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SCIENCE & TECHNOLOGY

GLOBAL

[Scientists Demonstrate Unique New Method for Quantum Data Storage and Retrieval](#)

In a first event of its kind, scientists hailing from universities in the United Kingdom and Europe have succeeded in storing and retrieving data from quantum computers. In doing so, they have achieved an important milestone with respect to quantum networking and quantum-based internet. Quantum communication and quantum data transmission has been difficult to realise. This is because quantum entanglement tends to get lost over long distances. To overcome this, scientists have been trying to divide the network into smaller segments in a shared quantum state. In this regard, the recent breakthrough allows quantum data to be stored and retrieved while being transmitted over long distances. The novel approach entailed a device that generated quantum dots or non-entangled photons which were stored in a quantum memory system using rubidium atoms. The memory was turned on and off and the photons were released using a laser. Holding immense computing power that can be used at lightning speed, quantum computers can significantly help humanity solve complex problems ranging from financial risk management to designing new drugs.

[New AI Tool Can Detect Cancer From a Dried Blooddrop](#)

AI-enabled techniques seem to be pioneering an entirely new age in medical sciences. In a recent new breakthrough, an AI tool was successfully able to analyse chemicals from a drop of blood to distinguish between patients suffering from three different types of cancer. The development is revolutionary because the presence of pancreatic, colorectal and gastric cancer in the current context can only be confirmed through imaging or surgical procedures. During tests at the preliminary level, the tool was able to live nearly accurate results in a matter of minutes. The AI tool analyses metabolites in blood which act as "biomarkers" that signify the presence of cancer in an individual's body. The test has been developed by scientists in China and the results have been published in Nature Sustainability.

[Novel Combination of Plasma Management Techniques May Enhance Nuclear Fusion Prospects](#)

Researchers at the Princeton Plasma Physics Laboratory (PPPL), USA have demonstrated a novel combination of methods to manage the temperature of plasma in a nuclear fusion reactor. The two methods: electron cyclotron current drive (ECCD) and applying resonant magnetic perturbations (RMP) have been looked at individually as means to control the temperatures in a fusion reactor. A nuclear fusion reactor attempts to generate energy through fusing atomic nuclei. This is done

through creating a plasma, a superheated state of matter consisting of atomic nuclei and electrons. Energy is generated from a fusion reaction when the plasma temperature exceeds the reactor's critical ignition temperature. However, maintaining the required temperature to sustain a fusion reaction has been seen to be technically challenging. The PPPL experiment is the purportedly the first time that the two methods have been employed together. The unique combination is expected to help overcome significant challenges associated with sustaining a nuclear fusion reaction. Application of RMPs can purportedly help create additional magnetic fields that can help overcome "edge localised modes" which disrupt fusion reactions. Meanwhile, microwave beams are directed to the edge of the plasma in ECCD. This allows for optimisation of plasma stability. Qiming Hu, a researcher who led the experiment compares the same to "using a dimmer switch alongside the light switch, providing us with the ability to fine-tune the plasma environment".

NASA Pioneers New Era in Spacefaring with the Launch of Solar-powered Satellite

The National Aeronautics and Space Administration (NASA) has launched a unique solar powered spacecraft aboard Rocket Lab's Electron rocket on 24 April 2024. To utilise sunlight for propulsion, the spacecraft has been fitted with a technology called the Advanced Composite Solar Sail System. According to NASA, "the rocket will deploy the mission's CubeSat above Earth to test the performance of the system". In two months, NASA also plans on conducting a series of manoeuvres during which the orbit of the CubeSat shall be raised and lowered using sunlight. The technology, if proven could be a real gamechanger in spacefaring. In addition to reducing the current reliance on heavy propulsion systems, solar sail technology can lower overall mission cost, while potentially prolonging mission duration.

