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FORUM FOR INDIAN SCIENCE DIPLOMACY

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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

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**CORONAVIRUS PANDEMIC**

Scientists from the University of Maryland's School of Medicine (UMSOM) developed an experimental diagnostic test for COVID-19 that can visually detect the presence of the virus in 10 minutes. It uses a simple assay containing plasmonic gold nano-particles to detect a colour change when the virus is present. The test does not require the use of any advanced laboratory techniques, such as those commonly used to amplify DNA, for analysis. This promising new test may detect RNA material from the virus as early as the first day of infection. Once a nasal swab or saliva sample is obtained from a patient, the RNA is extracted from the sample via a simple process that takes about 10 minutes. The test uses a highly specific molecule attached to the gold nanoparticles to detect a particular protein. This protein is part of the genetic sequence that is unique to the novel coronavirus. When the biosensor binds to the virus's gene sequence, the gold nanoparticles respond by turning the liquid reagent from purple to blue. A company called VitruVian Bio is developing the test for commercial application and emergency-use authorization for the test will be sought from FDA. If this new test meets FDA expectations, it could potentially be used in day-care centres, nursing homes, college campuses, and work places as a surveillance technique to monitor any resurgence of infections.

**New model predicts the peaks of the COVID-19 pandemic**

Researchers have found a single function that accurately describes all existing available data on active cases and deaths, and predicts forthcoming peaks. The tool uses q-statistics, a set of functions and probability distributions developed at the Santa Fe Institute, USA and Ege University, in Turkey. The formula works in all the countries in which it was tested. The researchers used data from China, where the active case rate is thought to have peaked, to set the main parameters for the formula. Then, they applied it to other countries including France, Brazil, and the United Kingdom, and found that it matched the evolution of the active cases and fatality rates over time. The model could be used to create useful tools like an app that updates in real-time with new available data, and can adjust its predictions accordingly. In addition, it can be fine-tuned to fit future outbreaks as well.

**Deep UV LED inactivation of SARS-CoV-2 - fast and effective**

A new study reports that the use of deep ultraviolet light-emitting diodes (DUV-LED) can rapidly inactivate the virus, pointing to its potential to contain the viral spread. SARS-CoV-2 has been found in aerosols, on copper, on cardboard, and plastic or stainless steel, for up to 3 hours, 4 hours, 24 hours, and three days respectively. To prevent such transmission via contaminated surfaces, frequent hand washing, and sanitization with alcohol is recommended, but the efficacy of the latter is in doubt. Recently, a DUV-LED instrument was reported to inactivate microbes of all kinds, with light at about 250-300 nm. The researchers found that even short periods of DUV-LED irradiation were capable of rapidly inactivating the virus. After one second of radiation exposure, the level of infectious virus

repeated use over the long term. The study is the first to show that this mode of sterilization works to inactivate SARS-CoV-2 rapidly. The availability of a safe and quick method of sterilizing an environment is of great value. The devices equipped with DUV-LED are expected to prevent the virus invasion through the air and after touching contaminated objects.

## Killing coronavirus with handheld ultraviolet light device may be feasible

A personal, handheld device emitting high-intensity ultraviolet light to disinfect areas by killing the novel coronavirus is now feasible, according to researchers at Penn State. There are two commonly employed methods to sanitize and disinfect areas from bacteria and viruses, chemicals or ultraviolet radiation exposure. The UV radiation is in the 200 to 300 nanometer range and known to destroy the virus, making the virus incapable of reproducing and infecting. While devices with these high doses currently exist, the UV radiation source is typically an expensive mercury-containing gas discharge lamp, which requires high power, has a relatively short lifetime, and is bulky. The solution is to develop high-performance, UV light emitting diodes, which would be far more portable, long-lasting, energy efficient and environmentally benign. Since there are no good material choice for a UV-transparent conductor material, finding a new material with the right composition is key to advancing UV LED performance. The researchers tried to grow these films using the standard film-growth technique widely adopted in industry, called sputtering, which was successful. According to researchers, this is a critical step towards technology maturation which makes it possible to integrate this new material into UV LEDs at low cost and high quantity.

## India and Australia invite Research proposals for COVID-19

Prime Minister Narendra Modi and the Prime Minister of Australia, Scott Morrison MP, jointly announced a Special COVID-19 Collaboration in 2020 during an India-Australia Leaders' Virtual Summit on 04 June 2020. Accordingly, Department of Science & Technology (DST), Ministry of Science & Technology, GOI and Department of Industry, Science, Energy and Resources (DISER), Australia have invited joint research projects on COVID-19 from interested scientists and researchers under the Australia-India Strategic Research Fund (AISRF), a platform for bilateral collaboration in science, jointly managed and funded by the governments of India and Australia. The research proposals are expected to focus on antiviral coatings, other preventive technologies, data analytics, modeling, AI applications, and screening and diagnostic testing as priority areas. The project duration would be for 12 months with maximum extension of 6 months and projects would be mutually beneficial whose outcomes contribute to the global response to the COVID-19 pandemic. The deadline for submission of online applications is 2nd July 2020.

## Anti-Microbial Nano-coating for Facemasks to Tackle COVID-19 developed

tested to effectively kill pathogens within 10-15 minutes. The formulation is highly effective against clinical pathogens such as Staphylococcus aureus and Escherichia coli O157. This formulation will be beneficial to frontline medical personnel for coating their existing facemasks and can be scaled up further for coating on their gowns. Facemask is a core component of the personal protective equipment (PPE), along with gown, gloves, and eye protection for frontline healthcare personnel. This nano-coating provides an additional layer of protection against pathogens in existing masks and can curb the transmission risk of the disease. The formulation also contains silver nanoparticles and plant-based antimicrobials which show synergistic killing effect against the pathogens. The combined effect of more than three antimicrobial compounds was used for the development of formulation which can be coated on any surface. Since the phytochemicals used in the formulation are known to destroy viruses, it has the potential to inhibit the Corona virus too.

