



## NEWS ALERT

*Forum for Indian Science Diplomacy*

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### GLOBAL

#### [Discussions on to open-up Horizon Europe to other countries](#)

The next steps towards opening up the EU's massive €94.1 billion Horizon Europe R&D programme to other countries in the world will begin on 10 February. Rules of access for non-EU countries to Horizon Europe are still to be agreed at the inter-institutional level, along with provisions related to synergies with other EU programmes. The overall EU budget for 2021-2027 still needs to be agreed by member states, which has delayed action on rules for EU research association. A new commission proposal for Horizon Europe is to

extend associate membership – which offers the best entry terms for non-EU countries – to those outside the European Economic Area and the Enlargement and European Neighbourhood countries, which are currently eligible for association status. Now, countries anywhere in the world with a developed research and development capacity are being offered the chance to pay in and collaborate with the EU, under a reform of the current Horizon 2020 programme. Australia, Canada, Japan, New Zealand, Singapore and South Korea have expressed interest in associate membership of the successor Horizon Europe programme starting in 2021. That would mean their researchers could obtain Horizon funding, as part of EU research consortia. The countries have to fulfil EU “like-mindedness” criteria, such as having democratic institutions that protect intellectual property rights. Exploratory talks with interested countries will start in earnest once EU leaders agree on the terms for international cooperation. The association process with non-EU countries needs to be completed by the autumn of 2021, which is the deadline for the first round of Horizon Europe funding calls. The European Parliament and member states will now have to decide on the terms for Horizon membership. One possibility is that non-EU countries may have “partial” association to specific parts, or pillars of the programme, which are in basic science, global challenge research, and innovation.

### **Researchers invent fastest high-precision 3D printer**

3D printers working in the millimetre range and larger are increasingly used in industrial production processes. Many applications, however, require precise printing on the micrometer scale at a far higher speed. Researchers of Karlsruhe Institute of Technology (KIT) have now developed a system to print highly precise, centimetre-sized objects with sub-micrometer details at a so-far unmatched speed. To demonstrate not only the speed but also the reliability of their setup, the researchers have printed a lattice structure of 60 cubic millimetres in size with details down to the micrometer scale. It contains more than 300 billion voxels (a voxel is the 3D counterpart of a pixel or 2D picture element). For this type of 3D printing, the beam of a laser passes a liquid photoresist in a computer-controlled manner. The material located in the focus of the laser only is exposed and hardened. The focal points correspond to the nozzles of an inkjet printer, the only difference being that they work three-dimensionally. In this way, highly precise filigree structures can be produced for various applications, such as optics and photonics, material sciences, bioengineering, or safety engineering. Scientists of KIT and Queensland University of Technology (QUT) in Brisbane/Australia have now developed a new system using special optics, dividing the laser beam into nine partial beams that focus on a focal point each. All nine partial beams can be used in parallel and, thanks to improved electronic control, they can be moved precisely much more rapidly than ever. This and some other technical improvements made the researchers reach 3D printing speeds of about 10 million voxels per second, which corresponds to the speed reached by graphical 2D inkjet printers.

### **Scientists develop new gene-editing tools for human stem cells**

During the past decade, the gene editing tool CRISPR has transformed biology and opened up hopeful avenues to correct deadly inherited diseases. Last fall, scientists began the first human clinical trials using CRISPR to combat diseases like cancer. They remove some of a person’s cells, CRISPR edit the DNA, and then inject the cells back in, where hopefully, they will cure the disease. But along with this promise of regenerative, personalised medicine, CRISPR can also have significant safety limitations. CRISPR may not edit in the right place (so-called off-target gene effects) or not being very efficient (successful editing may only be achieved in about 10 percent of the time for every available cell target). Now, researchers have used a new update to the CRISPR base editing technology to make highly accurate, single DNA base editing with an efficiency of up to 90 percent of human stem cells. The new TREE method (an acronym short for transient reporter for editing enrichment, or TREE), allows for bulk enrichment of DNA base-edited cell populations -- and for the first time, high efficiency in human stem cell lines. Unlike CRISPR, which cuts across both DNA strands, their TREE method only makes a single-strand nick in DNA. For example, when a single DNA base is successfully edited from a C to a T, a protein gives off

a signal, turning from blue to green. The research targeted the APOE gene, which can come in three flavours. One of the three gene variants, called APOE4, has been associated with a higher risk for late-onset Alzheimer's disease. For the study, they introduced single DNA based edits into the APOE gene. Not only could TREE make single DNA edits to the APOE4 gene, but unlike CRISPR, make highly accurate corrections to both copies of the APOE4 gene that humans possess. In addition, TREE could also be used to engineer critical gene knockout mutations into stem cell lines. While diseases like sickle-cell anaemia or cystic fibrosis are caused by single mutations in DNA, for most diseases and leading causes of death, like heart disease or high blood pressure, are complex, and involve multiple genes.

