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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

CONTENTS

Trina solar records highest efficiency in PERC cells so far

INDIA

India rejoins IIASA for science and technology research

IN BRIEF

Flat-panels to transform antennas, wireless, and mobile communications
Device brings silicon computing power to brain research and prosthetics
Stretchable super-capacitors to power future wearable devices
Highly efficient and stable double layer solar cell developed

RESOURCES AND EVENTS

IIT Madras, 6 IITs to attract research on rural technologies

CORONAVIRUS PANDEMIC

PM Modi's remarks at SAARC leaders' video conference on COVID-19

Prime Minster Modi has proposed the creation of a COVID-19 Emergency Fund, based on voluntary contributions. India will make an initial offer of 10 million dollars for this fund which can be used to meet the cost of immediate actions. Other SAARC countries have pledged a total of $ 8 million so far. India is assembling a Rapid Response Team of doctors and specialists in India to be placed at the disposal of member countries, if required. India can also quickly arrange online training capsules for emergency response teams. India has set up an Integrated Disease Surveillance Portal to better trace possible virus carriers and their contacts. This software will help SAARC partners to control disease outbreaks. A common Research Platform could be created, to coordinate research on controlling epidemic diseases within the region. The Indian Council of Medical Research can offer help coordinating such an exercise. Experts from member countries can be asked to brainstorm on the longer-term economic consequences of COVID-19, and how to insulate internal trade and local value chains from its impact.

PM Modi calls for complete lockdown of entire nation for 21 days

Prime Minister Shri Narendra Modi called for a complete lockdown of the entire nation for the next 21 days beginning at midnight 24 March in an effort to contain the COVID-19 Pandemic. He said this decision was taken on the basis of scientific advice of health sector experts and experiences of other countries and that 21 days is essential to break the chain of infection. Mathematical modeling of such outbreaks suggests that such measures can flatten the curve of infection rates and gain more time for health systems to deal with the situation. Shri Modi announced that the Government has provided Rupees 150 billion ($2

billion) for strengthening the medical infrastructure and treatment of the Corona infected patients.

Government eases restrictions on Indian COVID-19 research

On March 21, the government's Empowered Committee on COVID-19 response said in a memorandum that not only could national labs use clinical samples for research but also culture the virus themselves if they had Biosafety Level 3 facilities. Constituted by the government after the COVID-19 outbreak began, the Empowered Committee is co-chaired by India's Principal Scientific Advisor K. Vijay Raghavan and NITI Aayog member Vinod Paul; and includes representatives from multiple scientific agencies. Researchers would still have to follow all ethical and safety regulations, but any permission required from bodies like ICMR would be given in a "time-bound manner. The memo could jumpstart COVID-19 research in India by asking all diagnostic facilities as well as hospitals treating COVID-19 patients to cooperate with national labs that want samples. The memorandum also boosts potential drug development for COVID-19. Both short term and long-term COVID-19 research projects stand to benefit from the Empowered Committee's move. In the longer term, if labs develop vaccine candidates, the memo will ease their attempts to evaluate the vaccines' efficacy by giving access to live virus from clinical samples. Access to clinical samples will also help develop tests capable of detecting antibodies in the blood, which last for a longer time than the virus itself. A key stipulation in the Empowered Committee's memo is that all data generated by national labs on COVID-19 has to be published in open formats which will uplift COVID-19 research collaborations in India.

Cipla and CSIR-IICT to develop drugs to treat Covid-19

Pharmaceutical company Cipla has come forward to engage with CSIR-IICT to take up manufacture of three promising chemical compounds Favipiravir, Remdesivir and Baloxavir, with anti-viral properties, to treat Covid-19. It has sought the help of the Council of Scientific & Industrial Research-Indian Institute of Chemical Technology to make the active pharma ingredients (APIs) for manufacturing them. This will enable the pharma major to start the next phase of trials, take up regulatory authority approvals and subsequent mass production of the anti-viral drugs. Favipiravir and Remdesivir have already undergone clinical trials and will not require much time to make them as the raw materials are readily available. It could take six to 10 weeks to make them. IICT will be making about 100 gm each to begin with. Cipla will follow it up with bio-equivalence tests on dogs and human trials before approaching the regulatory authority to manufacture the drug to treat Covid-19. Cipla will be investing substantial resources into the making of the drug, which should be in the market in the next six months. IICT will get royalty.