INDIA

Cancer Vaccine: IISc Researchers Develop New Compound

A new compound which can potentially lead to a more effective cancer vaccine has been developed at Indian Institute of Sciences (IISc), Bengaluru. The compound can purportedly boost the production of antibodies that fight cancer cells by attaching itself to a protein in blood and hitchhiking a ride to the lymph nodes. During the study, the compound was injected into mice. Even at low quantities, the compound enabled the mice to produce antibodies, in comparison to the group of mice which were injected with a compound targeting an alternative protein. Antibody production was boosted in among the former after a second bout of immunisation. Details on the study have been published in the journal, Advanced Healthcare Materials.

Towards Net Zero Carbon Emissions: IICT and BHEL to Collaborate on Carbon Capture

The Indian Institute of Chemical Technology (IICT) and Bharat Heavy Electricals Limited (BHEL) have entered into a new Memorandum of Understanding for developing a new carbon capture technology. The project envisaged under the MoU shall seek to capture carbon dioxide and convert the same to dimethyl ether, which can be blended with LPG and used as a clean fuel. In doing so, the project seeks to achieve a reduction in green house gas emissions, while producing a cleaner source of energy. In the long run, use of such technologies is expected to help India transition to a low-carbon economy. The initiative has been funded by the Department of Science and

Technology, Government of India as a part of its “special call for proposals on CCU test bed for Methanol / Dimethyl Ether production”.

[BEL, IIT Mandi Sign MoU on Semiconductors, Quantum Computing](#)

Bharat Electronics Limited (BEL), a Navratna Public Sector Undertaking under the Ministry of Defence, Government of India has signed a Memorandum of Understanding with IIT Mandi. BEL, a company founded in 1954 specialises in the manufacture of critical technology components including electronic subsystems used in military equipment, telecom, satcom and photovoltaics. As per the terms of this MoU, BEL and IIT Mandi shall work together in areas including drones, semiconductors and quantum technologies. According to the official statement released by BEL, the collaboration seeks to “leverage the complementary strengths and capabilities” of the two entities. In line with the goals envisaged under Make in India, it aims to foster the indigenisation of the products and solutions offered by BEL to its customer base.

[ISRO Data Reveals Concerning Expansion in Himalayan Lakes](#)

Remote sensing data gathered by the Indian Space Research Organisation over the past few decades has revealed a concerning expansion in Himalayan glacial lakes. These glacial lakes are essentially formed when glaciers melt. The data reveals that at least 89 per cent of the total number of glacial lakes have grown nearly twice in size. 130 out of these lakes are located in India within the Indus, Brahmaputra and Gangetic River basins. Often regarded as the “third pole” due to the presence of glaciers and snow cover, the Himalayas have been witnessing the effects of climate change, much like the Arctic and Antarctic regions. According to ISRO, the expansion in the size of glacial lakes translates to an increased risk of occurrence of events such as Glacial Lake Outburst Floods (GLOF). Such a scenario ensues when natural damming systems made of moraine or ice fail to contain large volumes of water released by glacial lakes resulting in sudden floods.

GLOBAL CHALLENGE

[Combating Extinction: New Study Proves Success in Conservation Efforts](#)

In a development that has been described as a “ray of light” for conservationists, a new study has found conservation efforts to have been successful in reducing global biodiversity loss. The study published in the journal Science reviewed over 665 conservation initiatives dating as far back as 1890 and spanning across various countries, oceans and species. Among other findings, it concludes that conservation efforts had a positive impact in two out of three cases. The study also highlights important success stories such as that of deforestation in the Congo basin reducing to over 74 per cent following the introduction of forest management efforts. On the flipside, however, conservation also negatively impacted species, causing their numbers to decline. At other times, the species for which the conservation was not intended for was noted to benefit unintentionally.

