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NEWS ALERT

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GLOBAL

[New delivery system improves efficacy of anti-malaria drug Artemisone](#)

A team from Martin Luther University Halle-Wittenberg (MLU) and the Hebrew University of Jerusalem have developed a self-micro emulsifying drug delivery system (SMEDDS) that overcomes limitations of poor aqueous solubility and limited chemical

stability of Artemisone (ART). The team demonstrated the efficacy of this formulation against experimental cerebral malaria in mice and the impact of its administration using different routes (gavage, intranasal delivery, and parenteral injections) and frequency on the efficacy of the treatment. The minimal effective daily oral dose was 20?mg/kg. Splitting a dose of 20?mg/kg ART by administering two doses of 10?mg/kg each every 12?h, was highly effective and gave far superior results compared to 20?mg/kg once daily. The best results were obtained with nasal treatment; oral treatment was ranked second, and the least effective route of administration was intra-peritoneal injection. A complete cure of experimental cerebral malaria could be achieved through choosing the optimal route of application, dose, and dosing interval. The SMEDDS formulations tested consisted of combinations of polar lipid excipients that provides high solubility (59?mg/g) and stability of ART in both the water-free SMEDDS itself and the corresponding micro emulsions generated by the addition of water or Phosphate buffered saline. The developed formulation combines easy manufacturing with high stability and could be a successful and very versatile carrier for the delivery of ART in the treatment of human severe malaria and for other drugs and diseases.

[mRNA vaccine yields full protection against malaria in mice](#)

Scientists led by the Walter Reed Army Institute of Research and Naval Medical Research Center have developed a novel vaccine based on mRNA technology that protects against malaria in animal models. The most advanced malaria vaccine is RTS,S - a first-generation product based on the circumsporozoite protein of *P. falciparum*, the most dangerous and widespread species of malaria parasite. However, field studies have revealed limited sterile efficacy and duration of protection. The new mRNA based vaccine relies on *P. falciparum*'s circumsporozoite protein to elicit an immune response. It uses mRNA--accompanied by a lipid nanoparticle which protects from premature degradation and helps stimulate the immune system, to prompt cells to code for circumsporozoite protein themselves. Those proteins then trigger a protective response against malaria but cannot actually cause infection. The vaccine achieved high levels of protection against malaria infection in mice. More work remains before clinical testing to develop an effective, mRNA-based malaria vaccine.

[AI system-on-chip runs on solar power](#)

Swiss Center for Electronics and Microtechnology (CSEM) engineers have developed a new system-on-chip which runs on a tiny battery or a small solar cell and executes AI operations locally on the chip rather than in the cloud. The system is fully modular and can be tailored to any application where real-time signal and image processing is required, especially when sensitive data are involved. The CSEM system-on-chip consists of an ASIC chip with a RISC-V processor (also developed at CSEM) and two tightly coupled machine-learning accelerators. The first is a binary decision tree (BDT) engine that can perform simple tasks but cannot carry out recognition operations. The second accelerator is a convolutional neural network (CNN) engine that can perform these more complicated tasks recognizing individual faces and detecting specific words but it also consumes more energy. This two-tiered data processing approach drastically reduces the system's power requirement, since most of the time only the first accelerator is running. The engineers enhanced the performance of the accelerators themselves, making them adaptable to any application where time-based signal and image processing is needed. The CSEM innovation opens the door to an entirely new generation of devices with multiple processors that can run independently for over a year. It also sharply reduces the installation and maintenance costs for such devices, and enables them to be used in places where it would be hard to change the battery.

[Blood test for early detection of cancer](#)

GRAIL, Inc. (California, USA) has developed the multi-cancer early detection test, which can accurately detect cancer, often before any symptoms arise. The test involves

taking a blood sample and analysing it for cell-free DNA (cfDNA), which tumours (and other cells) shed into the blood. Using genome sequencing, methylation (chemical changes to the DNA) is detected and then a classifier developed with machine learning (artificial intelligence) uses these results to detect abnormal methylation patterns that suggests the presence of cancer. The classifier can also predict where in the body the cancer is located. The performance of the test was investigated in a Circulating Cell-free Genome Atlas (CCGA) study conducted over 15,254 participants from 142 clinics in North America. The third and final sub-study of CCGA investigated 2,823 people already diagnosed with cancer and 1,254 people without cancer. The test detected cancer signals from more than 50 different types of cancer and across all four cancer stages. The test's sensitivity was 51.5 percent and specificity was 99.5 percent. GRAIL has also established a partnership with the UK's National Health Service to investigate the multi-cancer early detection test's clinical and economic performance in approximately 165,000 eligible patients.