Government calls for technology proposals to combat Covid-19

To face the serious healthcare challenge due to Covid-19, on 22 March the Technology

Development Board (TDB), a statutory body under Department of Science and Technology invited applications from Indian companies and enterprises to address increasing demand for rapid diagnostic kits, oxygenators and ventilators for the Covid-19 patients. The government is focusing on supporting development of rapid innovative solutions like low-cost masks, cost-effective thermal scanning devices, technologies for sanitization of large areas like electrostatic spray as well as AI based solutions for contactless entry, rapid diagnostic kits, portable oxygenators and ventilators to monitor and control the spread of the new coronavirus. The new proposals can be submitted on the website on the official website of the Technology Development Board (TDB) on or before 27th March, after which they would be evaluated on the basis of scientific, technical, commercial, and financial merits. The Board provides financial assistance in the form of soft loans (up to 50% of project cost at 5% simple interest per annum), equity participation (up to a maximum of 25% of the project cost) or grant in exceptional cases to encourage the commercial application of indigenously developed technology and for adapting imported technology for wider domestic applications.

Government speeds clearance for India-made COVID-19 testing kits

The National Institute of Virology (NIV) is expected to give its go-ahead for domestic COVID-19 testing kits allowing Indian manufacturers to step in and ensure there is no shortage. While the kits developed by six firms are under examination, the NIV has validated the kit manufactured by two private firms. India is currently using diagnostic kits developed by the NIV to detect COVID-19. It is also importing kits developed by the Swiss healthcare company Roche through the World Health Organisation (WHO). The NIV and other government laboratories have 1 lakh testing kits, with the government ordering the import of 10 lakh probes - a component used in testing kits - from Germany to assemble more. A research proposal has been invited under the science and technology consortium (formed to deal with COVID-19, comprising the ICMR, the Institute of Genomics and Integrative Biology or IGIB, the Department of Science & Technology and the DBT) and the Union Science & Technology Ministry is coordinating efforts. Officials in the ICMR said that India is working on testing a kind of immunoglobulin therapy that is also being examined in Japan as a cure for COVID-19 - injecting blood plasma from recovered people into patients. There are also efforts by the Ministry of Science and Technology to devise an app that deploys artificial intelligence and travel data to trace possible COVID-19 patients.

Govt sets up science and tech core team to coordinate efforts against coronavirus

The government has set up a ‘science and technology core team’ on COVID-19 to help the Indian scientific community coordinate its efforts to find immediate solutions to the ongoing coronavirus pandemic. The S&T Core-team on COVID-19 will reach out to scientific clusters and “help define problems that need urgent and immediate solutions”.

According to Dr Vijay Raghavan, Pricinpal Scientific Advisor, the efforts of clinicians and health workers in the country would greatly benefit from inputs from science, technology, and innovation (STI). In addition to the "top-down" efforts of various departments and ministries scientists need to proactively work together to ensure synergy and develop implementable solutions that health-workers and communities need. The scientific adviser pointed out that clusters of scientific research institutions and industries need to form a collaborative team and leadership. Each of them can map out their strengths and identify what key COVID-19 problems they will address and solve.

Covid-19: Task force to map technologies to fund nearly market-ready solutions

The Department of Science and Technology (DST) has set up a Covid-19 task force for mapping of technologies to fund nearly market-ready solutions in the area of diagnostics, testing, healthcare delivery solutions and equipment supplies. The task force will map technologies from research and development labs, academic institutions, start-ups, and Micro, Small and Medium Enterprises (MSMEs). Some of these solutions are masks and other protective gear, sanitisers and affordable kits for screening for the coronavirus. Ventilators, oxygenators, data analytics for tracking, monitoring and controlling the spread of the virus through artificial intelligence are also being mapped. The task force will identify the most promising start-ups that are close to scale up their production in these areas.

Mahindra to make ventilators worth ?10 lakhs for just ?7,500

Mahindra & Mahindra expects to come up with a sophisticated ventilator at just Rs 7,500, which otherwise costs up to Rs 10 lakh, as it seeks to assist in combating coronavirus pandemic and to meet the shortage of ventilators. M&M along with two large PSUs are working with an existing manufacturer of high specification ventilators to help them to simplify design and scale up capacity, while on the other hand they are working on an automated version of the Bag Valve Mask ventilator (commonly known as Ambu bag). The company hopes to get approval for a prototype of an automated version of bag valve mask ventilator and thereafter to make this design available to all for manufacturing. Mahindra Group will also work on how its manufacturing facilities can make ventilators.

Epidemic response group reports rapid progress in COVID-19 vaccine

The Coalition for Epidemic Preparedness Innovations (CEPI) is funding six Coronavirus vaccine development projects, CEPI aims to have millions of doses available for public use within 12 to 18 months, which is a much accelerated timeline.