**Covid-19: Sun Pharma begins phase 2 trial of its phytopharmaceutical drug**

Sun-Pharmaceutical Industries Ltd has reportedly commenced phase-II clinical trial of AQCH, a phytopharmaceutical or a plant derived drug, for the treatment of covid-19. AQCH is the first phytopharmaceutical drug approved for clinical trials by the Drugs Controller General of India (DCGI) as a potential treatment therapy for covid-19. The clinical trial will be conducted across 12 centres in India in 210 patients. The treatment duration will be 10 days. The results of the clinical trial are expected by October. The human safety study of AQCH has already been completed and the drug has been found safe at the recommended dose for phase-II study. AQCH has shown anti-SARS-CoV-2 effects in in-vitro studies conducted in collaboration with the International Centre for Genetic Engineering and Biotechnology (ICGEB). These results combined with information on mechanism of action through in-vitro and small animal studies give us the confidence to evaluate its potential in treatment of covid-19 patients. AQCH, being developed for dengue, has shown broad antiviral effect in in-vitro studies and hence is being tested as a potential treatment option for covid-19. Since 2016, Sun Pharma has been working closely with the Department of Biotechnology (DBT)-ICGEB to develop a phytopharmaceutical drug for dengue. According to Dr Shekhar C Mande, director general, CSIR, this collaboration aligns with the scientific rationale for the quickest way to develop drugs against SARS-CoV-2.

**Tata Group & SCTIMST to commercially produce COVID-19 testing kits**

The Tata Group has entered into a partnership agreement with the Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), an institute of national importance, for commercial production of COVID-19 testing kits. The kits will be based on the futuristic RT-LAMP (Reverse Transcriptase of India Loop-Mediated Amplification) technology, which can produce results in significantly less time, thereby increasing the

test kits. The 'ChitraGene LAMP-N' test uses an isothermal setup to create copies of viral DNA for detection, which significantly reduces the complexity of the overall process compared to the prevalent Real Time PCR technology. Besides, the test also uses proprietary magnetic nanoparticle-based RNA extraction, which gives a highly purified and concentrated level of RNA from the swab sample. Testing was a crucial part in the fight against COVID-19 as early detection and treatment arrests the spread of the infection. The mass production of RT-Lamp- based COVID-19 testing kits with the active support of the Tata Group will be a significant milestone for the Institute.

## India's drug regulator grants Gilead marketing authorisation for remdesivir

India's drug regulator has granted US pharma giant Gilead Sciences marketing authorisation for its anti-viral drug remdesivir for "restricted emergency use" on hospitalised COVID-19 patients in view of the crisis posed by the pandemic. The approval process for remdesivir was accelerated in view of the emergency situation and the unmet need for medicines in light of the coronavirus outbreak. The drug has been allowed for restricted emergency use for treatment of suspected or laboratory-confirmed cases of COVID-19 in adults and children hospitalised with severe symptoms, subject to several safeguards. The drug, which is administered in the form of an injection, has been approved to be sold by retail on the prescription of specialists for use in hospital or institutional setup only. The approval process for remdesivir was accelerated by invoking special provisions under the New Drug and Clinical Trial Rules, 2019, which provides for waiver of clinical trials in special circumstances. The drug is being touted as a potential treatment for COVID-19. The approval was given following consultation with the subject expert committee of the Central Drugs Standard Control Organisation (CDSCO). The medicine has been issued an Emergency Use Authorization (EUA) by the United States Food and Drug Administration (FDA) to treat hospitalised coronavirus-infected patients. Gilead Sciences Inc has entered into non-exclusive licensing agreements with pharma firms, including three domestic majors Cipla, Jubilant Life Sciences and Hetero, for manufacture and distribution of remdesivir.

## India to look at test kits for COVID-19 from Argentina

Argentina is one among the countries from where India is considering buying the testing kits as it will help in mass testing. Amid border tensions with China, India could possibly look at alternatives other than China to meet the need for COVID-19 testing kits. Border tension with China may take a toll on India's trade with Beijing. Amid all this, India could possibly look at other alternatives than China to meet its need for COVID-19 testing kits. One such country is Argentina, which has recently launched its own "NEOKIT-COVID-19," which costs around $8 and allows detection of the virus in less than two hours. After meeting their internal demands, the government of that country which has been receiving queries from across the globe will be ready to export. The Ministry of External affairs (MEA) which has

Missions and Posts are getting in touch with the governments and companies in an effort to import testing kits and other supplies. India should produce under license as our domestic needs are and will remain high. The NEOKIT test was validated in a clinical trial with human samples, of course. The performance obtained was similar to that obtained with the rt-qPCR, considered the Gold Standard technique. However, the NEOKIT test should be approved by the regulatory agencies in the other countries that would be interested in using it.

**Math model may help map Covid-19 trajectory in India**

The Department of Science and Technology (DST) has started work on a Covid-19 "Indian National Supermodel" to help monitor the future transmission of infection, thus aiding decisions involving the readiness of the health system and other mitigation measures. Numerous mathematical models for Covid-19 forecasting and surveillance are being worked out by investigators funded by DST-SERB and other agencies. India will soon have a so-called super (mathematical) model for Covid-19 that can shed light on the likely trajectory of the pandemic in India, including details of when and where it is most likely to spread; its crests and troughs; and the number of ICU beds and ventilators that may be needed. Numerous mathematical models for Covid-19 forecasting and surveillance are being worked out by investigators funded by DST-SERB and other agencies. The models seek to deliver on four things - fine grained spatio-temporal progression of Covid 19; medical inventory prediction which includes how many PPE (kits), how many ventilators, are needed; policies like non pharmaceutical interventions and economic optimization such as working with a reduced workforce. The team is likely to present its initial findings based on the super model by end of June. The model will aggregate successful evidence-based mathematical and statistical forecasting models and include the best predictive analytics for robust forecasting of infectious disease spread.

