

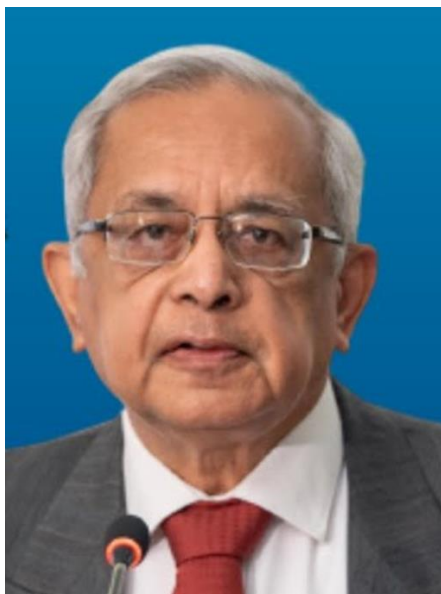
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RIS Science Diplomacy News Alert is your fortnightly update on Indian and global developments in scientific research, technological advancements, and G-20, global challenges, science diplomacy, policy and governance. The archives of this news alert are available at <https://fisd.in/en/alerts-archives>. Please email your valuable feedback and comments to science.diplomacy@ris.org.in.



DR BHASKAR BALAKRISHNAN
22 September 1947 – 21 January 2024

With profound grief, we would like to inform about the sudden and unfortunate demise of Dr Bhaskar Balakrishnan, Science Diplomacy Fellow at RIS. He was the founding editor of *Science Diplomacy News Alert*, and ensured their timely publication until the very recent (125th) issue and was preparing the template for this issue. He was founding Editor of *Science Diplomacy Review* and led the Science Diplomacy Program at RIS.

After finishing his Ph.D in the field of Theoretical High Energy and Particle Physics from the State University of New York at Stony Brook, USA, he taught at Stony Brook and Panjab University. He also worked at the Massachusetts Institute of Technology, Cambridge, before joining the Indian Foreign Service in 1974. During 2001-2005, he was India's Ambassador to Cuba, concurrently

accredited to Haiti and the Dominican Republic. Following which, he served as the Ambassador of India to Greece until his superannuation in 2007. He has also published a book titled *Technology and International Relations: Challenges for the 21st Century* in 2018. In his long career as a Diplomat he had represented India at; inter alia, IAEA, Vienna. He played a key role in establishing ICGEB, New Delhi and worked with UNIDO and Government of Italy for that.

He joined as a Fellow in Science Diplomacy at the Research and Information Systems for Developing Countries (RIS), New Delhi in 2018. Since then, he has contributed immensely and played an instrumental role in shaping and strengthening the Science Diplomacy Programme and concept and praxis of Science Diplomacy. Thus, paving the way for an Indian Science Diplomacy, and bringing forth a Global South perspective of Science Diplomacy.

Dr Balakrishnan had a myriad of interests in varied themes like international cooperation, energy, environment, biotechnology, gene editing, information technology, semiconductors, development cooperation, international negotiations on global commons and multilateral governance. By bringing and bridging the worlds of science and diplomacy, he brought invaluable insights and policy perspectives. His deep interest and unwavering spirit for science diplomacy can also be seen in his capacity building efforts. Recently, he developed a course on Science Diplomacy for the Capacity Building Commission, Government of India.

He will be deeply missed for his finest intellect and great humility and as the pioneer and thought leader of Science Diplomacy in India. It will be difficult to fill the void created by his absence in the Science Diplomacy Programme at RIS. We will continue the work initiated by him and take it to greater heights and glory.