EU boosts efforts to adjust R&D programmes to Coronavirus crisis

The European Commission is ramping up funding for research and development of treatments and vaccines against Covid19. EU institutions are adding to the growing number of funding opportunities for research and development of COVID-19 vaccines and cures.

The European Investment Bank (EIB) will use its InnovFin Infectious Disease Finance Facility, to finance research in addition to €40 billion in emergency funding to support the economy through the crisis. The Commission announced a funding opportunity with a budget of €10 million for research projects working on prevention, drugs and vaccines, since supplemented by another €37.5 million. The commission announced €80 million of financial support for German biotech CureVac, to support the development of a vaccine against the virus, in addition to €45 million budget for the development of treatments. The commission is also giving €164 million to start-ups and small and medium sized companies with technologies and innovations that could help in treating, testing, monitoring or other aspects of the COVID-19 outbreak.

The race for a COVID-19 vaccine

The global race to develop a vaccine against a corona-virus is gaining momentum.. Vaccine developers have worked with unprecedented speed since the first genome sequence of the COVID-19 virus was released in January, and the first Phase I trial with human volunteer was tried with Moderna Inc's candidate mRNA-127 in mid-March. Other vaccine candidates are close to being tested in humans. In total, the World Health Organisation lists 41 research groups and pharmaceutical companies currently working to develop a vaccine.

A possible treatment for COVID-19 and an approach for developing others

SARS-CoV-2, the virus that causes COVID-19 disease is a close relative of SARS-CoV. Remdesivir, an antiviral was recently tested in a non-human primate model of MERS-CoV infection. Remdesivir has also shown effectiveness against a wide range of coronaviruses. It has already undergone safety testing in clinical trials for Ebola, thereby reducing the time that would be necessary for conducting clinical trials for SARS-CoV-2.

Standardizing COVID-19 data analysis to aid international research efforts

Researchers from the Centre for Genomic Regulation (CRG) have launched a new database to advance the international research efforts studying COVID-19. The publicly-available, free-to-use resource (https://covid.crg.eu) can be used by researchers from around the world to study how different variations of the virus grow, mutate and make proteins. The database will help researchers more quickly and accurately spot the strengths and weaknesses of the coronavirus.

GLOBAL

Nanostructured rubber-like material could replace human tissue

Researchers from Chalmers University of Technology, Sweden, have created a new, rubber-like material with a unique set of properties, which could act as a replacement for

human tissue in medical procedures. The material has the potential to make a big difference to many people's lives. It consists solely of components that have already been shown to work well in the body. The foundation of the material is the same as plexiglass, a material which is common in medical technology applications. Through redesigning its makeup, and through a process called nanostructuring, they gave the newly patented material that is very soft, flexible and extremely elastic. The new rubber-like material may be appropriate for many applications which require an uncommon combination of properties - high elasticity, easy processability, and suitability for medical uses such as urinary catheters. The material can be constructed in such a way that prevents bacteria from growing on the surface which can treated so that it becomes antibacterial, in a natural, non-toxic way by sticking antimicrobial peptides onto its surface. The new material can be injected and inserted via keyhole surgery; it can also help reduce the need for drastic surgery and operations to rebuild parts of the body. The material can be injected via a standard cannula as a viscous fluid, so that it forms its own elastic structures within the body. Or, the material can also be 3D printed into specific structures as required. A further advantage of the material is that it contains three-dimensionally ordered nanopores. This means it can be loaded with medicine, for various therapeutic purposes such as improving healing and reducing inflammation and allows for localised treatment. Since it is non-toxic, it also works well as filler - the researchers see plastic surgery therefore as another very interesting potential area of application for the new material. A start-up company Amferia and Chalmers Ventures has been set up to exploit this development.

Creating stretchable thermoelectric generators

For the first time, a soft and stretchable organic thermoelectric module has been created that can harvest energy from body heat. Researchers at the Laboratory of Organic Electronics at Linköping University have developed an organic composite material with unique properties -- not only is it soft and stretchable, it also has a high electrical conductivity and good thermoelectric properties. This makes it ideal for many wearable applications. The researchers combined three materials: the conducting polymer PEDOT: PSS, a water-soluble polyurethane rubber, and an ionic liquid. The result is a composite with unique properties. The PEDOT: PSS gives it thermoelectric properties, the rubber provides elasticity, and the ionic liquid ensures softness. The material is 100 times softer and 100 times more stretchable than PEDOT:PSS. The ability to control the structure of the material both at the nano-scale and the micro-scale enables combining the excellent properties of the different materials in a composite. The new composite is also printable. The researchers see a huge range of new possibilities using the material to create soft and elastic organic conducting materials. There are many applications, such as thermoelectric generators, super-capacitors, batteries, sensors, and in wearable and implantable applications that require thick, elastic and electrically conducting materials.