**Innovative disinfection & sanitization solutions selected in COVID-19 Competition**

National Innovation Foundation – India (NIF) has recently supported two innovative disinfection solutions by common people which were received as a response to its Challenge COVID-19 Competition (C3). NIF is not only scouting for relevant and frugal innovations from the society and providing incubation and mentoring support be its value addition, financial support, mentoring, and so on. Under the Challenge COVID-19 Competition (C3), NIF managed to attract ideas and innovations from more than 1700 citizens through the website, email, and WhatsApp from nearly 360 districts spread across 33 States and Union Territories of the country. A Vehicle Disinfectant Bay and a Foot-operated Height Adjustable Hands-Free Sanitizer Dispenser Stand are the two recently supported innovations under the campaign. The Vehicle Disinfectant Bay is a device to disinfect vehicles automatically, and can be deployed easily at State Border/Checkposts, which are the entry

industrial applications wherein one simply needs to press with the foot a pedal, and the sanitizer will be dispensed. It is being commercialized by Mumbai based Vissco Rehabilitation Aids Pvt. Ltd, a leading manufacturer of orthopedic products and mobility aids.

## CSIR-CMERI develop new indigenous ventilator

Researchers at Durgapur-based Central Mechanical Engineering Research Institute (CMERI) have indigenously developed a ventilator amid rising cases of COVID-19. According to researchers, the bellow design, controllers and embedded electronics of this ventilator have all been customised to ensure price efficacy as well as meeting the requirements of the relevant industries. The ventilator has undergone multiple technical and design changes after adopting critical feedbacks from healthcare professionals of the Health World Hospital and Vivekananda Hospital, Durgapur. This ventilator costs around Rs. 80,000-90,000. CSIR-CMERI, in coordination with critical care experts of the Health World Hospitals, have studied and incrementally developed this ventilator. This will help in massive substitution of import dollars by strengthening the medical care manufacturing landscape of the country, believe scientists at the institution. The significantly reduced cost of the ventilators will help the economically marginalised sections of the society the most as well as help further fortify the Government-aided healthcare schemes. This will also help in upgrading the tertiary healthcare infrastructure.

## Scientists develop indigenous nasopharyngeal swabs

In the current pandemic scenario, global supplies of nasopharyngeal (NP) swabs are not dependable resulting in supply chain delays, escalating prices and variable quality. CSIR-National Chemical Laboratory (CSIR-NCL), Pune, has developed an indigenous NP swab for collecting samples from the throat cavity of COVID-19 patients. Nasopharyngeal swab is a medical device with stringent specifications of quality, polymer grade, dimensions and sterilization. An NP swab consists of a cylindrical plastic stick with a brush-like tip of synthetic bristles/flocks. The flocking process helps align the fine bristles in a parallel orientation on the stick head, much like a tooth brush, except that this has round uniform geometry and the NP swab bristles are of micron diameter. The NCL team successfully worked out the detailed specifications of NP swab polymers and adhesives. The specifications included medical-grade materials that must be used for manufacture, the swab design and the packaging and sterilization protocols. The NCL has transferred the process knowhow of indigenous NP swabs for sample collection to a Mumbai-based chemical company under the COVID-19 technology transfer guidelines of CSIR.

## Indian researchers develop new RT-nPCR test for coronavirus detection

Researchers at the Centre for Cellular and Molecular Biology (CCMB) have developed a

results with the standard RT-qPCR test. The standard RT-qPCR test can have low detection efficiency less than 50% in a real testing environment. It was attributed sometimes to low viral load in many samples. The new RT-nPCR test was able to make positive detections even in samples found to be negative in two RT-qPCR tests. It also detected 13% samples as positive among samples that were negative by the standard RT-qPCR test (likely false negatives). This new test is awaiting approval from ICMR and the lab that developed the new test says that RT-nPCR test could be deployed in those places where RT-qPCR test machines are not available.

**Panacea Biotec to collaborate with US-based Refana Inc for COVID-19 vaccine**

Biotechnology major Panacea Biotec said, it is collaborating with Refana Inc of the United States to make a COVID-19 vaccine widely accessible around the world in an equitable manner through a joint venture company to be based in Ireland. The collaboration aims to bring to patients a whole inactivated virus-based vaccine for COVID-19. Under the collaboration, Panacea Biotec will be responsible for product development and commercial manufacturing with the joint venture undertaking clinical development and regulatory submissions across the world. The project aims to manufacture over 500 million doses of the COVID-19 candidate vaccine with over 40 million doses expected to be available for delivery early next year," he said in a statement. Panacea Biotec is also undertaking the development of a novel tetravalent dengue vaccine, pneumococcal conjugate vaccine among other differentiated drug development programmes.

**Multipurpose disinfection cabinet to prevent surface contamination of COVID 19**

International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) and MEKINS Industries have co-developed a UVC-based Cabinet for disinfecting non-critical hospital items, laboratory wear, and PPEs in the research laboratories to prevent surface contamination of COVID 19. It can also be used to disinfect items exhibited to customers in commercial establishments and several domestic items. The compact UVC disinfection cabinet co-developed by ARCI and MEKINS, a Hyderabad based company, consists of 4 UVC lamps of 30W (on sides) and 2 lamps of 15 W (top and bottom). It gives a flux sufficient to disinfect articles of various dimensions placed in shelves separated by metal grilled frames to allow sufficient light from all sides. The irradiance intensity is measured at various points within the box to assure sufficient radiation to disinfect all the placed articles within 10 minutes. The UVC cabinet is multifunctional and very promising for establishments including research and academic institutes, corporate offices, hospitals, clinics, nursing homes, hotels, restaurants, commercial outlets and domestic usage for fighting COVID 19.