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SCIENCE & TECHNOLOGY

GLOBAL

[Artificial 'Power Plants' to Harness Energy from Wind and Rain](#)

The team built two different types of energy collectors: a triboelectric nanogenerator (TENG) to capture kinetic energy from the wind and a droplet-based energy generator (DEG) to collect energy from falling raindrops. The TENG consisted of a layer of nylon nanofibers sandwiched between layers of polytetrafluoroethylene, more commonly known as Teflon™, and copper electrodes. When the layers pressed into each other, static charges were generated and converted into electricity. Teflon was also used to make the DEG, which was waterproofed and covered with a conductive fabric to act as the electrodes. As raindrops hit one of the electrodes, it caused an imbalance in charges, generating a small current and high voltage. Under optimal conditions, the

TENG produced 252 volts of power and the DEG 113 volts, but only for short periods of time. The team mounted the DEG atop the TENG and incorporated leaf-shaped versions into an artificial plant. When the leaf-shaped generators were exposed to conditions mimicking natural wind and rain, they powered 10 LED lights in short flickers. This proof-of-concept "power plant" device could be further developed into larger systems or networks of power plants to produce clean energy from natural sources.

DNA Particles Holds Promise as Vaccines

Researchers from MIT and the Ragon Institute of MGH, MIT, and Harvard have created a vaccine that can induce a strong antibody response against SARS-CoV-2 using a virus-like delivery particle made from DNA. The vaccine, which has been tested in mice, consists of a DNA scaffold that carries many copies of a viral antigen. This type of vaccine, known as a particulate vaccine, mimics the structure of a virus. Most previous work on particulate vaccines has relied on protein scaffolds, but the proteins used in those vaccines tend to generate an unnecessary immune response that can distract the immune system from the target. In the mouse study, the researchers found that the DNA scaffold does not induce an immune response, allowing the immune system to focus its antibody response on the target antigen.

Ultrasensitive Tools 'Detect Asymptomatic Malaria'

Researchers in the USA and Uganda have developed tools that can detect the slightest traces of malaria in people who harbour the disease but do not show signs of sickness. Their current findings provide critical information on the burden of asymptomatic malaria that we hope one day will be useful to the national malaria control program in Uganda and other malaria-endemic African countries. The scientists from the University of Washington and Med Biotech Laboratories in Kampala said that due to the changing nature of malaria pathogens, parasite densities in the blood can suddenly drop below the level of detection. This is especially the case when older, less sensitive tests are used and when testing is done only at a single point in time. The researchers used ultrasensitive molecular diagnostic tools to test adults aged 18 to 59 and children aged eight to 17 who were not pregnant and were not under malaria medication in the Katawki district in eastern Uganda, which has a high incidence of malaria. They tested dried blood spots for the presence of *Plasmodium ribosomal RNA*, which helps produce the parasite proteins, to determine and classify the type and densities of the parasites over a period of one month.

Novel Catalyst for Production of Green Hydrogen Discovered

The Ulsan National Institute of Science and Technology (UNIST) research team has successfully developed a bi-functional water electrolysis catalyst for the high-efficiency and stable production of high-purity green hydrogen. The newly-developed catalyst exhibits durability in highly corrosive acidic environments. By utilizing ruthenium, silicon, and tungsten (RuSiW), the catalyst is more cost-effective compared to conventional platinum (Pt) or iridium (Ir) catalysts. Furthermore, it emits significantly fewer greenhouse gases, making it an eco-friendly alternative. The research team developed a catalyst based on ruthenium, silicon, and tungsten. By enhancing the function of the ruthenium catalyst, which has lower stability in both the hydrogen evolution reaction (HER) and the oxygen evolution reaction (OER), the team demonstrated the catalyst's potential as a bi-functional catalyst. The developed catalyst features a structure doped with tungsten and silicon around a ruthenium atom. The research team conducted a stability experiment on the

catalyst. The developed catalyst demonstrated stable performance even after running for over 100 hours.

