produced, it can cause oxidative stress and damage to the cells, resulting in inflammation and various diseases. The team has shown that the effective ROS levels vary rhythmically in the cell upon being treated with menadione or curcumin. Thus, the timing of administration of the anti-cancer drugs can affect its effectiveness. This means that by judiciously designing the time of administration of the ROS-generating anti-cancer drug, we can enhance cancer cell death by as much as 27 per cent, thus enhancing the effectiveness of the treatment. The team is collaborating with cancer hospitals to try our ‘simple timing’ strategy to enhance the effectiveness of cancer treatment.

### **Researchers develop low-cost, easy-to-use emergency ventilator for COVID-19**

A team of engineers and physicians at the University of California San Diego has developed a low-cost, easy-to-use emergency ventilator for COVID-19 patients that are built around a ventilator bag usually found in ambulances. The team built an automated system around the bag and brought down the cost of an emergency ventilator to just \$500 per unit, by comparison, state of the art ventilators currently cost at least \$50,000. The device's components can be rapidly fabricated and the ventilator can be assembled in just 15 minutes. The device's electronics and sensors rely on a robust supply chain from fields not related to healthcare that are unlikely to be affected by shortages. Researchers also wanted to make sure that the device could be used by healthcare workers with limited experience with ventilators and no experience with this type of system. As a result, the MADVent Mark V is safe to use, easy to assemble and easy to repair. This device could be a great option for use in situations where materials are scarce, such as when the normal supply chain breaks down, or in developing nations and hard-to-reach rural areas.

### **India to have say in Covid vaccine distribution**

India's Covid diplomacy has moved beyond HCQ and paracetamol to ensure that the country can leverage its position as the world's largest vaccine manufacturer to be part of the search and distribution of the Covid vaccine. After sustained conversations with their counterparts in key countries, the government has zeroed in on the Indo-Pacific group to cooperate on looking for a vaccine. According to Prime Minister's principal scientific adviser Dr K Vijayaraghavan, India will have a voice – even if there is no “Indian” vaccine — in terms of distribution because India's role in providing vaccines to others will be very important, and that the Indian officials are working with like-minded countries on not only vaccine development, but production and distribution. Globally there are more than 125 vaccine development programmes today and of these, 10 are in the first stage, eight in phase

of the international vaccine development programmes and owing to the size and extraordinary capability of the Indian vaccine manufacturing effort in bulk; India will not be ignored no matter who makes the vaccines.

### **COVID-19: India's first mobile laboratory launched for last-mile testing access**

In an endeavour to make an easy access of corona testing facility to rural population, Union Science and Technology Minister Harsh Vardhan recently launched country's first mobile laboratory. The mobile laboratory, also called I-Lab or Infectious Diseases Diagnostics Lab can be deployed in rural areas to help promote last-mile testing access. It has capacity to run 50 RT-PCR and about 200 ELISA tests. A double set of machines can help increase the capacity to about 500 tests per day in an eight-hour shift. The Department of Biotechnology (DBT) under the Ministry of Science and Technology, along with the Andhra Pradesh Medtech Zone (AMTZ), has initiated the DBT-AMTZ COMManD (COVID-19 Medtech Manufacturing Development) consortia to address the shortage of critical healthcare technologies in the country and move progressively towards a stage of self-sufficiency.

### **IIT Guwahati develops affordable diagnostic kits for COVID-19**

Accurate testing is important to get out of the clutches of novel coronavirus. Stepping up efforts in this regard, the Indian Institute of Technology (IIT) Guwahati, in association with RR Animal Healthcare Ltd and Guwahati Medical College and Hospital (GMCH), has developed low-cost diagnostic kits. These are Viral Transport Media (VTM) kits, RT-PCR kits, and RNA isolation kits. The VTM kits are the first-stop source used to collect nasal and oral swab specimens from an individual source to a laboratory safely for culture and testing. During this period, the virus, if present, in the sample specimens should remain intact until the testing procedure is completed. The kit consists of a comprehensive solution specially formulated for the collection and transport of SARS-CoV-2. To bring down the cost of kits, the developers have used materials that are available in the local market and they are as per the World Health Organisation (WHO) recommendation. Two batches of these kits have been handed over to the National Health Mission, Assam, and GMCH and are being made in bulk for the larger population. In addition to the sterile VTM kits, the Institute has also developed RNA isolation kits and RT-PCR kits jointly with RR Animal Healthcare Ltd.