[Engineered yeast could expand biofuel production](#)

A team of MIT engineers has found a way to expand the use of a wider range of non-food feedstocks such as straw and woody plants to produce biofuels. The team built on a technique of spiking the bioreactor with specific compounds that strengthen the membrane of the yeast and engineered yeast so that they could convert the cellulosic byproduct aldehydes into alcohols. They tested several naturally occurring enzymes that perform this reaction, from several species of yeast, and identified one that worked the best. Then, they used directed evolution to further improve it. The researchers demonstrated that they could achieve high yields of ethanol with five different types of cellulosic waste. The researchers also engineered their aldehyde-to-ethanol enzyme into a strain of yeast that has been engineered to produce lactic acid, a precursor to bioplastics. As it did with ethanol, this strain was able to produce the same yield of lactic acid from cellulosic materials. This technology could yield strains of yeast that generate other products such as oils, diesel, and jet fuel.

[Smart wound dressings with built-in healing sensors](#)

Researchers from RMIT University in Melbourne, Australia, have developed a smart wound dressings with built-in nanosensors that glow to alert patients when a wound is not healing properly. The multifunctional, antimicrobial dressings feature fluorescent sensors that glow brightly under UV light if infection starts to set in and can be used to monitor healing progress. The dressings use fluorescent magnesium hydroxide nanosheets that could conform to the curves of bandage fibers. The research team synthesized the nanosheets and embedded them onto nanofibres, which responds to changes in pH, and under UV light, the nanosheets glow brightly in alkaline environments and fade in acidic conditions, indicating the different pH levels that mark the stages of wound healing. The magnesium hydroxide nanosheets were non-toxic to human cells, while destroying emerging pathogens like drug-resistant golden Staph and Candida auris. The process to make the fluorescent nanosheets is simple to scale for potential mass production.

[Engineered cells to destroy malignant tumour cells](#)

Researchers at McMaster University have developed a promising new cancer immunotherapy that uses natural killer cells genetically engineered outside the body to find and destroy malignant tumours. The researchers first propagated natural killer cells taken from the blood of patients with breast cancer and genetically modified them to target specific receptors on cancer cells, successfully testing the Chimeric Antigen Receptor-Natural Killer (CAR-NK) cells in the laboratory on tumour cells derived from breast cancer patients. The modified natural killer cells can differentiate between cancer cells and healthy cells that are often intermingled in and around tumours, destroying only the targeted cells. The technology may have a similar effect on solid tumours

associated with lung, ovarian and other cancers. The researchers aim to conduct human trials for its clinical use.

COVID-19

COVID-19 (WORLD)

[COVID-19 creates conditions for emergence of 'superfungus' in Brazil](#)

Candida auris called a 'superfungus' because of the speed with which it has developed drug resistance has reportedly emerged in Brazil. The first two cases were confirmed in December 2020 at a hospital in Salvador. Nine other *C. auris* patients have since been diagnosed at the same hospital, some colonized with the fungus and others infected. Mortality among candidemia patients infected by *C. auris* can reach 60 percent. The species quickly becomes resistant to multiple drugs and is not very sensitive to the disinfectants used by hospitals and clinics, which enables it to persist in hospitals infecting patients with severe COVID-19 and other long-stay critical patients. Several factors make patients infected by SARS-CoV-2 ideal targets for *C. auris*, including long hospital stays, urinary and central venous catheters (allowing invasion of the bloodstream), and steroids and antibiotics usage. Several countries have reported the emergence of *C. auris* during the COVID-19 pandemic, making it necessary to intensify control of hospital-acquired infections. The presence of *C. auris* in a sample can be determined by matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry, which is not always available in hospitals.

[Phone swabs can accurately detect COVID-19](#)

A team of researchers from University College London have developed an accurate, non-invasive, and low-cost method of testing for COVID-19 using samples taken from the screens of mobile phones. They analysed swabs from smartphone screens rather than directly from people, and found that people who tested positive by the regular nasal swabbing PCRs were also positive when samples were taken from phone screens. The new method - known as Phone Screen Testing (PoST) detected the COVID-19 virus on the phones of 81 to 100 percent of contagious people with a high viral load. PoST sampling takes less than a minute and does not require medical personnel, which eases mass adoption in big facilities and large-scale applications. A machine is currently under development which will build on this research, and enable taking a phone for PoST sampling and deliver the results directly via SMS to minimize contact.

[New face mask prototype can detect COVID-19 infection](#)

Engineers at MIT and Harvard University have designed a novel face mask that can diagnose the wearer with COVID-19 within about 90 minutes. The researchers embedded freeze-dried disposable sensors (SHERLOCK) into a paper mask, surrounded by silicone elastomer. The sensors are placed on the inside of the mask, so they can detect viral particles in the breath of the person wearing the mask. The mask also includes a small reservoir of water that is released at the push of a button when the wearer is ready to perform the test. This hydrates the freeze-dried components of the SARS-CoV-2 sensor, which analyses accumulated breath droplets on the inside of the mask and produces a result by change of colour. The researchers can also swap in sensors for detection of other pathogens. They have filed for a patent on the technology and will further work with a company to develop the sensors.