[Climate Change Impact: One-fifths of Global GDP May be Lost by 2050](#)

A new study has projected that the effects of climate change could shrink global Gross Domestic Product by about USD 38 trillion by 2050. The study further estimates that the cost of climate change may increase to “upto tens of trillions of dollars per year by 2100”, if global temperatures

exceed the two-degree Celsius limit. Even in a high emission scenario, staying under two degree Celsius can purportedly “help limit average regional income loss to 20 percent compared to 60 percent”, notes, Max Kotz, the lead author of the study. However, a number of inadequacies have already been pointed out within the study. The exclusion of loss and damage resulting from reduction in tropical forests, sea-level rise and destabilisation of ice sheets etc has been pointed out as a major flaw.

[New Study: AI Models Can Improve Weather Prediction](#)

A new study has noted the potential for artificial intelligence (AI) to revolutionise weather forecasting. AI can purportedly do as well as traditional computing methods in assessing the trajectory and intensity of storms. In addition to matching the accuracy, the use of AI renders the entire process faster and cost effective. According to Professor Andrew Charlton-Perez who led the study, “(machine learning) models that can produce 10-day global forecasts in minutes.” The study essentially employed AI models employed by Google, Nvidia and Huawei to assess Storm Ciaran, which battered North-west Europe in November 2023. It sought to compare the assessment made by AI with that of the results obtained from applying traditional methods. It further details the ability of AI models to capture key atmospheric conditions that may influence the development and trajectory of the storm. Further details on the study can be found at the journal, npj Climate and Atmospheric Science.

[OpenCRISPR-1: World’s First AI-Generated Gene Editor Released](#)

OpenCRISPR-1, which has been termed the world’s first-ever open source AI-generated gene editor has been released by Profluent, a Berkeley-based AI-driven protein design company. Similar to how a Generative AI such as Chat GPT learns from diverse web sources, OpenCRISPR-1 learns from biological data to design gene editors. It draws from sequences of nucleic acids and amino acids, while learning from CRISPR gene editors found in nature and scrutinising their functions. In a bid to allow the scientific community to benefit from it, Profluent has made OpenCRISPR-1 open source and accessible for all. Once approved, OpenCRISPR-1 could increase the efficiency and precision with which diseases and health conditions are prevented, diagnosed and treated.

RESOURCES & EVENTS

[Our Ocean Conference: Deep Seabed Mining Ban, Marine Biodiversity Protection Discussed](#)

The 9th Our Ocean Conference was held in Athens, Greece, during 15-17 April, 2024. The Conference was initiated in 2014 by the US Department of State in order to fill the gap with respect to ocean governance. Held annually, it has since brought together multiple stakeholders hailing from academia, governments and intergovernmental organisations to deliberate upon how oceans can be protected and managed. The Athens conference sought to address four priority areas: reduction of marine plastics and microplastic pollution, green shipping, green transition in the Mediterranean and sustainable tourism in coastal areas and islands. The conference witnessed its delegates make about 469 commitments to protect the ocean amounting upto USD 11.3 million. Delegates also pledged to address climate change, illegal, unreported and unregulated fishing and take measures to protect marine biodiversity. While the European Union alone made commitments

worth USD 3.5 billion, US Agency for International Development committed 103 million dollars. Meanwhile, Palau called for the imposition of a moratorium on deep seabed mining.

Workshop on Green Hydrogen and Energy Transition Held at the University of Ladakh

The University of Ladakh in collaboration with the Hydrocarbon Sector Skill Council (HSSC) organised a two-day workshop on energy transition and green hydrogen on 18-19 April, 2024. The event held at the University of Ladakh was attended by academics and prominent personalities from India's energy industry. Speaking at the inaugural function, S K Bose, CEO, HSSC noted that Ladakh could be an ideal location for developing green hydrogen projects. Meanwhile, Amit Sharma, Secretary IT, Transport, Rural Development, S&T, DMRRR complemented Ladakh on becoming India's first carbon-neutral state/union territory. Plans for starting various courses relating to clean energy were also discussed at the workshop.