## **GLOBAL**

### **Treatment generating new neurons eliminates Parkinson's disease in mice**

A team from University of California, San Diego has found a possible method to treat Parkinson's disease and other neurodegenerative diseases. The researchers developed a noninfectious virus that carries an antisense oligonucleotide sequence, an artificial piece of DNA designed to specifically bind the RNA coding for a protein called PTB, thus degrading it, preventing it from being translated into a functional protein and stimulating neuron development. The researchers administered the oligonucleotide treatment directly to a mouse's midbrain, while a control group of mice received mock treatment. In the treated mice, a small subset of astrocytes converted to neurons, increasing the number of neurons by approximately 30 percent. Dopamine levels were restored to a level comparable to that in normal mice, and the neurons grew and sent their processes into other parts of the brain. There was no change in the control mice. The treated mice returned to normal within three

forcing PTB to go away a cell turns on the genes needed to produce a neuron. The team has also patented the PTB antisense oligonucleotide treatment in order to move forward toward testing in humans.

#### **KIST develops eco-friendly, flame-retardant carbon plastic ideal for recycling**

A flame-retardant carbon-fiber-reinforced-plastic (CFRP) composite material has been developed by researchers at Korea Institute of Science and Technology (KIST). CFRP contains carbon fiber and epoxy resin. By manufacturing epoxy resin from tannic acid and mixing it into carbon fiber, the KIST research team successfully developed a CFRP that is strong and flame-retardant. Toxic substances generated when incinerating CFRP for recycling would no longer be a problem. By dissolving CFRP in water in a supercritical fluid state, over 99% of the CFRP could be recovered without reduced carbon fiber performance. It was also found that epoxy resin when dissolved produced a substance called carbon dots, which can be used as an electronic material (Optronics, Sensing, Bioimaging etc.). Unlike the method of recycling by incineration, which burns up epoxy resin leaving only the incomplete carbon fiber to be recycled, this new method of recycling enables the recycling of all components of a composite material. These improved traits are significant in that they determine the range of application of said composite material.

#### **Exciting new developments for polymers made from waste sulfur**

Researchers at the University of Liverpool are making significant progress in the quest to develop new sulfur polymers that provide an environmentally friendly alternative to some traditional petrochemical based plastics. This new research builds on their discovery in 2019 when they reported a new catalytic process to make polymers out of sulfur. They demonstrated that adding a second type of bonding, urethane bonds, to the materials increases the strength of sulfur polymers by up to 135 times. The way this second type of bonding is introduced means that its amount can be controlled, and in turn controls the physical properties of the polymers. The strengthened sulfur polymers were found to have shape-memory effects - they can be set in one shape, before being temporarily deformed into another. The team showed that sulfur polymers could form rubber like materials that could be easily self-repaired to their original strength within minutes, just by applying an amine catalyst that helps the bonds in the broken surfaces heal back together. This new kind of rubber and catalyst can be used with low energy consumption to make flexible, repairable, sustainable objects - providing a very real and useful application for these new sulfur polymers, made from waste sulfur as a viable replacement material for some traditional petrochemical based plastics.

#### **Global artificial intelligence research council launched**

The Global Partnership on Artificial Intelligence, endorsed by the G-20 and promoted by the Organisation for Economic Co-operation and Development (OECD), has been launched on 15 June by 14 countries including India, plus the EU to set ethical guidelines for the use of artificial intelligence (AI). It will bring together experts from the private sector, academia and non-profit organisations to conduct research and pilot projects on AI. The group's secretariat will be run by the OECD which has established a network of AI experts to advise members on policy, and it has produced a set of AI principles endorsed by more than 40 countries. The global panel will draw up guidelines on four broad themes, including responsible AI, data governance, the future of work, and innovation and commercialisation.

in turn, are to be overseen by a series of three committees: a ruling council that includes government ministers, a steering committee, and a multi-stakeholders experts' group plenary that includes public and private experts.