Inhalable Nanoparticle Sensors Could Help Diagnose Lung Cancer

Researchers at MIT developed a new diagnostic based on nanosensors that patients can inhale through an inhaler or nebulizer. If the sensors encounter cancer-linked proteins in the lungs, they produce a signal that accumulates in urine. Patients can then take a urine test with a simple paper test strip and it reveals the potential presence of a tumor. The researchers say the approach could potentially replace or supplement the low-dose computed tomography (CT) imaging currently used as the gold standard for diagnosing lung cancer. This could help low- and middle-income countries that lack widespread CT scanner availability. The researchers designed the sensors from polymer nanoparticles coated with a reporter, such as a DNA barcode. This reporter is cleaved from the particle when the sensor encounters enzymes called proteases, which are often overactive in tumors. The reporters eventually accumulate in urine excreted from the body. The team tested the system in mice genetically engineered to develop lung tumors similar to those seen in humans. They administered sensors 7.5 weeks after tumors began to form. This would likely correlate with stage 1 or 2 cancers in humans. Now, the team plans to analyze human biopsy samples to see if the sensor panels would also detect human cancers. Further down the road, they hope for in-human clinical trials. The team said a company called Sunbird Bio already ran Phase I trials on a similar sensor developed by Bhatia's lab for use in diagnosing liver cancer and a form of hepatitis known as nonalcoholic steatohepatitis (NASH).

INDIA

Alternative Magnetic Refrigerant Can Minimize Greenhouse Gas Emissions

Researchers at the S.N. Bose National Centre for Basic Sciences have found a new alloy that can act as an effective magnetic refrigerant that can be an alternative cooling agent for minimizing greenhouse gas emissions and meet the global demand for higher energy efficiency for tackling global warming. The team experimented with a certain type of alloys called all-transition metal based Heusler alloys in their search for material exhibiting giant reversible MCE. They chose Ni (Co)-Mn-Ti Heusler system because such systems often exhibit multifunctional properties with ultrahigh mechanical stability because of their intrinsic *d-d* hybridization. The synergistic combinations of giant MCE and MR by proper tailoring of Cu-doped Heusler alloys may lead to a diverse range of solid state-based technological applications.

IISc and GE Healthcare Sign MoU to Advance Healthcare Innovation

Wipro GE Healthcare has signed a Memorandum of Understanding (MoU) with the Indian Institute of Science (IISc), Bengaluru, to advance healthcare innovation, research, and technology development in India. The collaboration aims to take a comprehensive approach in solving the care gap by addressing the full lifecycle that includes co-developing solutions, validating the technologies, and manufacturing them locally to bring them to the market. The collaboration will entail co-development initiatives in the areas of basic and applied science, systems engineering, product & software development, consultancy, joint IP & publications, academic studies, internships, fellowships, and training. IISc and GE HealthCare will constitute a joint working committee, comprising representatives from both sides, for research around product and solution development.

CPCL and IIT-M Tie Up for Green Hydrogen Production

The Chennai Petroleum Corporation Limited (CPCL) and Indian Institute of Technology, Madras have tied up to produce green hydrogen. IIT-M will be developing electrolyzers, the CPCL will be testing the green hydrogen at its refinery. The initiative will be joined by several other industry partners. IIT Madras could also use the green hydrogen for testing in the mobility sector. CPCL would offer utilities required for production.

Low Cost Device to Monitor Water Quality Developed

A researcher at the Indian Institute of Guwahati has developed an affordable Internet of Things (IoT) enabled water quality monitoring device. The device seeks to address water and sanitation needs with technological innovation, integrating IoT, multiple sensors, and AI readiness for advanced water quality monitoring. The device is cost-effective and use-friendly. Its real-time data transmission provisions can play a crucial role for environmental conservation and resource management.

IIT Jodhpur Develops Technology to Reduce Traffic Congestion and Road Accidents

IIT-Jodhpur has developed a cutting-edge technology aimed at reducing traffic congestion and road accidents. The technology, called the Novel MAC-based Authentication Scheme (NoMAS), has been developed by the institute's computer science and engineering department. NoMAS aims to enhance vehicle security and intelligence while addressing the multifaceted challenges prevalent on Indian roads. It enables the secure and real-time exchange of data on road conditions, accidents, and traffic jams among vehicles. This information can help drivers make informed decisions and avoid hazards, ultimately contributing to road safety. The data collected and shared through the Internet of Vehicles network can be analysed to identify accident-prone areas, patterns of risky behaviour, and road conditions that require improvement. This analysis can lead to authorities taking proactive measures to address these issues and improve road safety.