### **[Crystal-stacking process can produce new materials for high-tech devices](#)**

The magnetic, conductive and optical properties of complex oxides make them key to components of next-generation electronics used for data storage, sensing, energy technologies, biomedical devices and many other applications. Using a new platform developed by engineers at the University of Wisconsin-Madison and the Massachusetts Institute of Technology, researchers were able to create ultrathin complex oxide single-crystal layers, using graphene as the peel-away intermediate. The team demonstrated the efficacy of the technique using materials such as perovskite, spinel and garnet, among several others. They also can stack single complex oxide materials and semiconductors. The advance opens doors to new materials with functionalities that drive future technologies. The ability to create perfect interfaces while coupling disparate classes of complex materials may enable entirely new behaviours and tunable properties, which could potentially be leveraged for new capabilities in communications, reconfigurable sensors, low power electronics, and quantum information science.

### **[A solar-powered water desalination System developed at MIT](#)**

A completely passive solar-powered desalination system developed by researchers at MIT and in China could provide more than 6 litres of fresh drinking water per hour for every square meter of solar collecting area. Such systems could potentially serve off-grid arid coastal areas to provide an efficient, low-cost water source. The system uses multiple layers of flat solar evaporators and condensers, lined up in a vertical array and topped with transparent aerogel insulation. The key to the system's efficiency lies in the way it uses each of the multiple stages to desalinate the water. At each stage, heat released by the previous stage is harnessed instead of wasted. In this way, the team's demonstration device can achieve an overall efficiency of 38 percent in converting the energy of sunlight into the energy of water evaporation. The device is essentially a multilayer solar still, with a set of evaporating and condensing components like those used to distil liquor. It uses flat panels to absorb heat and then transfer that heat to a layer of water so that it begins to evaporate. The vapour then condenses on the next panel. That water gets collected, while the heat from the vapour condensation gets passed to the next layer, recycling the solar heat and boosting the overall efficiency. The team settled on a 10-stage system for their proof-of-concept device, which was tested on an MIT building rooftop. The system delivered pure water that exceeded city drinking water standards, at a rate of 5.78 liters per square meter of solar collecting area. This is more than two times as much as the record amount previously produced by any such passive solar-powered desalination system. Unlike some desalination systems; there is no accumulation of salt or concentrated brines to be disposed of. In a free-floating configuration, any salt that accumulates during the day would simply be carried back out at night through the wicking material and back into the seawater, according to the researchers. Their demonstration unit was built mostly from inexpensive, readily available materials such as a commercial black solar absorber and paper towels for a capillary wick to carry the water into contact with the solar absorber.

### **[India's EdTech Industry becomes second largest in the World](#)**

RS Components has released a new report on the EdTech sector. The US has the highest number of EdTech enterprises, with 43% (1,385) of all EdTech company headquarters

being based in the US. India is home to the second-highest number of EdTech companies (327), followed by Brazil (275), the United Kingdom (245) and China (101). Indian EdTech start-up company BYJU'S is leading the way with the highest amount of venture capital raised. With a predicted market value set to reach \$252 billion in 2020, EdTech start-ups are on the rise all over the world. India's EdTech start-up, BYJU's, has raised the highest amount of capital, at \$969 million. Seven of the highest funded companies are based in the US, with the likes of Coursera, Laureate Education and 2U Inc. attracting a total of \$313.1 million, \$400 million and \$426.8 million, respectively. EdTech is clearly seeing a huge boom at the moment, with acquisitions on the rise and its market value set to hit \$252 billion this year, so tech entrepreneurs all over the world are bringing their talents to the industry.

## INDIA

### [India announces National Mission on Quantum Technologies & Applications](#)

The government in its budget 2020 has announced a National Mission on Quantum Technologies & Applications (NM-QTA) with a total budget outlay of Rs 80 billion for a period of five years to be implemented by the Department of Science & Technology (DST). The Mission will be able to address the ever-increasing technological requirements of the society, and take into account the international technology trends and road maps of leading countries for development of next generation technologies. Implementation of the mission would help develop and bring quantum computers, secured communications through fibre and free space, quantum encryption and crypt-analysis and associated technologies within reach in the country and help address India specific national and regional issues. The mission will help prepare next-generation skilled manpower, boost translational research and also encourage entrepreneurship and start-up ecosystem development. By promoting advanced research in quantum science and technology, technology development and higher education in science, technology and engineering disciplines, India can be brought at par with other advanced countries and can derive several direct and indirect benefits.