[COVID test in just five minutes](#)

Researchers at Osaka University have developed a test for the SARS-CoV-2 virus that utilizes a fusion of artificial intelligence and nanopore technology. The complete test platform consists of machine learning software on a server, a portable high-precision current measuring instrument, and cost-effective semiconducting nanopore modules. To fabricate the device, nanopores (300 nanometers in diameter) were bored into a silicon

nitride membrane and when virus particles are passed through a nanopore, they can be accurately identified using machine learning. The team used 40 RT-PCR-positive and negative saliva samples each to train the algorithm. Using this platform, the researchers were able to achieve a sensitivity of 90 percent and a specificity of 96 percent for SARS-CoV-2 detection in just five minutes. This research will enable rapid point-of-care and screening tests for SARS-CoV-2 without the need for RNA extraction.

[New tech hub aims to boost access to mRNA COVID-19 vaccines in Africa](#)

The first “technology transfer hub” for mRNA COVID-19 vaccines will be established in South Africa to scale up production of and access to doses across the African continent. The new hub will provide training on mRNA technologies for manufacturers from low- and middle-income countries and license them to move forward with local production. But the hub still needs to secure agreements with mRNA vaccine manufacturers, and these efforts are in addition to a waiver of the World Trade Organization’s Agreement on Trade-Related Aspects of Intellectual Property Rights, or TRIPS. The mRNA technology is easier to scale than alternatives and could be faster and easier to adapt for COVID-19 variants of concern. If knowledge of the way to produce an existing mRNA COVID-19 vaccine is transferred to this new hub in South Africa, doses could be produced at the site in the next nine to 12 months. BioNTech, has committed to building capacity for manufacturing their vaccine in Africa. The hub is spearheaded by WHO; partners in the international COVAX initiative; South African companies such as Biovac, which will serve as a vaccine developer; Afrigen Biologics and Vaccines, which will serve as a manufacturer; universities; and the Africa Centre for Disease Control and Prevention. The Medicines Patent Pool is helping WHO negotiate with technical partners and supporting governance of the hub.

[New mRNA universal vaccine targets coronaviruses to prevent future pandemics](#)

Scientists at the University of North Carolina have developed a universal vaccine that protects mice not just against COVID-19 but also other coronaviruses and triggers the immune system to fight off a dangerous variant. The researchers designed the vaccine to provide protection from the current SARS-CoV-2 coronavirus and a group of coronaviruses known to make the jump from animals to humans. The team’s approach started with mRNA, but included the mRNA from multiple coronaviruses. When given to mice, the hybrid vaccine effectively generated neutralizing antibodies against multiple spike proteins. Additional testing could lead to human clinical trials next year. More universal pan coronavirus vaccines can proactively guard against viruses which could emerge in humans.

[Low-cost method for finding new coronavirus variants](#)

Researchers at Karolinska Institute in Sweden have developed a new method called COVseq, for cost-effective surveillance of the global spread of new SARS-CoV-2 variants. Comparative analyses of 29 SARS-CoV-2 positive samples revealed that COVseq had a similar ability as the standard method to identify small changes in the genome. Analyses of 245 additional samples showed that COVseq had a high ability to detect emergent coronavirus variants of potential concern. This inexpensive method can immediately be used for SARS-CoV-2 genomic surveillance by public health agencies and can also be easily adapted to other RNA viruses, such as influenza and dengue viruses.

[Researchers develop more reliable rapid tests for COVID-19](#)

Researchers at the University of Maryland School of Medicine (UMSOM) have developed two rapid diagnostic tests for COVID-19, which can detect the presence of the virus in five minutes without extraction of the virus’s RNA. One test is a COVID-19 molecular diagnostic test, called Antisense, which uses electrochemical sensing to detect the presence of the virus in a swab sample. The unique dual-pronged molecular

detection approach integrates electrochemical sensing to rapidly detect the SARS-CoV-2 virus. RNA Disease Diagnostics, Inc. (RNADD) received an exclusive global license from UMB and UMBC to commercialize the test. The final prototype is like a glucometer, and is easy for people to use themselves. The other test uses a simple assay of gold nanoparticles to detect a colour change when the virus is present. The nucleic acid in the swab sample is amplified 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, which 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.

Fast and reliable SARS-CoV-2 antibody assay

Researchers at the Technical University of Munich (TUM) have developed a rapid antibody test that is highly sensitive and highly specific in detecting the three most important antibodies against SARS-CoV-2. The measurement is carried out on a foil-based sensor chip using the MCR microarray analysis platform. The device displays its measurement results within eight minutes of injecting a blood sample. The test can simultaneously analyse IgG antibodies against a protein fragment of the SARS-CoV-2 receptor binding domain (RBD), the spike protein (S1 fragment) and the nucleocapsid protein (N) and can even determine the concentration of antibodies in a sample. The researchers aim to further reduce the process time to four minutes.

