FORUM FOR INDIAN SCIENCE DIPLOMACY

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# NEWS ALERT

*Forum for Indian Science Diplomacy*

RIS Science Diplomacy News Alert is your fortnightly update on Indian and global developments in science research, technological advancements, science diplomacy, policy and governance. The archives of this news alert are available at http://fisd.in. Please email your valuable feedback and comments to science.diplomacy@ris.org.in

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## GLOBAL

### Development of Laser diode emitting shorter wavelength UV light

Through various efforts in the development of ultraviolet laser diodes, scientists have managed to achieve emissions down to 336 nm. Recently, Nagoya University scientists, in cooperation with Asahi Kasei Corporation, have succeeded in designing a laser diode that emits the world's shortest lasing wavelength, at 271.8 nanometers (nm), under pulsed [electric] current injection at room temperature. Laser diodes that emit short-wavelength ultraviolet light, is called UV-C and has a wavelength of 200 to 280 nm. It could be used for disinfection in healthcare, for treating skin conditions such as psoriasis, and for analysing DNA. The research team used a high quality aluminium nitride (AlN) substrate as their base for building up the layers of the laser diode. They found that a pulsed electric current of a low operating voltage of 13.8V was needed for the emission of "the shortest wavelength" reported so far. The team is now conducting advanced joint research to achieve continuous

room temperature deep-UV lasing for the development of UV-C semiconductor laser products.

**Blood test predicts onset of tuberculosis**

The emergence of gene expression signature tests, which can aid diagnosis and early treatment, provides real hope for the management of infectious diseases. Scientists at University College London have shown that a blood test could predict the onset of tuberculosis (TB) within three to six months, prior to people getting unwell; this finding could help develop target antibiotics and save countless lives. Researchers found eight gene signatures, including measurement of expression of a single gene, which could predict the diagnosis of TB within three to six months, falling within the accuracy required by the World Health Organisation (WHO) for new diagnostic tests. Further development of these tests could help identify people who will benefit most from preventive antibiotic treatment, in order to reduce the occurrence of tuberculosis. About one-quarter of the world's population is estimated to have been infected with the bacteria that cause TB. Majority of these individuals remain well and cannot transmit the disease. Identification of individuals who are likely to develop the disease can enable early treatment of the infection and prevent it from spreading to others. Future development of a blood test based on these findings could make an important contribution in reducing the impact and spread of this infection.

**Physicists design 'super-human' red blood cells**

Modification of red blood cells have been done to be used to distribute drugs throughout the body, which could specifically target infections or treat catastrophic diseases such as cancer or Alzheimer's. A team of physicists from McMaster University has developed a process to modify red blood cells, designed to circulate in the body for several weeks at a time, seeking out specific targets including bacteria, tumours or organs. The researchers have developed a method to open up the red blood cell, modify its outer cell wall, and replace its contents with a drug molecule, which would be injected back into the body. The hybrid appears and behaves as a normal red blood cell, but has a sticky surface which can attach itself to bacteria, for example, open up and release antibiotics exactly where they are needed. They have combined synthetic and biological materials to create a new structure. The entire process is very efficient and novel, and can be completed in a single day. This targeted delivery method could be helpful in minimising dosages and therefore, potential side effects. It holds significance for potent drugs used in cancer and Alzheimer's disease, as well as for the treatment of infections of potentially resistant bacteria.

## INDIA

**Establishment of 51st K9 VAJRA-T Armoured System Complex**

The 51st K9 VAJRA-T Gun from Larsen & Toubro (L&T) Armoured System Complex has been established in Gujarat. The establishment will encourage active participation of the private sector in defence manufacturing, reaffirming the Government's commitment to make India an arm manufacturing hub and net defence exporter. The K9 VAJRA-T Gun is model adopted under 'Make in India', showcasing indigenous capabilities. More than 75 per cent of K9 Vajra has been manufactured in India. Over 5,000 people have got direct employment and more than 12,500 indirect employments have been generated, through this complex. L&T Defence is currently executing the order for 100 pieces of 'K9 VAJRA-T' Tracked, Self-Propelled Howitzer Guns program - under a contract awarded to the company by Ministry of Defence, through global competitive bidding.