## Bangladesh eggplant farmers reap rewards with Bt Brinjal

Farmers in Bangladesh achieved significantly higher yields and revenues by growing insect-resistant, genetically engineered eggplant, a new Cornell study has found. The four genetically engineered (Bt) varieties yielded, on average, 19.6% more eggplant—known as brinjal in Bangladesh—than non-Bt varieties and earned growers 21.7% higher revenue. The additional revenue per hectare is the equivalent of around $664, a substantial sum for resource-poor farmers in Bangladesh.The study was based on a 2019 survey of Bt and non-Bt brinjal farmers. Bt brinjal was developed by the Bangladesh Agricultural Research Institute (BARI) in conjunction with Mahyco (an India-based agricultural company), Cornell and the U.S. Agency for International Development, in an effort to stop the losses caused by eggplant fruit and shoot borer (EFSB) larvae caterpillars, and reduce pesticide use.,The survey was conducted in the five most important brinjal producing districts in Bangladesh through face-to-face interviews with 195 Bt farmers and 196 non-Bt farmers. Farmers made their own choices about which crop to grow.

## New genetic engineering technique for advances in medicine and beyond

A new genetic engineering method developed by investigators at Harvard Medical School and the Biological Research Center in Szeged, Hungary, may transform decades-old bacterial engineering technique called recombineering (recombination-mediated genetic engineering) to allow scientists to scarlessly swap pieces of DNA of their choosing for regions of the bacterial genome. The investigators have developed a high-throughput screening method to look for the most efficient proteins that serve as the engines of recombineering. Such proteins, known as SSAPs, reside within phages viruses that infect bacteria. Applying the new method, which enables the screening of more than two hundred SSAPs, the researchers identified two proteins that appear to be particularly promising. One of them doubled the efficiency of single-spot edits of the bacterial genome. It also improved tenfold the ability to perform multiplex editing--making multiple edits genome-wide at the same time. The other one enabled efficient recombineering in the human pathogen Pseudomonas aeruginosa, a frequent cause of life-threatening, hospital-acquired infections, for which there has long been a dearth of good genetic tools. The advantage of recombineering is that it works without cutting DNA. Instead, recombineering involves edits into the genome during bacterial reproduction. The new technpology could enable the use of bacteria for environmental cleanup of oil spills or other contaminants, for example. Re-combineering is likely to usher in a whole new world of applications.

## Aerosol-printed graphene unveiled as low cost, faster food toxin sensor

Researchers in the USA have developed a graphene-based electrochemical sensor capable of detecting histamines (allergens) and toxins in food much faster than standard laboratory tests. The team used aerosol-jet printing to create the sensor. The ability to change the

team created high-resolution interdigitated electrodes (IDEs) on flexible substrates, which they converted into histamine sensors by covalently linking monoclonal antibodies to oxygen moieties created on the graphene surface by a CO2 thermal annealing process. The graphene biosensor could detect histamine in PBS and fish broth over toxicologically-relevant ranges of 6.25 to 100 parts per million (ppm) and 6.25 to 200 ppm, respectively, with similar detection limits of 2.52 ppm and 3.41 ppm, respectively. The biosensor's sensitivity was not significantly affected by the non-specific adsorption of large protein molecules commonly found in food samples and used as blocking agents. This type of biosensor could be used in food processing facilities, import and export ports, and supermarkets where continuous on-site monitoring of food samples is needed. It could also be used in other bio-sensing applications where rapid monitoring of target molecules is needed, and by switching the antibody immobilized on the sensor platform to one that is specific towards the detection of suitable biological target species, the sensor can further cater to specific applications. Examples include food pathogens (Salmonella spp.), fatal human diseases (cancer, HIV) or animal or plant diseases (avian influenza, Citrus tristeza).

## Researchers develop viable sodium battery

Washington State University (WSU) and Pacific Northwest National Laboratory (PNNL) researchers have created a sodium-ion battery. There has been great interest around the potential for replacing Li-ion batteries with Na-ion in many applications. The team reports one of the best results to date for a sodium-ion battery. It is able to deliver a capacity similar to some lithium-ion batteries and to recharge successfully, keeping more than 80 percent of its charge after 1,000 cycles. Lithium-ion batteries are ubiquitous, used in numerous applications such as cell phones, laptops, and electric vehicles. But they are made from materials, such as cobalt and lithium that are rare and expensive. Lithium-based batteries would also be problematic in meeting the tremendous growing demand for power grid energy storage. On the other hand, sodium-ion batteries, made from cheap, abundant, and sustainable sodium from the earth’s oceans or crust, could make a good candidate for large-scale energy storage. A key problem for some of the most promising cathode materials is that a layer of inactive sodium crystals builds up at the surface of the cathode, stopping the flow of sodium ions and, consequently, killing the battery. The researchers are now working to better understand the important interaction between their electrolyte and the cathode, so they can work with different materials for improved battery design.

## Universal virus detection platform to expedite viral diagnosis

The prompt, precise, and massive detection of a virus is the key to combat infectious diseases such as Covid-19. A new viral diagnostic strategy developed by researchers in Korea uses reactive polymer-grafted, double-stranded RNAs will serve as a pre-screening tester for a wide range of viruses with enhanced sensitivity. Currently, the most widely using

from KAIST identifies viral activities without amplifying specific nucleic acid targets. The research constructed a universal virus detection platform by utilizing the distinct features of the PPFPA-grafted surface and double-stranded RNAs. The key principle of this platform is utilizing the distinct feature of reactive polymer-grafted surfaces, which serve as a versatile platform for the immobilization of functional molecules. To increase detection sensitivity, the research team devised two-step detection process analogues using fluorophore-tagged antibodies that also recognize the RNAs' double-stranded secondary structure. By targeting a common biomarker, viral double-stranded RNAs, it is possible develop a pre-screening platform that can quickly differentiate infected populations from non-infected ones. This detection platform provides new perspectives for diagnosing infectious diseases. This will provide fast and accurate diagnoses for an infected population and prevent the influx of massive outbreaks.