COVID-19 vaccine generates immune structures critical for lasting immunity

A study from researchers at Washington University School of Medicine in St. Louis has found evidence that nearly four months after the first dose, people who received the Pfizer mRNA vaccine still had so-called germinal centers in their lymph nodes churning out immune cells directed against SARS-CoV-2, the virus that causes COVID-19. Moreover, vaccination led to high levels of neutralizing antibodies effective against three variants of the virus, including the Beta variant from South Africa that has shown some resistance to vaccines. Vaccination induced stronger antibody responses in people who had recovered from SARS-CoV-2 infection compared to those who had never been infected.

COVID-19 (INDIA)

Alcohol free hand sanitiser

An alcohol free, colloidal silver solution-based hand sanitiser has been developed by a start-up firm based in Pune. The researchers used silver nanoparticles to prevent the synthesis of viral negative-strand RNA and viral budding. Also the slow and sustained release of silver ions to kill microorganisms that come in contact, provide prolonged antimicrobial activity. It has successfully completed the Central Drugs Standards Control Organisation (CDSCO) approved clinical trial for the hand sanitizer and demonstrated high efficiency in killing viruses.

CSIR and Tata MD partner to make COVID-19 detection more accessible

The Council of Scientific and Industrial Research (CSIR) and Tata group have announced a significant partnership to ramp up the COVID-19 testing capacity across Tier II and III towns as well as rural areas across India. The initiative will utilize CSIR's network of labs across India to increase India's testing capacity in smaller locations in the country. CSIR and Tata MD will jointly develop the testing capacity. RT-PCR CRISPR test will be conducted using the Tata MD CHECK SARS-CoV-2 test kits that are powered by FELUDA technology from CSIR-IGIB. Tata MD will also deploy a proprietary 3-room design mobile testing lab that can conduct end-to-end, on-site COVID-19 testing to increase the testing capacity in the state.

SENSIT Rapid COVID-19 Antigen Kit

Ubio Biotechnology Systems Pvt. Ltd has developed an antigen test kit called ‘SENSIT Rapid COVID-19 Ag kit’ for qualitative detection of SARS CoV-2 Nucleocapsid Protein with an assay time of 15 minutes. The kit is a chromatographic immunoassay, which allows the healthcare personnel to visually read the test result. The test works on the principle of sandwich immunoassay and utilizes a pair of monoclonal antibodies, which when bound to COVID-19 specific antigen, result appears in the form of a coloured line. The kit exhibits sensitivity and specificity of 86 percent and 100 percent respectively and has a shelf life of 24 months. The test kit has been approved by Indian Council of Medical Research and has been successfully commercialised.

Cipla to import Moderna’s COVID-19 vaccine

The Drugs Controller General of India granted permission to Mumbai-based pharmaceutical firm Cipla to import Moderna’s COVID-19 mRNA vaccine, making it the fourth vaccine in the country to be given the Emergency Use Authorisation (EUA). The Moderna vaccine will be brought in as a ready-to-use injectable vaccine which can be stored for a period of seven months at prescribed temperature and that normal storage after vial is opened is 30 days. The firm has to submit a safety assessment of the vaccine in the first 100 beneficiaries before rolling out the vaccine for further immunisation programmes.

Covaxin effectively neutralises Alpha, Delta variants

India's Covaxin, developed by Bharat Biotech in collaboration with the Indian Council of Medical Research, can effectively neutralise both Alpha and Delta variants of coronavirus. This has been confirmed by the US’ National Institute of Health (NIH). Results of two studies of blood serum from people who had received Covaxin suggest that the vaccine generates antibodies that effectively neutralise the variants. According to NIH, the adjuvant that was used to boost immune response of Covaxin was developed with funding from it and it has contributed to the success of the highly efficacious Covaxin, which has been administered to roughly 25 million people till date in India and elsewhere.

IIT Delhi launches rapid low cost COVID test kit

Two researchers at The Indian Institute of Technology, Delhi have launched a Rapid Antigen Test (RAT) kit for SARS-CoV-2 detection which is priced at Rs. 50 per piece. The test kit comes with nasal and throat swabs and a tube filled with a liquid. Once the swab is placed inside the tube, it reacts with the liquid and within five minutes can indicate the result by change in colour of the liquid. The results can be inferred visually, and the kit has been found to be 99.8 percent accurate. The identification is based on the monoclonal antibodies specific for the Coronavirus antigen. Currently, the test kit is ready for technology transfer and to be manufactured and distributed widely. However, the researchers recommend that the test cannot be used by patients at home and requires a lab technician.