**Successful launch of GSAT-30**

India's latest communication satellite GSAT-30 was successfully launched from the Spaceport in French Guiana on 17 January, 2020. The launch vehicle Ariane 5 VA-251 launched GSAT-30 into an elliptical Geosynchronous Transfer Orbit. The 3357 kg, GSAT-30 will provide continuity to operational services of the in-orbit satellites. GSAT-30 has a unique configuration of providing flexible frequency segments and flexible coverage. The

satellite will provide communication services to Indian mainland and islands through Ku-band and wide coverage covering Gulf countries, a large number of Asian countries and Australia through C-band. GSAT-30 will provide DTH Television Services, connectivity to VSATs for ATM, Stock-exchange, Television up-linking and Teleport Services, Digital Satellite News Gathering (DSNG) and e-governance applications. The satellite will also be used for bulk data transfer for a host of emerging telecommunication applications. It will be operational after the successful completion of all in-orbit tests.

**Preparedness for Novel Corona Virus(nCoV)**

Union Minister of Health and Family Welfare has been closely monitoring the situation after the reports of 41 confirmed cases of novel Corona virus (nCoV) including one death from Wuhan, China. According to WHO, the situation is still evolving and preliminary investigations suggest link to the sea food market. Coronaviruses are large family of viruses, which cause illness to human as well as get circulated in animals including camels, cats and bats. Public health preparedness is being reviewed on day-to-day basis and the core capacities to timely detect and manage importation of the nCoV into the country are being strengthened further. The Ministry of Health has instructed screening of international travellers from China at designated airports namely, Delhi, Mumbai and Kolkata through thermal scanners. A travel advisory has also been issued to the passengers travelling to and from China. The Ministry has issued necessary directives on laboratory diagnosis, surveillance, infection prevention and control (IPC) and risk communication. Integrated Disease Surveillance Program (IDSP) is geared up for community surveillance and contact tracing. The NIV-ICMR Laboratory in Pune is coordinating the testing of samples for nCoV in India. The hospital preparedness with regard to management and infection prevention control facilities has been also reviewed, and IPC Guidelines have been shared with the state governments.

**Strengthening Brazil- India cooperation in science and technology**

During the visit of President Bolsonaro of Brazil (25-27 January), an action plan was adopted to strengthen the partnership between Brazil and India in the field of science and technology. The plan outlines action in all spheres of cooperation, including Trade & Commerce, Investments, Agriculture, Civil Aviation and Energy; Science, Technology and Innovation; Space Cooperation; Environment and Technical Cooperation; and Health. Bilateral MoUs were signed in the fields of Cyber Security; Bioenergy, Traditional Systems of Medicine and Homeopathy; Geology and Mineral Resources. The two countries signed the Programme of Scientific and Technological Cooperation (2020-2023) to carry forward their bilateral engagements.

## IN BRIEF

**Creating learning resources for visually-impaired students**

Mathematics and Science Braille textbooks are expensive and require an enormous effort to produce. A team of researchers has developed a method for easily creating textbooks in Braille, with an initial focus on math textbooks. The new process is made possible by a new authoring system which serves as a "universal translator" for textbook formats, combined with enhancements to the standard method for putting mathematics in a Web page. Building foundation of this work on established systems will ensure easy, inexpensive and extensive production of Braille textbooks. It uses a system for writing textbooks which automatically produces print versions called PreTeXt. Approximately 100 books have been written in PreTeXt, which can be converted to Braille using a computer system called MathJax. The group has begun discussions with professional organizations to incorporate Braille output into the production system for their publications.