Terahertz wave technology advances further

Terahertz (THz) waves (100 to 3000 Ghz) are useful for their distinctive properties: they can penetrate paper, clothing, wood and walls, as well as detect air pollution and could revolutionize security and medical imaging systems and carry vast quantities of data could hold the key to faster wireless communications. THz wave technology is already used in some airports to scan passengers and detect dangerous objects and substances. Researchers at EPFL have now built a nanodevice that can generate extremely high-power signals in just a few picoseconds, or one trillionth of a second, -- which produces high-power THz waves. The technology, which can be mounted on a chip or a flexible medium, could one day be installed in smartphones and other hand-held devices. The compact, inexpensive, fully electric nanodevice consists of two metal plates situated very close together, down to 20 nanometers apart. When a voltage is applied, electrons surge towards one of the plates, where they form a nanoplasma. Once the voltage reaches a certain threshold, the electrons are emitted almost instantly to the second plate. This rapid movement enabled by such fast switches creates a high-intensity pulse that produces high-frequency waves. Another team at Helmholtz-Zentrum Dresden-Rossendorf (HZDR), TU Dresden and the University of Konstanz have developed a germanium component that generates short terahertz pulses with an advantageous property: the pulses have an extreme broadband spectrum and thus deliver many different terahertz frequencies at the same time. The team used an ion accelerator to shoot gold atoms into a germanium crystal to a depth of 100 nanometers, followed by heating the crystal for several hours at 900 degrees Celsius, ensuring even distribution of the gold atoms in the germanium crystal. The team illuminatedthe gold doped germanium with ultra-short laser pulses forming charge carriers. These charges are accelerated by applying voltage which enforces the generation of a terahertz waves. This method facilitates terahertz pulses with an extremely broad bandwidth: instead of 7 terahertz using the established gallium-arsenide technique, it is now ten times greater - 70 terahertz. Another benefit is that, effectively, germanium components can be processed with the same technology that is used for microchips.

Trina solar records highest efficiency in PERC cells so far

The China-based solar cell and module manufacturer Trina Solar has announced the fabrication of Passivated Emitter Rear Cells (PERC) with a 23.39% power conversion efficiency rate by using only standard manufacturing equipment. This is the highest conversion efficiency, available so far, and confirmed by ISO/IEC 17025 certified calibration laboratory for such an industrial cell. Trina Solar along with Adani, and Risen Energy (China) are among the top three suppliers of solar modules in India in terms of shipments.

INDIA

India rejoins IIASA for science and technology research

Recognizing the mutual benefits of scientific collaboration in a broad field of activities of global concern and interest, India has rejoined the International Institute for Applied Systems Analysis (IIASA) as a full member through the Technology Information, Forecasting, and Assessment Council (TIFAC). Research collaborations between IIASA and India stretch back to the 1970s and have provided a global perspective, interdisciplinary research expertise, and policy relevance to issues ranging from the future of India's energy system to tackling air pollution. This partnership is set to be strengthened and expanded by the country's membership of IIASA with TIFAC representing India as National Member Organization on the IIASA Council. India was a full member of IIASA from January 2007 to November 2017, and an observer from November 2017 to the end of 2019. As part of the new Memorandum of Understanding signed between IIASA and TIFAC, six priority research areas were identified taking into account the shared objectives of the IIASA and Indian research agendas; the potential to engage with wide ranging research, academic, and policy partners across India and Asia; and the interests of policymakers and researchers in India and the international community. The areas that will be addressed over the next five years include: the Sustainable Development Goals (SDGs), India's National Clean Air Action Program, Disaster and Climate Resilience on the Indian subcontinent, Artificial Intelligence and Digital India, the Indian Energy Model, and NEXUS – An Integrated Solution to Water, Energy, Land, and Ecosystem Security. Indian membership of IIASA will also provide many new opportunities for Indian scientists, including participation in the institute's capacity building activities. These activities will help Indian researchers develop interdisciplinary research skills, as well as forge international research relationships.

IN BRIEF

Flat-panels to transform antennas, wireless, and mobile communications

Researchers at Los Alamos National Laboratory are reinventing the mirror, at least for microwaves, using flat panels that are compact, versatile, and better adapted for modern communication technologies. The flat-panel reflector can be controlled electronically, which means its characteristics can be reconfigured on the fly. This opens the window for beam steering, customized focusing, and other functions that are difficult to achieve with conventional antenna designs. The reflectors are composed of an array of finely structured electronic components on a planar surface. Applying signals to the components allows the 2-D reflector to perform much like a 3-D antenna, and in some cases do things no conventional antenna could do. By applying electrical signals to the reflector components, the researchers managed to modulate the metasurface to control the direction and frequency of reflected light. The new development opens exciting opportunities in various applications, including adaptive optics that can account for distortions that disrupt signals, one-way wireless transmission, and novel antenna designs for civil and military applications.