### **New technology detects breast cancer using tears**

Japanese researchers have developed new technology to detect breast cancer using the exosomes found in tears as biomarkers using the world's first chemical nano-processing technology to detect exosomes in a very small amount of bodily fluid, without the need for pretreatments and detection reagents. The process TearExo, consists of a fluorescent exosome sensing chip and an automatic exosome analyzer. The fluorescent exosome sensing chip was constructed by placing an antibody and a fluorescent reporter molecule in a 100nm nanocavity formed on a glass chip. The antibody recognizes the surface proteins of exosomes and the fluorescent reporter molecule can be used to read the exosomes' binding with the antibody based on changes in the fluorescence. Tests showed that tear fluid can be used to detect breast cancer and also be used to check and monitor patients' post-treatment recovery, as well as for initial cancer detection. For the first time in the world, this research demonstrated that cancer can be detected using tear fluid. Tests will be conducted on a larger scale to determine the specificity and sensitivity of this method of breast cancer diagnosis and to commercialise TearEx as an in vitro diagnostic device.

### **Light-activated 'CRISPR' triggers precision gene editing and super-fast DNA repair**

In a series of experiments using human cancer cell lines, scientists at Johns Hopkins Medicine say they have successfully used light as a trigger to make precise cuts in genomic material rapidly, using a molecular scalpel known as CRISPR, and observe how specialized cell proteins repair the exact spot where the gene was cut. For the new experiments, the scientists modified the CRISPR-Cas9 complex by engineering a light-sensitive RNA molecule that allows the CRISPR complex to cut genomic DNA in living cells only when exposed to a particular wavelength of light. The team found that within 30 seconds of shining the light on the cells, the CRISPR complex had cut more than 50 percent of its targets. They determined that the cellular repair proteins started their work within two minutes of the CRISPR activation, and the repair was completed as early as 15 minutes later. The team also used high-resolution microscopes and a focused beam of light to show that they could activate CRISPR cutting of one of two gene copies that are normally found in human cells. The team has filed a provisional patent on the CRISPR technology described in this research.

### **Breakthrough in drug delivery for prostate cancer treatment**

A novel formulation of the prostate cancer drug abiraterone acetate -- currently marketed as Zytiga -- will dramatically improve the quality of life for people suffering from prostate cancer, as pre-clinical trials by the University of South Australia show the new formulation improves the drug's effectiveness by 40 per cent. The new method uses an oil-based oral formulation that not only enables a smaller dose of the drug to be effective, but also has the potential to dramatically reduce possible side effects. Using oils to mimic pharmaceutical food effects, enables significant increase in the drug's solubilisation and absorption, making it more effective and a far less invasive treatment for patients. The new formulation uses very high levels of abiraterone acetate dissolved within a specific oil and encapsulated within



day. This novel formulation is flexible enough to be adopted by thousands of different oil soluble medicines with great potential benefits.

### **Scientists warns of increasing threats posed by invasive species**

In a new study, scientists from around the world including a professor at the University of Rhode Island warn that the threats posed by invasive alien species are increasing. Alien species are plants, animals and microbes that are introduced by people, accidentally or intentionally, into areas where they do not naturally occur. Many of them thrive, spreading widely with harmful effects on the environment, economy, or human health. The study states that the number of invasive alien species is increasing rapidly, with more than 18,000 currently listed around the world. The escalation in biological invasions is due to the increase in the number and variety of pathways such as the online trade in unusual pets and the transport of species across oceans on rafts of plastic. The researchers note that the scale of the problem is enormous. A 2017 analysis of global extinctions revealed that alien species contributed to 25 percent of plant extinctions and 33 percent of terrestrial and freshwater animal extinctions. The study also shows how drivers of global change, such as climate change, land-use change, and international trade, are exacerbating the impacts of biological invasions. Action is needed more widely at both national and international levels in order to tackle the challenges effectively.

### **AI could help improve performance of lithium-ion batteries and fuel cells**

A new machine learning algorithm allows researchers to explore possible designs for the microstructure of fuel cells and lithium-ion batteries, before running 3D simulations that help researchers make changes to improve performance. Fuel cells use clean hydrogen fuel, which can be generated by wind and solar energy, to produce heat and electricity, and lithium-ion batteries, like those found in smartphones, laptops, and electric cars, are a popular type of energy storage. The performance of both is closely related to their microstructure: how the pores (holes) inside their electrodes are shaped and arranged can affect how much power fuel cells can generate, and how quickly batteries charge and discharge. Now, Imperial researchers have applied machine learning techniques to help them explore these pores virtually and run 3D simulations to predict cell performance based on their microstructure. The research findings will help researchers from the energy community to design and manufacture optimised electrodes for improved cell performance. Improvements could include making smartphones charge faster, increasing the time between charges for electric vehicles, and increasing the power of hydrogen fuel cells running data centres.