INDIA – SCIENCE & TECHNOLOGY

Sea water desalination through solar thermal forward osmosis

Indian Institute of Technology, Madras in collaboration with Empereal – KGDS Renewable Energy have successfully established a solar thermal Forward Osmosis (FO) sea water desalination system in a drought prone village in Tamil Nadu. The FO system facilitates high recovery, low energy consumption, potential for resource recovery, especially in solutions of high osmotic pressure, less fouling of the membrane because of low pressure operation (2 Bar), easier and more effective cleaning of the membrane, longer membrane life and lower operating costs. The water produced (20 kilolitres per

day) using this technology will be supplied to the local people with the support of villagers and panchayat. Since, the operation and maintenance costs of this technology is much lower, such an initiative can pave the way for scaling-up the technology in various rural coastal areas to address drinking water shortage.

[A novel technology for coating carbon on lithium metal oxide electrode](#)

Researchers at the International Advanced Research Centre for Powder Metallurgy & New Materials have developed a technique to coat carbon on lithium metal oxide electrodes for lithium-ion batteries. In the method developed, a carbon precursor is trapped in between the transition metal hydroxide layers to minimize the reaction with oxygen even when heat-treated in the air during solid-state synthesis. Uniform carbon coating on the lithium transition metal oxides - $\text{LiNi}_{0.33}\text{Mn}_{0.33}\text{Co}_{0.33}\text{O}_2$ (NMC111) was achieved through this technique. Superior cyclic stability of the carbon coated product with capacity retention of more than 80 percent after 1000 cycles of charging/discharging has been demonstrated with an optimum carbon thickness matching commercial samples. The life of the lithium-ion cells prepared using these electrode materials is expected to be double due to protective carbon coating.

[Improved method of imaging objects through fog](#)

A team of researchers from different research institutes and universities have developed a method to modulate the light source and demodulate them at the observer's end to achieve sharper images during foggy weather conditions. In the experimental setup, the researchers used ten red LED lights as the source of light and modulated the source of light by varying the current flowing through the LEDs at a rate of about 15 cycles per second. An external piece of cardboard, placed at a distance of 20 centimetres from the LEDs reflected the light to the camera. The modulated light reflected from the cardboard, travelled through the fog and was then captured by the camera. The researchers have demonstrated the technique by conducting extensive experiments on foggy winter mornings. The cost of the technique is low and it can provide a good view of the beacons for landing aeroplanes and safer rail and road transportation in foggy weather.

[Climate change to increase sea level in Lakshadweep Islands](#)

A team of scientists from Indian Institute of Technology, Kharagpur, studied the climate projections of sea level rise to assess the potential areas of inundation over the archipelago of Lakshadweep Islands in the Arabian Sea. The study estimated that smaller islands are expected to have major land-loss and the coastal inundation can have wide socio-economic impact. The projected inundation due to sea-level rise can impact the islanders as residential areas are quite close to the present coastline and the only airport in the archipelago, located at the southern tip of Agatti Island, has higher likelihood of damage due to inundation from sea-level rise. The study can be used by the policy makers for both short and long-term planning that benefit the population in Lakshadweep Islands.

[Cost-effective catalysts for metal-air battery](#)

Scientists at the International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) have developed a cost-effective electrocatalyst by anchoring transition metal ions into the sulfur-doped carbon framework via carbonization of a polymer called sPEEK (sulphonated polyether ether ketone). The catalyst synthesis method can also be used to recycle used ionomers. The researchers have used an ion-exchange strategy that positions the metal ions in the carbon framework homogeneously, limits the particle size and offers control on composition and size at a very low loading of transition metal. The catalyst also leads to reduced voltage polarization, enabling higher energy efficiency and a stable charge-discharge

characteristic. The results obtained were comparable to that of conventionally used noble metal-based catalysts with metal loading of 20 percent or higher.

Cost-effective nanogenerators can harvest electricity from vibrations

Scientists at the Centre for Nano and Soft Matter Sciences, Bengaluru, have fabricated a simple, cost-effective, transparent nanogenerator that can generate electricity from vibrations all around. They have designed a transparent triboelectric nanogenerators (TENG) by using thermoplastic polyurethanes (TPU) either in the form of electrospun nanofibers or as a flat film using the simpler Doctor's blade technique, along with Polyethylene terephthalate as tribo layers. TPU nanofibers are obtained from the electrospinning technique. The easy availability of the active material and the simplicity of the fabrication process make it cost-effective, highly efficient, robust, and gives reproducible output over long hours of operation. The fabricated device could light up eleven LEDs by gentle hand tapping and could be a potential candidate for use in optoelectronics, self-powered devices, and other biomedical applications.

IN BRIEF

Imaging at the tip of a needle

A team from the University of Exeter, have pioneered a new way to use a single hair-thin strand of optical fibre for high-resolution imaging deep inside the body at the tip of a needle. They applied a concept used in astronomy to see through atmospheric turbulence to light coming through optical fibres. The method relies on a 'guide-star' which in their case is a small brightly fluorescing particle on the end of the fibre. Light from the guide-star encodes how the transmission of light changes when the fibre bends, thus ensuring that the imaging is not disrupted. This technology could enable development of flexible ultra-thin endoscopes which could be used to guide biopsy needles to the right place, and help identify diseased cells within the body.