Device brings silicon computing power to brain research and prosthetics

Researchers at Stanford University have developed a new device for connecting the brain directly to silicon-based technologies. While brain-machine interface devices already exist -- and are used for prosthetics, disease treatment and brain research -- this latest device can record more data while being less intrusive than existing options. The device contains a bundle of microwires, with each wire less than half the width of the thinnest human hair. These thin wires can be gently inserted into the brain and connected on the outside directly to a silicon chip that records the electrical brain signals passing by each wire. Current versions of the device include hundreds of microwires but future versions could contain thousands. With this microwire array, one can see what's happening on the single-neuron level. The researchers tested their brain-machine interface on isolated retinal cells from rats and in the brains of living mice. In both cases, they successfully obtained meaningful signals across the array's hundreds of channels. Ongoing research will further determine how long the device can remain in the brain and what these signals can reveal. Following their initial tests on the retina and in mice, the researchers are now conducting longer-term animal studies to check the durability of the array and the performance of large-scale versions. The researchers are optimistic about being able to someday use the array to improve medical technologies for humans, such as mechanical prosthetics and devices that help restore speech and vision.

Stretchable supercapacitors to power tomorrow's wearable devices

Researchers at Duke University and Michigan State University have engineered a novel type of supercapacitor that remains fully functional even when stretched to eight times its original size. It does not exhibit any wear and tear from being stretched repeatedly and loses only a few percentage points of energy performance after 10,000 cycles of charging and discharging. The stretchable supercapacitors were made of a patch of millions of carbon nanotubes just 15 nanometers in diameter and 20-30 micrometers tall -- on top of a silicon wafer. The researchers then coat a thin layer of gold nanofilm on top of the carbon nanotube forest. The gold layer acts as an electric collector, dropping the resistance of the device an order of magnitude below previous versions, which allows the device to charge and discharge much faster. The carbon nanotube forest is transferred to a pre-stretched elastomer substrate with the base gold-side-down. The gel-filled electrode is then relaxed to allow the pre-strain to release, causing it to shrink to a quarter of its original size. This process crumples up the thin layer of gold and smashes together the "trees" in the carbon nanotube forest. The crumpling greatly increases the amount of surface area available in a small amount of space, which increases the amount of charge it can hold. The super dense forest is then filled with a gel electrolyte that can trap electrons on the surface of the nanotubes. When two of these final electrodes are sandwiched close together, an applied voltage loads one side with electrons while the other is drained, creating a charged super-stretchable supercapacitor. Stretchable supercapacitors could power some futuristic

devices on their own, or they could be combined with other components to overcome engineering challenges.

Highly efficient and stable double layer solar cell developed

An international research team led by the Department of Materials Science and Engineering at KAIST, has developed a new type of solar cell that can both withstand environmental hazards and is 26.7% efficient in power conversion. They built a double layer solar cell, called tandem, in which two or more light absorbers are stacked together to better utilize solar energy. To use perovskite in these tandem devices, the scientists modified the material's optical property, which allows it to absorb a wider range of solar energy and engineered combinations of molecules composing a two-dimensional layer in the perovskite, stabilizing the solar cells. The engineering method used carefully controls the mixing ratio of the molecules building the two-dimensional layer. It improved efficiency of the resulting solar cell but also gained durability, retaining 80 percent of its initial power conversion capability even after 1,000 hours of continuous illumination. This is the first time such a high efficiency has been achieved with a wide bandgap perovskite single layer The researchers, having stabilized the wide bandgap perovskite material, are now focused on developing even more efficient tandem solar cells that are expected to have more than 30% of power conversion efficiency, something that no one has achieved yet, This development could contribute to making the planet healthier.

RESOURCES AND EVENTS

IIT Madras, 6 IITs to attract research on rural technologies

The Indian Institute of Technology Madras has joined hands with the Rural Technology Action Groups (RuTAG) of six other IITs to organize a three-day International Conference on 'Rural Technology Development and Delivery' to attract more mainstream research in rural technologies. RuTAG centers have been established at seven IITs (Madras, Guwahati, Kharagpur, Delhi, Roorkee, Bombay, and Kanpur). The conclave themes are on rural technology solutions like innovative designs for rural livelihoods, water resources, energy systems, landscapes and rural environment and smart technologies for rural development: education, healthcare and ICT.

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