**Advanced polymers to remove arsenic from water**

Arsenic in water is a global issue affecting more than 200 million people in 70 countries. A device has been developed that can purify and remediate arsenic-contaminated water in a

single step. Using specialized polymer electrodes, the device can reduce arsenic in water by over 90% while using roughly 10 times less energy than other methods. The device works by integrating the contaminant; separation and reaction takes place within a single unit with an electrocatalytic cell, similar to a battery which uses redox-active polymers. When the contaminated water enters the device, the first polymer electrode selectively captures the arsenite and sends it to the other polymer electrode, where it is stripped of two of its electrons - or oxidized - to form arsenate. Pure water then leaves the device, and the arsenate waste is concentrated for further disposal. The device does not require a lot of electricity to run and allows for the reuse of the electrodes.

**Revelation of a new blood component**

Mitochondria are organelles that are found in the eukaryotic cells and play a major role in energy metabolism and intercellular communication. They possess their own genome, transmitted solely by the mother and is separate from the DNA contained in the nucleus. Researchers from the Montpellier Cancer Research Institute have found that the plasma of a healthy individual contains up to 50,000 times more mitochondrial DNA than nuclear DNA. They found highly stable structures containing whole mitochondrial genomes in circulating blood. Electron microscopy indicated up to 3.7 million per ml. of plasma of intact and functional mitochondria. This discovery could lead to improvements in the diagnosis, monitoring and treatment of certain diseases. The research team is now devoting its attention to evaluating the extracellular mitochondria as biomarkers in non-invasive prenatal diagnosis and cancer.

## RESOURCES AND EVENTS

**Science Diplomacy Course 2020**

RIS conducted the 4th edition of the Science Diplomacy course from 6-17 January 2020. Supported by the ITEC programme of the Ministry of External Affairs, 30 participants from 25 ITEC partner countries were present in the course. The programme included visits to international science centres promoted by India, such as the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre), International Centre For Genetic Engineering And Biotechnology (ICGEB), and the International Solar Alliance (ISA). Participants also submitted individual papers on topics related to science diplomacy and took part in group presentations and discussions. The next edition of the course is to be held in January 2021. Details on http://ris.org.in/itec-science-diplomacy

**Drafting of New Science, Technology & Innovation Policy**

A new National Science, Technology and Innovation Policy is being discussed and deliberated, to replace the existing policy framed in 2013. The new policy will be forward-looking and have both a vision document as well as an action plan on the fundamental research required in crucial areas such as space, health, atomic physics and bio-technology. The Department of Science & Technology is steering the exercise and will soon initiate stakeholder interaction in this regard. The stakeholder consultation process will be at four levels: The first level would involve the scientific community and industry representatives to bring in citizen-centric scientific break-through and innovation. At the second level, State governments will be engaged with the Centre to discuss collaborative efforts for developing world-class products. The third level will deal with various Ministries and Departments such as Railways, Shipping and Water Resources to find out their science and technology related requirements. The fourth level of interaction would be horizontal, focusing on basic research in areas such as condensed matter physics, solid state physics, material research, etc. The Principal Scientific Advisor, Dr. K. VijayRaghavan, pointed out that private investment in India in R&D was still very low and a suitable environment is to be created to encourage

investment from such entities. Restoring the 200 per cent income tax deduction for in-house R&D spend, which was reduced to 150 per cent from April 1 2017, could be one way to encourage investment in the area.

**Hands-Off Approach to AI Regulation**

The White House's Office of Science and Technology Policy (OSTP) has issued a draft memo to US government agencies which states that the principles to be abided by the agencies when creating regulations for the use of AI. The principles are designed to achieve three goals: Ensure public engagement, limit regulatory overreach and promote trustworthy technology. The memo includes 10 principles that agencies must consider when drafting AI regulations. The ten principles for "Stewardship of AI" listed in the document are public trust in AI, public participation, scientific integrity and information quality, risk assessment and management, benefits and costs, flexibility, fairness and non-discrimination, disclosure and transparency, safety and security, and interagency coordination. These principles are designed to help agencies such as the Food and Drug Administration (FDA) with its approval process for AI-powered medical devices, or the Transportation Department's work on autonomous vehicles and drones.

We welcome your comments and valuable suggestions. Please write to us for receiving publications, updates and notices regarding seminars, conferences etc.

**Research and Information System for Developing Countries**
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