Using visible light to decompose CO₂ with high efficiency

Researchers have developed a novel, easy to synthesize composite compounds that enable the efficient use of solar energy to reduce carbon dioxide in emissions and in the atmosphere. They have developed a new photocatalyst that incorporates single-walled carbon nanotubes (SWCNTs) with silver iodate (AgIO₃) and silver iodide (AgI) to form a three-component composite catalyst. Experimental analysis with simulated solar light revealed that the SWCNTs acted as the conductive pathway through which photoexcited electrons moved from AgI to AgIO₃, enabling the efficient reduction of CO₂ to carbon monoxide (CO). The incorporation of SWCNTs also allowed for the composite dispersion to be easily spray-coated on a thin film polymer to yield flexible photocatalytic electrodes that are versatile and can be used in various applications. Next, the team would be exploring the possibility of using their photocatalyst for solar hydrogen generation.

Compact quantum computer for server centers

Physicists at University of Innsbruck have built a prototype of an ion trap quantum computer that can be used in industry. The device is compact, self-sustained and fits into two 19-inch server racks. For this, the individual components of the world's first compact quantum computer needed to be significantly reduced in size. For example, the ion trap, which is the centerpiece of quantum computers, installed in a vacuum chamber, occupies only a small portion of the previously required space. The compact quantum computer can be operated autonomously and will soon be programmable online. To ensure the stability of the quantum computer, the team applied quality standards as in quantum devices to the compact device to ensure safe and uninterrupted operation. Also, the team was able to individually control and successfully entangle up to 24 ions functional quantum bits with the new device.

[New CRISPR 3.0 system for highly efficient gene activation in plants](#)

Researchers at the University of Maryland (UMD), have developed a new and improved CRISPR 3.0 system in plants, focusing on gene activation instead of traditional gene editing. This third generation CRISPR system focuses on multiplexed gene activation, boosting the function of multiple genes simultaneously. This system has high accuracy and efficiency in up to seven genes at once. The team has validated the CRISPR 3.0 system in rice, tomatoes, and Arabidopsis (the most popular model plant species, commonly known as rockcress). The team showed that one can simultaneously activate many kinds of genes, including faster flowering to speed up the breeding process. This activation system uses deactivated CRISPR-Cas9 that can only bind. Without the ability to cut, the system can focus on recruiting activation proteins for specific genes of interest by binding to certain segments of DNA instead. This technique could have many applications.

[Recycling strategies for perovskite photovoltaic modules](#)

Researchers from Cornell University assessed a variety of perovskite solar cell architectures and found that substrates with conducting oxides and energy-intensive heating processes are the largest contributors to primary energy consumption, global warming potential and other types of impact. Their result revealed perovskite photovoltaic wafers offer a faster return on the initial energy investment than silicon-based solar panels because all-perovskite solar cells consume less energy in the manufacturing process. Recycling them enhances their sustainability, as the recycled perovskite solar cells could bring 72.6 percent lower primary energy consumption and a 71.2 percent reduction in carbon footprint. The best recycled module architecture can exhibit an extremely small energy payback time of 0.09 years and a greenhouse gas emission factor as low as 13.4 g CO₂ equivalent per kWh.

[Edible Cholera vaccine made of powdered rice](#)

Researchers from Japan have developed a new vaccine named MucoRice-CTB, to protect against deadly cholera. The vaccine has been made by grinding up genetically modified grains of rice and is stable at room temperature from start to finish. The first human trial was done on forty volunteers where, thirty received a placebo and 10 received a total of four doses spaced every two weeks of either 3 mg, 6 mg or 18 mg each of the vaccine. Tests two and four months after receiving the last dose revealed that volunteers who responded to the vaccine had IgA and IgG antibodies specific to cholera toxin B (CTB). The trial data showed no obvious side effects and a good immune response. Also, the results showed a larger role of gut microflora in vaccine effectiveness i.e., higher microflora diversity creates a better situation for strong immune response against oral vaccines. The researchers plan to work with partners in the pharmaceutical industry to bring MucoRice-CTB into the next phase of clinical trials in Japan and overseas.

[Harvesting drinking water from humid air around the clock](#)

Researchers at ETH Zurich have now developed a new technology that allows the harvesting of water from the atmosphere 24 hours around the clock, with no energy input. It relies on a self-cooling surface and a special radiation shield. The researchers applied a novel super-hydrophobic (extremely water-repellent) coating to the underside of the pane in the water condenser, which causes the condensed water to bead up and run or jump off on its own accord. Under ideal conditions, up to 0.53 decilitres (approximately 1.8 fluid ounces) of water per square metre of pane surface per hour could be harvested. The researchers would further develop this technology or combine it with other methods, such as water desalination, to increase their yield.