## Double-sided solar panels that follow the sun prove most cost effective

According to a report by researchers from National University of Singapore, solar power systems with double-sided (bifacial) solar panels which collect sunlight from two sides instead of one, and single-axis tracking technology that tilts the panels so they can follow the sun are the most cost-effective to date. They determined that this combination of technologies produces almost 35% more energy, on average, than immobile single-panel photovoltaic systems, while reducing the cost of electricity by an average of 16%. Solar power systems with double-sided (bifacial) solar panels, which collect sunlight from two sides instead of one, and single-axis tracking technology that tilts the panels so they can follow the sun are the most cost effective to date. The researchers determined that this combination of technologies produces almost 35 percent more energy, on average, than immobile single-panel photovoltaic systems, while reducing the cost of electricity by an average of 16 percent. This means that investing in bifacial and tracking systems should be a safe bet for the foreseeable future. Double-sided solar panels produce more energy per unit area than their standard counterparts and can function in similar locations, including rooftops. In future, the manufacturing costs of these materials are expected to keep on decreasing, and a point in time might be reached when they become economically competitive.

## New technique takes 3D imaging an octave higher

Researchers at Colorado State University and University of Illinois at Urbana-Champaign developed a new 3D imaging technique to visualise tissues and other biological samples on a microscopic scale, with potential to assist with cancer or other disease diagnoses. The technique allows specimens to generate light at double the frequency, or half the wavelength, of the incident light which is referred to as harmonic optical tomography and looks at 3D signals that are generated from the sample. Mostly, images that are captured by a cellphone camera flatten 3D information onto a 2D image. 3D imaging can peer into the interior of an

diagnostics, finding cracks in oil wells and airplane wings, using tomographic X-ray, and ultrasound methods.

## INDIA

### Govt initiates process for science technology and innovation policy

The Office of the Principal Scientific Adviser to the Government of India (Office of PSA) and the Department of Science and Technology (DST) have jointly initiated a decentralized, bottom-up, and inclusive process for the formulation of a new national Science Technology and Innovation Policy (STIP 2020).The fifth S&T policy of India is being formulated at a crucial juncture when India and the world are tackling the COVID-19 pandemic and many important changes have taken place in the past decade. The new policy will reorient STI in terms of priorities, sectoral focus, the way research is done, and technologies are developed and deployed for larger socio-economic welfare. The STIP 2020 formulation process is organised into 4 highly interlinked tracks: (1)Track I involves an extensive public and expert consultation process through Science Policy Forum - a dedicated platform for soliciting inputs from larger public and expert pool during and after the policy drafting process. (2) 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. (3)Track III involves consultations with Ministries and States. (4) Track IV constitutes apex level multi-stakeholder consultation. For Track III nodal officers are being nominated in States and in Ministries, Departments and Agencies of Government of India for extensive intra-state and intra-department consultation and for Track IV consultation with institutional leadership, industry bodies, global partners and inter-ministerial and inter-state consultations represented at the highest levels are being carried out. The consultation processes on different tracks have already started and are running in parallel. The Track-II thematic group (TG) consultation started with a series of information sessions last week. The sessions were attended by around 130 members of the 21 thematic groups along with 25 Policy Research Fellows and scientists of DST and Office of PSA. The six-month process involves broad-based consultations with all stakeholders within and beyond the scientific ecosystem of the country –including academia, industry, government, global partners, young scientists and technologists, civic bodies, and general public. A Secretariat with in-house policy knowledge and data support unit, built with a cadre of DST-STI Policy fellows, has been set up at DST to coordinate the complete process and interplays between the four tracks.

### India pledges 15 Million US Dollars to Gavi, the international vaccine alliance

Prime Minister Narendra Modi pledged 15 Million US Dollars to Gavi, the international vaccine alliance while addressing the virtual Global Vaccine Summit hosted by UK Prime

had launched Mission Indradhanush, which aims to ensure full vaccination of the country's children and pregnant women, including those in the remote parts of the vast nation. India has added six new vaccines to its National Immunization Programme. India had digitized its entire vaccine supply line and developed an electronic vaccine intelligence network to monitor the integrity of its cold chain. Prime Minister said India is also the World's foremost producer of vaccines and that it is fortunate to contribute to the immunization of about 60 percent of the World's children. India's support to GAVI is not only financial but that India's huge demand also brings down the Global price of vaccines for all, saving almost 400 Million Dollars for GAVI over the past five years.

## "Healthy and Energy Efficient Buildings" Initiative launched

On occasion of World Environment Day, today, Energy Efficiency Services Limited (EESL), in partnership with the U.S. Agency for International Development's (USAID) launched the "Healthy and Energy Efficient Buildings" initiative that will pioneer ways to make workplaces healthier and greener. This initiative is aimed at accelerating the adoption of cost-effective energy efficiency as a standard practice within buildings, and specifically focuses on cooling, while addressing the challenges of retrofitting existing buildings and air conditioning systems so that they are both healthy and energy efficient. Maintaining good indoor air quality is essential for occupant comfort, well-being, productivity and the overall public health. The EESL office pilot will address this problem by developing specifications for future use in other buildings throughout the country, as well as aid in evaluating the effectiveness and cost benefits of various technologies and their short and long-term impacts on air quality, comfort, and energy use, directly improving comfort, health, productivity, and ultimately the quality of life of citizens in India and South Asia.

## CeNS develops low-cost catalyst for hydrogen generation from water

Scientists from The Centre for Nano and Soft Matter Sciences (CeNS), an autonomous institute of the Department of Science and Technology (DST), have found out a low cost and efficient way to generate hydrogen from water using Molybdenum dioxide as a catalyst. The scientists have shown that Molybdenum dioxide ($MoO_2$) nanomaterials annealed in hydrogen atmosphere can act as efficient catalysts to reduce the energy input to bring about water splitting with great efficiency. Electrolytic splitting of water is a promising method to generate hydrogen but requires energy input that can be brought down in the presence of a catalyst. $MoO_2$ is a conducting metal oxide that is one of the low-cost catalysts with good efficiency and stability for hydrogen evolution. The researchers were able to grow $MoO_2$ directly on to tin oxide substrates for direct use as a catalyst in electrochemical cells, avoiding the need for any further electrode fabrication process. Hydrogen is considered as the future of clean and sustainable energy as it can be generated from water and produces water on energy generation without any carbon footprint. Hydrogen can be directly used as

energy for a clean environment and an alternative to fossil fuels, underlining the necessity of low-cost catalysts for its production.