### [Production of silver nanowires through inexpensive technology](#)

The importance of nanowires has been steadily increasing in the development of various nano-electronic devices, ranging from conductor inks used in electronic circuit manufacturing to the production of touch screens and infrared shields. Researchers at National Chemical Laboratory (NCL), Pune have developed an inexpensive technology for manufacturing of precision silver nanowires that can be used in future nano-electronic devices. A pilot plant for continuous flow manufacture of silver nanowires inaugurated recently at the NCL campus can produce as much as 500 grams a day and is scalable to any desired production rates. The international market price of silver nanowires of different sizes (20 to 100-nanometer diameter) varies from Rs. 18,000 to Rs. 43,000 per gram. The silver nanowires produced from this technology are at least 12 times cheaper than the global rates. Also, the process can be adjusted to manufacture a wide range of nanowires suitable for a variety of applications. The technology was developed by the Chemical Engineering and Process Development Division, NCL, under the Advanced Manufacturing Technologies (AMT) initiative by the Department of Science and Technology (DST).

### [IIT-Hyderabad based start-up launches first-of-its-kind electric scooter](#)

Pure EV, a start-up incubated at the Indian Institute of Technology, Hyderabad, launched its High Speed Electric Scooter 'E-Pluto 7G' at the institute's campus. Being launched at an ex-showroom price of Rs 79,999, the vehicle offers affordability, long range of 90 km, a top speed of 60 KMPH and battery warranty for 40,000 KM..A unique point of this vehicle is that the battery and the vehicle have been designed and developed after factoring in Indian terrain and weather conditions; the company has a manufacturing capacity of 2000 units per month at its facility co-located with the campus. It aims to deploy over 10,000 Electric Vehicles on the road during the current calendar year. Pure EV has established a 40,000-square foot state-of-the-art facility, co-located with IIT Hyderabad, for cutting-

## IN BRIEF

### [Coronavirus outbreak and the challenge of bat viruses](#)

It's no coincidence that some of the worst viral disease outbreaks in recent years -- SARS, MERS, Ebola, Marburg and likely the newly arrived 2019-nCoV virus -- originated in bats. A new University of California, Berkeley, study finds that bats' fierce immune response to viruses could drive viruses to replicate faster, so that when they jump to mammals with average immune systems, such as humans, the viruses wreak deadly havoc. Some bats - including those known to be the original source of human infections - have been shown to host immune systems that are perpetually primed to mount defences against viruses. Viral infection in these bats leads to a swift response that walls the virus out of cells. While this may protect the bats from getting infected with high viral loads, it encourages these viruses to reproduce more quickly within a host before a defence can be mounted. This makes bats a unique reservoir of rapidly reproducing and highly transmissible viruses. While the bats can tolerate viruses like these, when these bat viruses then move into animals that lack a fast-response immune system, the viruses quickly overwhelm their new hosts, leading to high fatality rates.

### [New technology could help solve AI's 'memory' problems](#)

Memory-hungry, power-sapping big data might finally have met its match. Electrical engineers at North-western University and the University of Messina in Italy have developed a new magnetic memory device that could potentially support the surge of data-centric computing, which requires ever-increasing power, storage and speed. Based on antiferromagnetic (AFM) materials, the device is the smallest of its kind ever demonstrated and operates with record-low electrical current to write data. The rise of big data and the emergence of artificial intelligence (AI) are challenging the capability of existing hardware. The new technology potentially could solve this challenge.

### [New technique significantly reduces pathogen identification time](#)

Scientists based in Saskatoon, Canada, developed a rapid, simple laboratory and field-adaptable DNA extraction method that allowed them to identify both plant pathogen and insect vector using molecular bar-coding and gene sequencing. This method reduced the time from collection of insects to a positive identification of the presence of a pathogen from up to two weeks to less than one hour. To achieve this quick turnaround. The team used DNA lysis paper to extract pathogen DNA combined with the rapid-detection potential of the sensitive and field-adaptable loop-mediated isothermal amplification (LAMP) assay. While this research focuses on agriculture, this technique has potential applications to horticulture as well as animal and human health.

### [Silica increases water availability for plants](#)

Researchers at the University of Bayreuth and the Leibniz Centre for Agricultural Landscape Research (ZALF) have now discovered a way to mitigate the drought problem: Amorphous silica is able to significantly increase the amount of available water for plants. This offers an opportunity to enhance global food security despite climate change. They suggest a soil management that ensures higher amorphous silica content. The scientists have systematically investigated how amorphous silica affects the ability of soils to absorb and store water, for the first time. Even if the proportion of amorphous silica in soils increases by just one percent by weight, the amount of plant available water in soils increases by up to 40 percent - or even more. This is because gels, which contain enormous amounts of water, form in the soil out of amorphous silica molecules. These water supplies are easily accessible to the roots of plants. This suggests that soil management should be modified to increase the amorphous silica stocks in soils. Moreover, artificially produced amorphous

silica - which has the same chemical properties as the biogenic silica - should be used as soil amendments. Such soil silica management may play an important role in global food security in the future.