[Simple blood test for early detection of Alzheimer's disease](#)

An international research team led by HKUST has developed a simple but robust blood test from Chinese patient data for early detection and screening of Alzheimer's disease (AD) for the first time, with an accuracy level of over 96 percent. The team identified 19 out of the 429 plasma proteins associated with AD to form a biomarker panel representative of an 'AD signature' in the blood. Based on this panel, the team has developed a scoring system that distinguishes AD patients from healthy people. This system can also differentiate among the early, intermediate, and late stages of AD, and can be used to monitor the progression of the disease over time. These findings may also pave the way to novel therapeutic treatments for the disease.

[A template for fast synthesis of nanographenes](#)

A group of researchers at Nagoya University, Japan, have developed a new method for quickly and efficiently synthesizing nanographenes, a type of nanocarbon with great potential as a next generation material. The group used the APEX reaction, a reaction which uses polycyclic aromatic hydrocarbons as templates to synthesize nanographenes. A large number of nanographenes can be synthesized from a single polycyclic aromatic hydrocarbon template molecule. This method has the potential to revolutionize semiconductors and solar energy.

[Making seawater drinkable in minutes](#)

A team from the Korea Institute of Civil Engineering and Building Technology (KICT) has announced the development of a stable performance electro-spun nanofiber membrane to turn seawater into drinking water by membrane distillation process. They developed co-axial electro-spun nanofiber membranes fabricated by electro-spinning. The team used poly (vinylidene fluoride- co- hexafluoropropylene) as the core and silica aerogel mixed with a low concentration of the polymer as the sheath to produce a co-axial composite membrane and obtain a super-hydrophobic membrane surface. The membrane distillation process was tested using the fabricated coaxial electro-spun nanofiber membrane for 30 days and performed a 99.99 percent salt rejection and may be suitable for pilot-scale and real-scale membrane distillation applications.

[First-ever transient pacemaker harmlessly dissolves in body](#)

Researchers at Northwestern and George Washington (GW) universities have developed the first-ever transient pacemaker, a wireless, battery-free, fully implantable pacing device that harmlessly dissolves in the body. The device harvests energy from an external, remote antenna using near-field communication protocols which eliminates the need for bulky batteries and rigid hardware, including wires (or leads). All components of the pacemaker are biocompatible and naturally absorb into the body's biofluids over the course of five to seven weeks, without any need for surgical extraction. The device can provide temporary pacing, depending on the patient's need anywhere from a couple days to several weeks. By varying the composition and thickness of the materials in the device, the precise number of days to remain functional before dissolving can be controlled. With further modifications, such bioresorbable pacemakers can be implanted through a vein in the leg or arm and can provide temporary pacing to patients who have suffered a heart attack or to patients undergoing catheter-based procedures.

[Horizon Europe 2021-27 launched](#)

After six months of delay, Horizon Europe, Europe's €95.5 billion R&D programme, is finally underway. It has five missions to tackle grand challenges - on climate, cancer, oceans, smart cities and soil health, with 6 percent of the total Horizon budget. Horizon Europe has a collection of subject-specific work programmes in health, energy, ICT and other fields. There are 49 so-called partnerships, legally constituted public-private, or all-public, consortia doing collaborative R&D in specific sectors. A new feature is the European Innovation Council (EIC), a funding agency focused on start-ups, fast-growth companies and their plans to get new or "disruptive" technologies to market. One part of the EIC, the Accelerator, is intended to support innovation in small and medium-sized enterprises (SMEs) through a mix of grants, equity investment and loans. A further important feature is expanded support for east European researchers and tech entrepreneurs. 3.3 percent of Horizon Europe's budget would support efforts to make it easier for poorer countries to win grants. The agreed structure for Horizon Europe rests on three "pillars," - Pillar I: Excellent Science; Pillar II: Global Challenges and European Industrial Competitiveness (budget share 56 percent); Pillar III: Innovative Europe. The fourth component of Horizon Europe attempts to improve the performance of research centres in Europe's poorer regions, and the "European Research Area".

[China launches 3 astronauts to new space station](#)

China launched its Shenzhou 12 mission on 16 June from Jiuquan Satellite Launch Center in northwest China, its first crewed spaceflight with three astronauts to Tianhe (Harmony of the Heavens), the core module of the nation's new Tiangong space station. The trio will spend three months aboard (16.6 meters) Tianhe, performing a variety of tests and maintenance activities. The four rocket boosters and core stage of China's Long March 2F rocket powered the successful launch. Shenzhou 12 commander Nie Haisheng has already made two trips to Earth orbit before today's launch, in 2005 and 2013. The other crew members are Liu Boming, a veteran of space flight in 2008, and Tang Hongbo, on his first space flight. Shenzhou 12's launch is the third of 11 that will be required to build China's new space station, which the nation expects to complete by the end of 2022. The first construction lift-off occurred on April 28, sending Tianhe to low Earth orbit. The second came on May 29, lofting the robotic Tianzhou 2 cargo craft, which was packed with more than 6.6 tons of supplies and is still attached to the core module.