## Rare earth based magnetocaloric material developed for cancer treatment

Scientists at the International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) have developed a rare-earth-based magnetocaloric material (certain materials in which application and removal of a magnetic field causes the materials to become warmer or cooler) that can be effectively used for cancer treatment. Magnetocaloric materials can provide controlled heating in the therapeutic range of 42-46 degrees C, for destroying cancer cells in the human body. ARCI and SCTIMST are carrying out vitro measurements on the tumour cells with rare-earth nanoparticles dispersed in fluids for testing with MRI at a higher magnetic field of 0.5 Tesla to generate more data.This method, when used in conjunction with radiation therapy, would reduce the side effects, damage caused to the human body and also reduce the treatment time of cancer tumours.

## Novel photo-sensitive cholesteric liquid crystals developed

Scientists from Centre for Nano and Soft Matter Sciences (CeNS), Bengaluru have synthesised a series of novel photo-sensitive cholesteric liquid crystals at room temperature which can be used to make optical storage devices such as optically rewritable boards, advertising boards and so on. These novel photo-sensitive cholesteric liquid crystals operate over the temperature range from -10 to 160 degrees C. A simple, cost-effective procedure was adopted to synthesise such materials. These room-temperature liquid crystals can be used for creating optical storage devices, liquid crystal displays and so on.An optical storage device was fabricated using one of these materials. The device has shown very high thermal back relaxation with good contrast and 5 hours to relax back to its original configuration. Such devices are extremely useful in creating rewritable advertisement boards where one can store the images for several hours and then can be rewritten or in some cases can be kept as permanent storage device. Then can also be used as optical rewritable boards for schools and colleges.This invention will bring down the cost of the devices. An Indian patent has been filed for this invention.

## CSIR and Atal Innovation Mission to Foster Innovation in the Country

CSIR a premier R&D organization has come together with Atal Innovation Mission (AIM), a flagship initiative to promote a culture of innovation and entrepreneurship have come together to collaborate in promoting innovation in the country in various sectors. Major areas of mutual interest, among others include: Supporting world class start-ups through CSIR Incubators and jointly work on new models of innovation, including setting up of CSIR Innovation Parks. Stimulating innovation and research in the MSME industry by CSIR. Creating problem solving mind-set across schools in India through close cooperation

## India, Australia strengthen cooperation in cyber and defence technology

India and Australia on 4 June elevated their bilateral ties to a Comprehensive Strategic Partnership (CSP) and signed seven agreements including on defence and mining during a virtual summit between Prime Minister Narendra Modi and his Australian counterpart Scott Morrison. The agreements included an MOU on cooperation in the field of mining and processing of Critical and Strategic Minerals. An implementing Arrangement concerning cooperation in Defence Science and Technology was also signed during the summit. A Framework Arrangement on Cyber and Cyber-Enabled Critic Enabled Critical Technologies Cooperation was signed covering topics ranging from artificial intelligence (AI) to quantum computing and robotics. The new four-year agreement includes a corpus of $12.7 million to fund research and development for Indian and Australian businesses and researchers that will help countries improve their cyber resilience. Research collaboration between Australia and India has been given a nearly $20 million with funding for new projects to advanced pandemic research and reduce plastics waste. $15 million will go to extending the Australia India Strategic Research Fund (AISRF) for another four years, while an additional $4.5 million will support collaborative work led by CSIRO to reduce plastic wastes. Both sides also announced the opening of a special grants round under the Australia-India Research Fund for joint projects responding to the COVID-19 pandemic.

## CSIR's Anti-Cancer Drug IIIM-290 enters Clinical Trial

CSIR-Indian Institute of Integrative Medicine (IIIM) Jammu, has received approval for clinical trials of a potent anti-cancer drug effective against pancreatic cancer after successful completion of preclinical development. The drug, rohitukine, is a pure molecule natural product from the leaves of a tree from the Western Ghats Dysoxylum binectariferum,commonly known as Indian white cedar.The proposed clinical trial is aimed to assess the safety, tolerability and exposure of the compound in humans along with the early efficacy indicators in pancreatic cancer patients. This drug was discovered and developed at the natural-products driven drug discovery program of CSIR-IIIM. Pancreatic cancer is considered as one of the untreatable cancer types, because of its very late diagnosis and therefore there is a huge scarcity of drugs for the treatment of this cancer.

## IIT-Students Develop Mobile App for Seamless, Contactless Air Travel

A group of IIT-Guwahati students has developed a mobile application for seamless and contactless air travel not only during the current pandemic but also during non-crisis situations. The aim of the mobile app Flyzy, developed as per International Air Transport Association (IATA) guidelines, is to provide contactless boarding, keeping in mind the easier baggage drop, manageable parking, better shopping experience and providing necessary updates during the whole journey. The app also has a smart UI (user interface) assistant that helps elderly people to use it easily. Other features of the application include real-time flight

the complete software system of the airport and is secured as the app is hosted on the cloud. The mission of the startup, which has been recognised by the Startup India, is to build Flyzy as India's finest aviation IT Technology Company for providing a stress-free and safe journey to flyers. The passengers can shop from the airport using the app and can make payment as well, besides they can either opt for the takeaway or gate delivery option. Flyzy also supports multi-currency payments. For instance, if the flight departs in one hour, the app will suggest to the passenger the food items that could be prepared within the available time. The application will help the aviation industry save money as the process will become automated, faster and easier.

## IN BRIEF

### Recycling plastics together, simple and fast

Researchers of Shinshu University have developed a simple and fast treatment using a blending process would allow plastics to be useful again, rather than sitting in landfill. Polyurethane and polypropylene have significantly different melting points at 145 C° and 165 C°, so melting them together posed a challenge. To solve this issue, the team added an appropriate compatibilizer which acts as a go-between the plastics, which successfully enabled them to be processed together at the same time. The quality of the plastic was not undermined. The researchers were able to efficiently produce thermoplastic blends using the melt extrusion process and injection molded process. Only a small amount of the compatibilizer, polypropylene grafted maleic anhydride was needed to do so. This finding would allow for unwanted plastic to be economically valued again and protect wildlife and the environment from further pollution.