G-20 AND GLOBAL CHALLENGES

Palau and Chile Ratify High Seas Treaty

Chile and Palau have become the first two countries to ratify a landmark UN treaty for the protection of the high seas. Palau became the first nation to officially approve and sanction the UN High Seas Treaty at the UN headquarters in New York. The Chilean Senate also voted unanimously in favour of ratifying the historic conservation agreement on 17 January. Chile will also become one of the 60 countries needed to ratify the treaty by the 2025 UN Ocean Conference in Nice, France to keep ocean protection goals in sight. The UN's High Seas Treaty was adopted in 2023 after two decades of negotiations. The treaty would become the world's first international law to mandate the conservation and management of marine life in areas beyond countries' national jurisdictions.

Novel Method to Estimate Biodiversity Loss

Scientists from the National University of Singapore (NUS) employed novel statistical methods to reveal the extent of biodiversity loss in Singapore over the past two centuries. The study paints the most accurate picture to date of the ecological impact of deforestation and urban development in the tropical city-state. The team compiled over 200 years of biodiversity records for Singapore, encompassing more than 50,000 individual records and over 3,000 species across ten major taxonomic groups. From this comprehensive dataset, the study estimated that Singapore has lost

37 per cent of its species. Importantly, the novel statistical models used by the team considered ‘dark extinctions’ — species that went extinct before they could be discovered and documented.

IN BRIEF

Japan ‘Moon’s Sniper’ Mission

On 29 January, Japan’s “Moon Sniper” rover regained power on the Moon, after its successful ‘pin-point’ landing on the lunar surface more than a week was marred by technical challenges and forced into hibernation. Japan Aerospace Exploration Agency (JAXA) confirmed it had successfully established communication with the Smart Lander for Investigating Moon (SLIM) spacecraft on the surface of the Moon. Upon SLIM’s revival, JAXA said “science observations were immediately started.” The rover has already sent back new images, JAXA said, sharing a shot of the lunar surface captured by the lander’s multiband spectroscopic camera.

European Council Approves EU’s Global Health Strategy

The Council on January 29, approved conclusions on the 'EU Global Health Strategy: Better health for all in a changing world', in which it reaffirms the leading role of the EU and its member states in advancing global health. Global health requires effective multilateralism and inclusive multi stakeholder partnerships, and is an essential pillar of EU external policy. The Council acknowledges that physical and mental health is a human right and that health is a prerequisite for sustainable development. The Council calls for increased ambition, a comprehensive approach to health including the promotion of health and well-being, mental health, fighting discrimination and stigma and tackling inequalities. The three complementary priorities of the EU Global Health Strategy, as pillar of Global Gateway and the European Health Union, should guide these efforts:

- deliver better health and well-being for people across their life course
- strengthen health systems and advance universal health coverage
- prevent and combat health threats, including pandemics, applying a One Health approach

The Council calls on the European Commission, the High Representative and the member states to apply these guiding principles and implement as appropriate the lines of action and initiatives proposed, in a Team Europe approach. This includes taking concrete action to promote global health across relevant sectors, strengthening capacity and enhancing coordination, taking a proactive and constructive role to strengthen multilateral cooperation with the World Health Organization (WHO) at its core, and by filling existing gaps in global governance and ensuring complementarities and coherence of action, expanding equitable and mutually-beneficial bilateral, regional, trans-regional and global partnerships. It also includes promoting equitable access to health services and products, including through local manufacturing, collectively enhancing financing for global health at global, regional and national level, supporting domestic resource mobilisation in partner countries, developing a coherent EU global health diplomacy with augmented capacity in EU Delegations and regularly taking stock of progress and the impact of the strategy.