[SDG performance report 2021 highlights negative impact of pandemic](#)

The 2021 Sustainable Development Report, which includes the updated SDG Index and Dashboards, was released on 14 June. The report shows the first-ever reversal in progress since the SDGs were adopted in 2015, due to increased poverty rates and unemployment related to COVID-19. Among the country-specific findings - Finland, Sweden and Denmark are ranked the top 3, but even they are not on track to achieve all for the SDGs by 2030. The most progress is found in Bangladesh, Afghanistan, and Côte d'Ivoire. The region with the most progress has been East and South Asia. Countries with the sharpest declines in SDG scores since 2015 include Brazil, Venezuela, and Tuvalu. The report highlights that for the poorest countries, SDG progress is being pushed back a full ten years because of the pandemic. India is ranked 120 (out of 165 countries) with a score of 60.1.

[8th Session of the IPBES Plenary focuses on nexus assessment](#)

The eighth session of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Plenary met virtually to approve scoping reports for two future assessments on the inter-linkages among biodiversity, water, food and health (nexus assessment), and the underlying causes of biodiversity loss, as well as work plans for the inter-sessional period. The session also considered the workshop report on biodiversity and climate change, co-sponsored by IPBES and the Intergovernmental

Panel on Climate Change (IPCC) and launched the report along with the report on biodiversity and pandemics. The members highlighted the important inter-linkages between IPBES and other bodies, especially the CBD, and asked for IPBES to contribute toward CBD processes, including the post-2020 global biodiversity framework. Participants attending the meeting represented IPBES Member and non-member governments, UN agencies and convention secretariats, intergovernmental and non-governmental organizations, Indigenous Peoples and local communities (IPLCs), and stakeholder groups. The participants called for greater focus on the marine environment, including capacity building at all levels. The Open-Ended Network of IPBES Stakeholders (ONet) urged IPBES members to take more advantage of the skills and capacity of stakeholders and encouraged strengthening multidisciplinary approaches for policy making to curb biodiversity and ecosystem loss.

SCIENCE POLICY AND DIPLOMACY

[India and Bhutan sign MoU for developing cooperation in the areas of Environment](#)

India and Bhutan inked a Memorandum of Understanding (MoU) for developing cooperation between the two countries in the area of environment. The MoU will open new vistas of bilateral co-operation to enhance Indian and Bhutanese partnership and support, exchange best practices in areas like prevention of air pollution, waste management, chemical management, climate change, etc. It will also provide the possibility to have joint projects in areas of mutual interest. The MoU will also strengthen technological, scientific and management capabilities and expand the areas of cooperation in the field of environment to promote a mutually beneficial partnership between the two countries.

[Climate talks end in deadlock](#)

The UNFCCC Bureau organized a virtual informal three-week meeting from 31 May to 16 June which ended in stalemate with little signs of convergence on unresolved issues of the Paris Agreement and points of contention on the overdue Paris rulebook, which countries are expected to finalize at Cop26 in Glasgow, UK, in November. Talks on carbon markets, transparency and aligning countries' climate plans to cover a common time period of 5 or 10 years all reached stalemate. On the carbon market rules, the contentious issues of double counting, the transfer of old credits in the new system and allocating a share of proceeds from the market to adaptation finance remain with no compromise in sight. As part of the virtual setting, countries agreed not to take any decisions at the meeting. Instead, progress is due to be captured in informal notes to form the basis of future talks. In a bid to end the deadlock, the UK Cop26 host is convening a group of representative ministers for an in-person meeting in London on 25-26 July. It has tasked ministers from Singapore and Norway to host informal ministerial discussions on carbon markets. However, the virtual format had enabled many more participants than an in-person meeting with more people following discussions online than in 2019.

[BRICS nations agree on science and technology innovation cooperation](#)

BRICS 11th Science and Technology Steering Committee meeting has endorsed an Indian concept note and action plan for BRICS Innovation Cooperation 2021-2024. The proposal will now be considered at the BRICS Science, Technology and Innovation Entrepreneurship (STIEP) working group for elaborating the action plan. The Steering Committee also discussed plans for the BRICS Young Scientist Conclave, BRICS Senior Official Meetings and BRICS Science and Technology Ministerial Meeting. This meeting was hosted as a part of the series of sectoral events including Minister level meeting and BRICS Summit. India will host the 6th edition of BRICS Young Scientist

Conclave during 13-16 September, 2021 and the themes would include healthcare; energy solution and; interdisciplinary cyber physical system.

Call for Papers - Science Diplomacy Review

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

<https://bit.ly/3jXLuJA>

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Research and Information System for Developing Countries

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

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

Website: www.fisd.in

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