## RESOURCES AND EVENTS

### [UK launches new visa regime for leading scientist and researchers](#)

The UK government has announced its new fast-track, visa scheme for leading scientists to come into effect on February 20, with no limit on numbers and no need for applicants to have found a job before arriving in the country. The Global Talent route will replace the existing Tier One visa for highly skilled migrants, which were capped at 2,000 per year. The new system, announced on the eve of UK's departure from the EU, will be open to those who work in a qualifying field and who have been recommended by a recognised UK body such as the Royal Society, or the Royal Academy of Engineering. The approval process will be managed by UK Research and Innovation, the agency which oversees the public research budget. Applicants won't need a job offer before arriving in the country and will be assessed more quickly for settlement once accepted. Venki Ramakrishnan, president of the Royal Society, said the new visa system is welcome and attractive. The changes are part of what the government promises will be wider reforms to enable greater openness to scientific talent from around the world, even as freedom of movement between the UK and EU is expected to end after the Brexit transition period on 31 December 2020. The government is also poised to reform UKRI's systems and processes.

### [Atal Innovation Mission collaborates with Ministries to stimulate Innovation](#)

With a vision to bring together the stakeholders of the food processing and agriculture sector in India, Atal Innovation Mission, NITI Aayog (AIM) started a series of innovation demo days where start-ups, Micro, Small and Medium Enterprises (MSMEs), entrepreneurs, corporate partners and sector academics are brought together for a showcase of government-funded innovations. The first such event was held in association with Ministry of Food Processing Industries and Ministry of Agriculture & Farmers Welfare at Atal Incubation Centre (AIC) - Entrepreneurship & Management Process International (EMPI) Business school, New Delhi. The innovation demo day series initiative aims at promoting commercialisation of technologies funded by the Ministries of Agriculture and Farmers Welfare and Food Processing and Industries. It also aims at connecting innovation with sectors like Indian MSME industry and government funded research industries. ARISE demo day is an initial attempt to stimulate and showcase innovation in various sectors. The idea is to support start-ups better.

### [Prime Minister inaugurates DefExpo 2020](#)

Prime Minister Shri Narendra Modi, inaugurated the 11th edition of DefExpo in Lucknow, Uttar Pradesh. India's biennial military exhibition seeks to showcase the potential of the country as a global defence manufacturing hub. DefExpo 2020 has become one of India's largest defence exhibition platforms as well as one of the Top DefExpo in the world. This time more than a thousand defence manufacturers and 150 companies from all over the world are part of this Expo. Prime Minister said that 'Make in India' will not only increase India's security but create new opportunities for employment and will also boost Defence Exports in future.

### [UNIDO organizes workshop on Science, Technology and Innovation for SDGs](#)

A three-day workshop on Science, Technology and Innovation (STI) for the SDGs was inaugurated today in UNO City, Vienna. The event was co-organized by the United Nations Department of Economic and Social Affairs (DESA), the UN Conference on Trade and Development (UNCTAD), the UN Office for Sustainable Development (UNOSD), the UN Office of Outer Space Affairs (OOSA), and the United Nations Industrial Development Organization (UNIDO). It brought together a wide range of participants including experts from governments, the private sector, academia, non-governmental organizations and the UN system. The event supports the preparation of the

5th STI Forum to make an effective contribution to the 2020 High-Level Political Forum on Sustainable Development (HLPF) and the future work of the UN report STI for SDGs.

### [RIS organises discussion on India's Strategic Identity](#)

Dr Anil Kakodkar, former chairman of the Atomic Energy Commission warned that the tipping-point for climate change issues was fast approaching and added that India's clean energy future "invariably depends" on the rapid growth of its nuclear power. He added that the climate crisis is becoming deeper and that the implementation of the atomic energy programme will become more urgent. Kakodkar was speaking at the discussion on his book, *Fire and Fury: Transforming India's Strategic Identity* organised by Research and Information System for Developing Countries (RIS). According to Kakodkar, who was instrumental in the signing of the US-India civil nuclear deal in 2006, India's entry into the civil nuclear market will not only boost the country's economic growth but will also enhance India's global standing. The book has been co-authored by Suresh Gangotra, senior technical advisor to the AEC chairman.

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