RESOURCES & EVENTS

Global Pandemic Preparedness Report Released

According to the new report prepared by the International Pandemic Preparedness Secretariat (IPPS), there is a global lack of preparedness and reactive responses when confronted with emerging epidemic threats, a concerning lack of investment in the R&D vaccine and therapeutic

pipeline, and signs of waning focus on pandemic preparedness. The IPPS launched its third annual report on the 100 Days Mission (100DM) for pandemic preparedness at the Accademia dei Lincei in Rome on 24 January. The report assesses how much progress has been made toward ensuring the global availability of diagnostics, therapeutics, and vaccines (DTVs) within the first 100 days of a pandemic threat. It also evaluates progress toward the 100 Days Mission target of two antiviral therapies for each high-risk viral family, ready for Phase II/III clinical trials by 2026.

23rd World Sustainable Development Summit to be Held in New Delhi

The Energy and Resources Institute (TERI) will be organising 23rd edition of World Sustainable Development Summit (WSDS) from February 7-9 at the India Habitat Centre here that will see assembly of leaders, policymakers and experts to engage in discussions, share innovative solutions, and formulate strategies which prioritize not only environmental sustainability but also social equity. The summit will have 11 plenary sessions. It will also include high-level sessions on women leadership, businesses, and youth, apart from the inaugural and valedictory sessions.

SCIENCE POLICY AND DIPLOMACY

Second Indo-French Joint Committee of Science and Technology

The second meeting of the Indo-French Joint Committee of Science and Technology (JCST) took place on 18 January. During the meeting, ways of catalyzing a stronger and rejuvenated Indo-French scientific partnership were discussed. The Committee was co-chaired by Prof Abhay Karandikar, Secretary for the Department of Science and Technology (DST), Ministry of Science and Technology, Government of India and Dr Claire Giry, Director General for Research and Innovation at the French Ministry of Higher Education and Research. Professor Karandikar highlighted the success of the CEFIPRA model as a catalyst of Indo-French Collaboration and said that it could help step up research partnerships in new age technologies like ICPS, health, clean energy, AI, quantum technologies, and advanced materials. He also underscored the need for more collaboration between the innovators and entrepreneurs of the two countries. The need for stronger associations between researchers of the two countries focusing on sustainable technologies, applied mathematics, health and ocean research were underlined by Dr Giry. India and France agreed to prioritize scientific collaboration in the thematic fields of Health, Decarbonized Hydrogen, Marine Sciences, and Applied Mathematics.

Oceanographic Course for Colombo Security Conclave

The CSIR - National Institute of Oceanography (NIO) commenced a month-long certificate course for the member countries of the Colombo Security Conclave (CSC) to foster collaboration and capacity building in Oceanography. The CSC Oceanographers and Hydrographers conference held in November 2022 brought scientists together from CSC nations to jointly conduct two expeditions in the Indian Ocean Region. Participants in the course will delve into various facets of Oceanography, addressing the profound impacts of climate change on the Indian Ocean and around the world. The program includes interactive discussions, the exchange of best practices, and hands-on project work to enhance practical knowledge. The course is anticipated to facilitate a rich exchange of ideas and contribute to the growing body of knowledge in Oceanography. The engagement aims to enhance the capabilities of the participating nations in addressing environmental challenges, fostering sustainable practices, and promoting scientific cooperation.

Missing Russian Scientific Data Cause Arctic Climate Blind Spots

Researchers have noted that loss of scientific data from Russia's Arctic monitoring stations following the invasion of Ukraine has worsened information gaps that could have serious implications for tracking and predicting climate change globally. Monitoring relies heavily on data from stations spread across the vast and diverse region, but Moscow's assault on Ukraine in February 2022 triggered a freeze in scientific cooperation in the Arctic—and elsewhere. Russia represents almost half the landmass of the entire Arctic region, creating a massive information gap. Using computer models, they looked at eight factors—including air temperature, rainfall, snow depth, vegetation biomass and soil carbon—and found that even before the conflict in Ukraine the network had gaps, with stations concentrated in warmer, wetter areas.

We welcome your comments and valuable suggestions. Please write to us for receiving publications, updates and notices regarding seminars, conferences etc. Contact us at science.diplomacy@ris.org.in