## **INDIA**

### **India sets up IN-SPACe, to boost private participation in the space sector**

The government approved the creation of the Indian National Space Promotion and Authorisation Centre (IN-SPACe), to ensure greater private participation in India's space activities, as part of reforms to open up the space sector and make space-based applications and services more widely accessible to everyone. IN-SPACe, which is expected to be functional within six months, will assess the needs and demands of private players, including educational and research institutions, and, explore ways to accommodate these requirements in consultation with ISRO. Existing ISRO infrastructure, both ground and

Already, a large part of manufacturing and fabrication of rockets and satellites now happens in the private sector. But Indian industry needs to grow its three per cent share in the growing global space economy of \$360 billion. Some 95 per cent of this industry is related to satellite-based services, and ground-based systems. IN-SPACe will help Indian industry, to meet the growing demand for space-based applications and services, as an interface between ISRO and private parties, and assess how best to utilise India's space resource and increase space-based activities.

### **India's first gas trading platform to transform the Indian gas market**

Indian Energy Exchange, India's leading and premier energy market platform today announced the launch of Indian Gas Exchange (IGX), first nationwide online delivery-based gas trading platform. The platform is fully automated with a web-based interface to provide seamless trading experience to the customers and is powered by best-in-class technology from GMEX. IGX will enable market participants to trade in standardised gas contracts and facilitate the availability of gas at lower prices, stimulate demand and facilitate greater investments in domestic gas exploration. The Indian Gas Exchange will offer six market products beginning from the day-ahead market and forward contracts.

### **Nanomaterials used as broad-spectrum antimicrobial agents for first time**

A research team from the Indian Institute of Science (IISc) Bangalore has synthesized a nanomaterial that mimics an enzyme and can disintegrate the cell membranes of a range of disease-causing bacteria. The researchers decided to target phospholipids in cell membranes with the help of nanomaterials that would break the bonds holding the membrane bilayer together. These nanomaterials are known as nanozymes. The team synthesized a cerium oxide based nanozyme using a chemical co-precipitation method and carried out a reaction between cerium oxide and sodium polyacrylate in a basic solution to coat the nanoparticles with polymers. The polymer coating allows the nanozyme to disperse onto any surface or material and boosts its activity. The nanomaterial was then tested in the lab on several potentially pathogenic bacteria such as Salmonella Typhi, Shigella flexneri, Escherichia coli, Vibrio cholerae and Klebsiella pneumoniae. The nanozyme stopped their growth and subsequently inhibited the formation of biofilm. The nanomaterials were able to penetrate even a 10-day old, well-developed biofilm and showed anti-bacterial activity inside the biofilm because of their small size. In order to use the nanomaterial in other medical devices, more research would be required to ensure that there is no contact between human cells and the nanozymes.

### **Temperature over India likely to rise by 4.4 degrees Celsius**

A report by the Centre for Climate Change Research, Indian Institute of Tropical Meteorology, Pune has stated that India's average temperature has risen by around 0.7 degree Celsius during 1901-2018, largely on account of Greenhouse Gases-induced warming. The average temperature over India is projected to rise by 4.4 degrees Celsius, by 2100, while the intensity of heatwaves is likely to increase by 3-4 times Between 1986 and 2015; temperatures of the warmest day and the coldest night of the year have risen by about 0.63 degrees Celsius and 0.4 degree Celsius, respectively. By 2100, the temperatures of the warmest day and the coldest night are projected to rise by approximately 4.7 degrees Celsius and 5.5 degrees Celsius, respectively, according to the report. The frequency of summer (April-June) heat waves over India is projected to be 3 to 4 times higher by 2100.

### **STIP 2020 process gains momentum**

The Office of the Principal Scientific Adviser to the Government of India (Office of PSA) and the Department of Science and Technology (DST) have started a consultative process for the formulation of a new National Science Technology and Innovation Policy (STIP 2020) reaching out to a wide range of stakeholders along 4 tracks. STIP 2020 Town Hall Meet, the Track-I public & expert consultation process for the formulation of Science, Technology and Innovation Policy (STIP) 2020 was launched on June 12, 2020. The Track I consultation process involves an extensive public and expert consultations through Science Policy Forum, a dedicated platform for soliciting inputs from larger public and expert pool, to make the formulation of STIP 2020 decentralized, bottom-up, and inclusive. The engagements in Track I will include public dialogue series with thought leaders & policy scholars, a thematic panel discussion with public engagement, targeted survey instruments, print media articles and channels for written inputs, community podcasts for last-mile connectivity. Track II comprises experts-driven thematic consultations to feed evidence-informed recommendations into the policy drafting process. Twenty-one (21) focused thematic groups have been constituted for this purpose. Track III involves consultations with Ministries and States, while Track IV constitutes apex level multi-stakeholder consultation. The consultation processes on different tracks have already started and are running in parallel. A Secretariat has been set up at DST to coordinate the complete process.