### New compound defeats highly antibiotic-resistant bacteria

A team of Princeton researchers have found a compound, SCH-79797, that can simultaneously puncture bacterial walls and destroy folate within their cells -- while being immune to antibiotic resistance.The team found that even with extraordinary effort, they were unable to generate any resistance to this compound whose derivatives they called Irresistin. To prove its resistance to resistance, the team exposed bacteria to the drug over and over and over again. They also tried using it against bacterial species that are known for their high antibiotic resistance. The researchers tested a sample of the most resistant strain of N. gonorrhoeae from the vaults of the World Health Organization -- a strain that is resistant to every known antibiotic -- and the compound still killed this strain. The researchers found that SCH-79797 uses two distinct mechanisms within one molecule. It targets the outer membrane -- piercing through even the thick armour of Gram-negative bacteria -- and then shreds folate, a fundamental building block of RNA and DNA. The researchers found that the two mechanisms operate synergistically, combining into more than a sum of their parts. A

demonstrated that they could use Irresistin-16 to cure mice infected with N. gonorrhoeae. The new approach could revolutionize antibiotic development, by targeting processes that are present in both bacteria and in mammalian cells.

## Ultrathin nanosheets separate harmful ions from water

An international research team, led by Monash University and ANSTO, has created an ultrathin porous membrane to completely separate potentially harmful ions, such as lead and mercury, from water. This innovation could enhance the desalination process and transform the dirtiest water into something potable for millions of people across the world. The membrane performed steadily for more than 750 hours using limited energy. It could also be manufactured on a global scale, pending further testing. The method uses water-stable monolayer aluminium tetra-(4-carboxyphenyl) porphyrin frameworks (termed Al-MOFs) nanosheets for ion separation from water. These Al-MOFs nanosheets, exfoliated to just a nanoscale in thickness, can help remove harmful carcinogens from the atmosphere by creating highly porous membranes to facilitate the separation processes of gases and organic solvents, such as paint. This study confirms that the intrinsic nanopores of Al-MOFs nanosheets facilitate the ion/water separation by creating vertically-aligned channels as the main transport pathway for water molecules.

## Researchers advance fuel cell technology

Washington State University researchers have made a key advance in solid oxide fuel cells (SOFCs) that could make the highly energy-efficient and low-polluting technology a more viable alternative to gasoline combustion engines for powering cars. They developed a unique and inexpensive nanoparticle catalyst that allows the fuel cell to convert logistic liquid fuels such as gasoline to electricity which could result in highly efficient gasoline-powered cars that produce low carbon dioxide emissions that contribute to global warming. SOFC technology can run on a wide variety of liquid fuels, such as gasoline, diesel, or even bio-based diesel fuels, and doesn't require the use of expensive metals in their catalysts. Cars powered by gasoline SOFCs could use existing gas stations. The WSU team used an inexpensive catalyst made from nickel and then added nanoparticles of the element, molybdenum. Testing their molybdenum-doped catalyst, their fuel cell was able to run for 24 hours straight without failing. The system was resistant to carbon build-up and sulfur poisoning. In contrast, a plain nickel-based catalyst failed in an hour. Liquid fuel cell technology has tremendous opportunities for various power-hungry markets, including transportation applications. The researchers are working with the automotive industry to build fuel cells that can run under real-world and longer-lasting conditions.

## 3D-printable material that mimics biological tissues

University of Colorado Denver scientists have been able to 3D print a complex, porous

light processing (DLP). The team developed a honey-like LC resin that, when hit with ultraviolet light, cures forming new bonds in a succession of thin photopolymer layers. The final cured resin forms a soft, strong, and compliant elastomer. When printed in lattice structures, it began to mimic cartilage. The combination of the resin and printing process also led to 12 times greater rate-dependence and up to 27 times greater strain-energy dissipation compared to those printed from a commercially available photocurable elastomer resin. The structures could have several applications, like shock-absorbing helmet foam or even small biomedical implants for toes or in the spine.

## Making vaccines safe in all temperatures

Scientists have now found a way to prevent vaccines from degrading. By encasing protein molecules in a silica shell, the structure remains intact even when heated to 100°C, or stored at room temperature for up to three years. The technique known as ensilication- was developed by a UK team and has demonstrated its effectiveness in the real world. The ensilicated vaccine even after a day was effective in mice tests. The ensilication preserves not just the structure of the vaccine proteins but also the function -- the immunogenicity. "This project aims to create a silica cage for the DTP trivalent vaccine, so that every child in the world can be given DTP without having to rely on cold chain distribution. The technology to silica-wrap proteins could eventually be adopted to store and transport all vaccines, as well as other protein-based products, such as antibodies and enzymes, make important medicines stable so they can be more widely available. Currently, up to 50% of vaccine doses are discarded before use due to exposure to suboptimal temperatures.

## Renewable fuel from carbon dioxide with the aid of solar energy

Researchers at Linkoping University, Sweden have shown that it is possible to selectively produce methane, carbon monoxide or formic acid from carbon dioxide and water and sunlight. They have combined graphene and cubic silicon carbide to develop a graphene-based photoelectrode that preserves the ability of cubic silicon carbide to capture the energy of sunlight and create charge carriers. The graphene functions as a conducting transparent layer while protecting the silicon carbide. They can tailor the layers of graphene on the silicon carbide and control the properties of the graphene-based photoelectrode. The conversion of carbon dioxide is in this way made more efficient, while the stabilities of the components are at the same time improved. The photoelectrode developed by the researchers can be combined with cathodes of various metals, such as copper, zinc or bismuth. Different chemical compounds, such as methane, carbon monoxide and formic acid, can be selectively formed from carbon dioxide and water by selecting suitable metal cathodes.