Critical Minerals for Energy Transition: UN Secretary-General Launches New Panel

The UN Secretary-General Antonio Guterres has launched a new panel to focus on "ensuring fairness, sustainability and respect for human rights throughout the entire process of sourcing and using critical minerals needed for the clean energy transition". Launched on 24 April 2024, the panel consists of multiple stakeholders including UN bodies, governments and other organisations. The plan for establishing such an initiative had been indicated by Guterres at the 28th Conference of Parties on climate change, held in Dubai in December 2023. Launching the initiative, he noted that "the race to net zero cannot trample over the poor", while urging the world to ensure that energy transition be implemented in a just manner.

CSIR- Indian Institute of Petroleum Celebrates 65th Anniversary

The Dehradun-based CSIR-IIP marked its 65th founding day at its campus on 27 April 2024. Established on 14 April 1960, the CSIR-IIP is regarded as one of India's premier research institutions working on science and technology. Dr. V.K. Saraswat, member, NITI Aayog and mentor, CSIR-IIP delivered a lecture on the theme, "Energy Transition in India" during the occasion. The lecture emphasised on clean energy technologies that would power the future and highlighted e-Methanol and green hydrogen as priority research areas that scientists should pursue. Dr. Saraswat further underlined the importance of rigorously pursuing carbon neutrality so that Indian technologies may remain competitive around the world. Dr Harender Singh Bisht, Director CSIR-IIP, highlighted several achievements of the Institute including medical oxygen units, sustainable aviation fuel and the Numaligarh Wax Plant, located in Golaghat, Assam. Dr. Bisht also presented a roadmap for the institute from 2024-2030.

SCIENCE POLICY AND DIPLOMACY

Sweden, Slovenia Sign Artemis Accords

Two European Union member-states, Sweden and Slovenia became the 38th and 39th signatories to the US-led Artemis Accords. The two European Union member-states signed the Accords on 16th and 20th April 2024, respectively. The Artemis Accords were established in 2020 by the United States of America, along with seven founding members: Italy, Japan, Australia, Canada,

Luxembourg, the United Kingdom and the United Arab Emirates. The Accords essentially entail a set of non-binding principles that guide nation-states in their pursuit of peaceful and sustainable lunar exploration. Among other things, the principles including peaceful uses of outer space, transparency, preservation of outer space heritage feature among the principles.

Research and Innovation: Letta Report Calls on EU to create a ‘Fifth Freedom’

A high-profile policy report submitted before the European Commission has urged for the EU to consider creating a fifth freedom for “free movement of research, innovation, knowledge and education”. The report has been put together by Italian Prime Minister Enrico Letta. It reportedly entails perspectives gathered from over 400 meetings that Letta held with experts from around Europe. Among other things, the report urges for a revamp of the EU’s notion of single market, while calling the same outdated for the 21st Century. The four freedoms which pertain to the movement of people, goods, services and capital “fall short in addressing the shift from an economy based on ownership to a new one, based on access and sharing,” the report notes. Letta further writes that the outdated idea of a single market is causing the EU to fall behind the United States of America and China with respect to economic productivity and competitiveness. The report entails recommendations that pertain to various aspects of Europe’ research and innovation system. These include: education mobility, the creation of a European knowledge commons and the role of Small and Medium Enterprises.

India’s Bharat 6G Alliance May Soon Formalise Collaboration with EU’s Next G Alliance

India’s Bharat 6G alliance may soon ink an agreement with Industry Alliance 6G, the European telecommunications industry body. Created by the Department of Telecommunications, Government of India in 2023, Bharat 6G aims to bring together Indian startups, companies, and the manufacturing ecosystem to establish consortia that drive the design, development and deployment of 6G technologies in India. According to sources, the partnership could be similar to the one that Bharat 6G inked with the US telecommunication body, Next G alliance in September 2023. This agreement had signalled a joint intent to work together on 6G technologies as well as bolster supply chain resilience. Bharat 6G and Next G had further signalled their intent to work on secure and trusted telecommunications and digital inclusion. The agreement with Industry Alliance 6G comes amid India and the European Union’s efforts to strengthen cooperation across high technology sectors including semiconductors and communications.

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