### **National Mission on Quantum Technologies and Applications**

Covid-19 pandemic has reportedly affected the implementation of government's National Mission on Quantum Technologies & Applications (NM-QTA) among department of science and Technology (DST) search for a sector expert to head the head the ambitious Rs 8,000 Crore worth quantum mission committee for Cyber Physical Systems. According to Dr Ashutosh Sharma, secretary, DST, as we come out with this time of Corona, then we would think about quantum, so it may get little bit slow start and delayed, we are all ready to start it because DPR (Detailed Project Report) and stuff has been nearly completed. The DST has put together groups working on quantum across the country, and brought them on-board for drafting parts of the DPR. The DST launched the quantum mission three years ago, and set-up a new division called frontier and futuristic technologies to first roll out this mission on cyber physical systems. The DST has set up about 25 hubs which form the architecture, structure and processes of quantum technology mission. According to Dr Sharma, the Indian industries and even MSMEs may not be in the quantum frontier, they would all benefit by a dose of knowledge.

## **IN BRIEF**

### **Self-compacting concrete made using granite residue**

A University of Cordoba team has analyzed the feasibility of using granite sludge to substitute conventional aggregates in self-compacting mortar. They found that it is possible to substitute up to 40% of conventional aggregates for granite sludge while still maintaining the mortar's qualities of durability, strength and compaction. Granite production, results in granite sludge, produced during the cutting process and which after water evaporates, emits silicon dust into the atmosphere and can be inhaled, with negative health consequences. It can also interfere with normal soil mechanics. The new process can manage a residue that is bad for

### [\*\*New thin-film technology uses sustainable components for solar panels\*\*](#)

Commercial thin-film solar panels on the market consist of rare-earth elements like indium and gallium, or highly toxic metals like cadmium resulting in high-cost and problems in use in living places. A team of Korean scientists has developed a process for making efficient solar panels made from cheaper and more abundant elements based on CZTSSe (copper, zinc, tin, sulfur, and selenium) thin films. The team revised the annealing process, using a special "liquid-assisted method," which allowed the grains of CZTSSe to grow at a faster rate, enabling production of large grains with less defects, even at low temperatures, resulting in improved performance. This could lead to low-cost environment-friendly solar energy and diverse applications, including in electronic devices, household goods, buildings, and vehicles, free of the current drawbacks of toxic and rare metals.

### [\*\*Engineers develop new fuel cells with twice the operating voltage as hydrogen\*\*](#)

Engineers at Washington University in St. Louis have developed high-power direct borohydride fuel cells (DBFC) that operate at double the voltage of conventional hydrogen fuel cells. The research team pioneered a reactant: identifying an optimal range of flow rates, flow field architectures and residence times that enable high power operation. They demonstrated a single-cell operating voltage of 1.4 or greater, double that obtained in conventional hydrogen fuel cells, with peak powers approaching 1 watt/cm<sup>2</sup>. Doubling the voltage would allow for a smaller, lighter, more efficient fuel cell design, which translates to significant gravimetric and volumetric advantages when assembling multiple cells into a stack for commercial use. Their approach is broadly applicable to other classes of liquid/liquid fuel cells. This promising technology is being scaled up to make stacked cells for applications in both submersibles and drones. The technology and its underpinnings are the subject of patent filing and are available for licensing.