## Antibiotic Rifabutin combats deadly superbug

USC researchers have discovered that an old antibiotic rifabutin, is “highly active” in fighting

can't tolerate a similar drug, rifampin. It is on the World Health Organization's List of Essential Medicines, the safest and most effective medicines needed in a health system. Until now, it hadn't been tried against Acinetobacter baumannii, which emerged during the Iraq War as a troop-killing superbug in military treatment facilities. Acinetobacter causes pneumonia, meningitis and bloodstream infections; it tends to strike patients requiring lengthy hospital stays and invasive devices like catheters and ventilators. The team found that rifabutin was vigorously active against Acinetobacter baumannii grown in the nutrient-limited media (as well as in animal tissue) but not effective against bacteria grown in the more commonly used rich nutrient media. Rifabutin can be used immediately to treat such infections because it is already FDA-approved, cheap and generic, and on the market.

### Study discovers BAM15 as a potential treatment for obesity

Researchers at the Pennington Biomedical Research Center in Baton Rouge, Louisiana have found a compound BAM15 when given to mice make them resistant to weight gain by burning more calories than their untreated counterparts. Other benefits of BAM15 include: Reducing blood sugar and insulin levels, regardless of weight loss. Improving sensitivity of skeletal muscle to the effects of insulin. Skeletal muscle insulin resistance is a primary risk factor for the development of type 2 diabetes. Reducing fat accumulation overall by restricting fat from building up in the liver, kidney, and blood. Accumulating too much fat in one's liver, kidneys, or blood can damage the organs and lead to heart disease. It is hoped that in the future, BAM15 or related compounds will advance to clinical drug development and become a viable treatment option for patients with obesity.

### Scientists develop paper based sensors for carbon dioxide

Physicists at University of Alberta showed that a sensitive carbon dioxide detector can be made from a simple piece of paper. The sensor changes colour in about one minute based on the amount of carbon dioxide in the environment, and have many potential applications from industries that make use of carbon dioxide to smart buildings. It can help to aid in building usage and design. With its paper base, the sensor is inexpensive to create and provides a simple template for mass production. This could be a prototype for mass-produced sensors for carbon dioxide as well as other gases. However, mass-production of the sensor would require further design, optimization and packaging.

## RESOURCES AND EVENTS

### SpaceX Safely Delivers Astronauts to the Space Station

The astronauts' spaceship, Crew Dragon capsule named “Endeavour”, disconnected from Space X’s Falcon 9 launcher and entered orbit on 31st May. The ship then completed a series of engine burns to catch up to the International Space Station (ISS), which orbits

first by a privately developed spaceship with a crew on board. The two atronauts will spend the next 110 days on the ISS and will then disembark from the ISS, and use the Endeavour to go back to Earth. Known as NASA's SpaceX Demo-2, the mission is an end-to-end test flight to validate the SpaceX crew transportation system, including launch, in-orbit, docking and landing operations.

## US joins global AI group, citing technology threat from China

The Trump Administration has dropped its opposition to joining an international panel for setting ethical guidelines for the use of artificial intelligence (AI), nearly two years after France and Canada announced plans to form the global group. Science and technology ministers from the the G7, met 28 May over videoconference and promised to work together to launch the so-called Global Partnership on AI (GPAI). The AI group will commit to developing and using the technology to fight the Covid pandemic—including efforts to speed up drug discovery, improve disease diagnosis, and aid telehealth services. The launch of working groups, consisting of experts from the private sector, academia and non-profit organisations, is expected in the coming weeks. The initiative was in response to mounting concerns that AI, while potentially beneficial, could also lead to dystopian scenarios of automated privacy invasion, discrimination or even warfare. The OECD will provide the secretariat of the new international group and 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. There are concerns that AI is being used by authoritarian regimes to violate human rights. As well as AI to fight COVID-19, the partnership will tackle responsible AI, innovation and commercialisation, data governance and the future of work. The working groups would 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.

## European Commission Adopts Circular Economy Action Plan

The European Commission has adopted a plan focusing on the design and production for a circular economy, ensuring that resources used stay in the EU economy for as long as possible. The plan aims to reduce the EU's consumption footprint, double its circular material use rate, and contribute to economic decarbonization by reducing the EU's carbon and material footprint. The Circular Economy Action Plan for a Cleaner and More Competitive Europe, which is central to the European Green Deal, seeks to ensure that the economy is fit for a green future and strengthen competitiveness while protecting the environment. It introduces legislative and non-legislative measures and target areas where action at the EU level brings added value. Applying ambitious circular economy measures in Europe can increase the EU's gross domestic product (GDP) by an additional 0.5% by 2030, creating around 700,000 new jobs. The Action Plan includes measures to mobilize

InvestEU. It also proposes the launch of a global circular economy alliance to explore starting a discussion on a possible international agreement on natural resource management.

## Zero Draft of HLPF Declaration Calls for Sustainable, Inclusive Growth

The Ministerial Declaration to be adopted at the 2020 session of the UN High-level Political Forum on Sustainable Development (HLPF) has been released in zero draft form. Negotiations on the text will continue from 8 June with a series of virtual informal consultations. The Declaration would commit to accelerating action to achieve the 2020 targets and requesting them to be updated for 2030.It includes a section on 'Assessment of the situation regarding the 2030 Agenda,' which highlights uneven progress in implementation of the 2030 Agenda, with some areas stalled or reversed (hunger, climate change, inequality). The draft also acknowledges the effects of the COVID-19 pandemic, asserting that "insufficient efforts" to implement the SDGs have exacerbated the pandemic's impacts (overwhelming health systems, affecting the livelihoods of half the global workforce, disrupting supply chains, and closing schools, while also expected to push tens of millions of people back into extreme poverty and hunger). The majority of the draft is a section listing 'Actions to be taken for the way forward'. The text ends with a commitment to "invest more in human capital, to empower children, adolescents and youth, as critical agents of change, and support their meaningful participation in realizing the vision of the 2030 Agenda." The 2020 HLPF takes place from 7-16 July

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