### [\*\*Preventing lithium loss for high-capacity lithium-ion batteries\*\*](#)

A team of Korean researchers has developed a processing technology for maximizing energy densities of high-capacity batteries. When charged in the initial cycle, a battery with a silicon-based anode loses more than 20% of the lithium ions it uses for electricity storage, which results in an issue of reduced battery capacity. To resolve this issue, the researchers have developed a technology that enables the pre-loading of lithium ions using a lithium-containing solution rather than lithium powder, preventing lithium loss in a silicon-based anode. Submerging an electrode in the tailored solution for just five minutes is enough to achieve successful lithium pre-loading, as the solution rapidly seeps into an electrode, ensuring homogeneous delivery of lithium into silicon oxide. The prelithiated silicon-based anode developed by the research team loses less than 1% of active lithium in the first charge, yielding a high initial battery efficiency of 99% or higher. A battery manufactured with the prelithated anode exhibited an energy density 25% higher than that of a comparable battery using a graphite anode available on the market (406 Wh/kg—504 Wh/kg). This technology is readily applicable to the process used in existing battery manufacturing facilities; it has potential to achieve a breakthrough in the implementation of silicon-based anodes for practical batteries.

## RESOURCES AND EVENTS

[\*\*Indian-American scientist Rattan Lal wins 2020 World Food Prize\*\*](#)

production that conserves natural resources and mitigates climate change. Dr. Lal's research in soil science helps the earth's estimated 500 million small farmers through improved management, less soil degradation, and the recycling of nutrients. Dr. Lal explored and transformed techniques such as no-tillage, cover cropping, mulching, and agroforestry that protected the soil from the elements, conserved water, and returned nutrients, carbon, and organic matter to the soil. This in turn improved the long-term sustainability of agro-ecosystems and minimized the risks to farmers of droughts, floods, and other effects of a changing climate. His research showed how atmospheric carbon can be sequestered in soils. This breakthrough research laid the foundation for increasing the quality and quantity of food and preserving natural ecosystems and mitigating climate change. Three separate United Nations Climate Change Conferences adopted his strategy of restoring soil health as a means to sequestering carbon.

### **European physicists take step toward 100-kilometer-long collider**

CERN's governing council announced plans to launch a technical and financial feasibility study to build an even bigger collider 80 to 100 kilometers long (actually two of them in succession) that could ultimately reach an energy seven times higher than the Large Hadron Collider (LHC), which is now undergoing an upgrade and should run till the mid 2030s. In 2012, the LHC led to discovery of the Higgs boson, the last particle predicted by physicists' standard model. Now, CERN physicists envision a future in which, around 2040, they build a huge circular electron-positron collider to study the Higgs. Then, they would follow up with a more powerful proton collider to reach a new high-energy frontier. The CERN council took a step in that direction, announcing an update to its long-range strategy, the first since 2013. The feasibility study for the big new machine should be done by 2026 or 2027, when CERN will next update its long-term strategy.

### **Indian-American Scientist heads US National Science Foundation**

Eminent Indian-American scientist Dr Sethuraman Panchanathan on 23 June took charge as 15th Director of National Science Foundation, the top American body supporting fundamental research in non-medical fields of science and engineering with an annual budget of \$7.4 billion. Soon after taking over, Panchanathan identified three pillars of his vision for the NSF: advancing research into the future, ensuring inclusivity and continuing global leadership in science and engineering. Panchanathan noted that it was NSF's mission of funding basic research that has yielded groundbreaking discoveries over the years. He said the National Science Board's (NSB) Vision 2030 strategic plan is an excellent framework for advancing science and technology. Panchanathan was educated at the University of Madras, Indian Institute of Science Bangalore, and Indian Institute of Technology Madras.

### **RIS holds webinar on India-Vietnam Cooperation in Science, Technology and Innovation (STI)**

RIS together with Overseas Office for Science & Technology of Vietnam (VOOST, India) and Vietnam Embassy in New Delhi organized a webinar, "Promoting India-Vietnam Cooperation in Science, Technology and Innovation (STI): Perspectives and Prospects" on Wednesday, 24 June 2020. The webinar was co-chaired by H.E. Mr Pham Sanh Chau, Ambassador of Vietnam to India and Mr Pranay Verma, Ambassador of India to Vietnam. The panellists included Dr Sanjeev Varshney, Head & Advisor, International Bilateral Cooperation Division (IRCD), Ministry of Science and Technology, India; Prof Le Van

for Indian & Asian Studies, Institute for Indian and Southwest Asian studies. Highlighting that S&T cooperation as one of the important pillars of India-Vietnam relations, the webinar identified areas such as IT, pharmaceuticals, blue economy, oceanology, etc as new areas in addition to the existing areas of cooperation.

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**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](mailto:science.diplomacy@ris.org.in)

Website: [www.fisd.in](http://www.fisd.in)

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