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INSIDE INDIA'S 'DEEP OCEAN MISSION', A CHALLENGE HARDER THAN GOING TO SPACE

Relevant for: Science & Technology | Topic: Science and Technology- developments and their applications and effects in everyday life

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October 31, 2023 10:00 pm | Updated November 01, 2023 09:06 am IST

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A prototype of the Matsya6000 submersible made by the National Institute of Ocean Technology, Chennai, March 17, 2023. | Photo Credit: Ravindran R./The Hindu

The [Deep Ocean Mission](#) (DOM) is India's ambitious quest to explore and harness the depths of the ocean. As part of this initiative, India will, for the first time, embark on a journey to a depth of 6,000 metres in the ocean using an indigenously developed submersible with a three-member crew. The mission will require technologies to access and transport tonnes of valuable minerals from the ocean-bed in an environmentally safe manner. The following interview, with **M. Ravichandran**, Secretary of the Ministry of Earth Sciences, breaks down the mission and its salient features and challenges. It was conducted by Bhavya Khanna, a scientist in the Ministry.

Please tell us about the DOM and how MoES contributes to this programme.

DOM is India's ambitious programme, chiefly implemented by the MoES. DOM was approved by the Union Cabinet in 2021 at a cost of nearly Rs 4,077 crore over a five-year period in a phased manner. The mission has six pillars:

(i) Development of technologies for deep-sea mining and a manned submersible to carry three people to a depth of 6,000 metres in the ocean. The submersible will be equipped with a suite of scientific sensors, tools and an integrated system for mining polymetallic nodules from the central Indian Ocean;

(ii) Development of ocean climate change advisory services, involving an array of ocean observations and models to understand and provide future climate projections;

(iii) Technological innovations for the exploration and conservation of deep-sea biodiversity;

(iv) Deep-ocean survey and exploration aimed at identifying potential sites of multi-metal hydrothermal sulphides mineralisation along the Indian Ocean mid-oceanic ridges;

(v) Harnessing energy and freshwater from the ocean; and

(vi) Establishing an advanced Marine Station for Ocean Biology, as a hub for nurturing talent

and driving new opportunities in ocean biology and blue biotechnology.

The 'New India 2030' document outlines a blue economy as the sixth core objective for India's growth. The years 2021-2030 have been designated by the United Nations as the 'Decade of Ocean Science', and Prime Minister Narendra Modi has, on several occasions, emphasised the need for India to work towards sustainably harnessing the ocean's potential for the nation's growth.

DOM is one of nine missions under the Prime Minister's Science, Technology, and Innovation Advisory Council (PMSTIAC). It is imperative that DOM supports the blue-economy priority area, blue trade, and blue manufacturing in India.

MoES institutes, especially the Centre for Marine Living Resources and Ecology (CMLRE), Indian National Centre for Ocean Information Services (INCOIS), National Centre for Coastal Research (NCCR), National Centre for Polar and Ocean Research (NCPOR) and National Institute of Ocean Technology (NIOT) will collaborate with other national institutes and academia to achieve the objectives outlined in DOM, albeit with well-segregated responsibilities. DOM's progress is closely monitored by special councils and committees comprising experts from across the national and multi-institutions, given its status as a priority and focus area for us.

Please tell us about the progress of the first pillar of DOM, which requires the development of technologies for deep-sea mining and a crewed submersible.

The NIOT, an autonomous institute under MoES, has been entrusted with the mandate of developing indigenous technologies to address engineering challenges associated with exploring and utilising oceanic resources. As a part of DOM, India's flagship deep ocean mission, 'Samudrayaan', was initiated in 2021 by the Minister of Earth Sciences.

With 'Samudrayaan', India is embarking on a groundbreaking crewed expedition to reach a depth of 6,000 m to the ocean bed in the central Indian Ocean. This historic journey will be accomplished by Matsya6000, a deep-ocean submersible designed to accommodate a crew of three members. Equipped with a suite of scientific sensors and tools, Matsya6000 boasts an operational endurance of 12 hours, which is extendable to 96 hours in the event of an emergency.

The design of Matsya6000 has now been completed. Our initial phase will involve testing and experimentation at a depth of 500 metres (shallow water) within the upcoming year, followed by a realisation of the full 6,000-metre depth capability within two to three years. The shallow-water personnel sphere of Matsya6000 has been certified for human-rated operations at up to 500-m water depths. A human acclimatisation test in a shallow-water sphere was successfully conducted with three personnel for two hours at a depth of 7 m.

Three people sit inside a prototype of the Matsya6000 submersible made by the National Institute of Ocean Technology, Chennai. | Photo Credit: Ravindran R./The Hindu

The Ministry is also working on an integrated system to mine polymetallic nodules of precious minerals from the central Indian Ocean bed. The minerals we can mine from the ocean bed in the central Indian Ocean region, allocated to us by the United Nations International Seabed Authority (ISA), include copper, manganese, nickel, and cobalt.

NIOT has successfully conducted deep-sea locomotion trials on the seabed at a depth of 5,270 m using our underwater mining system, 'Varaha'. This milestone is a step towards future exploration and harvesting of deep-sea resources. With encouraging progress observed in field

tests and trials, we remain steadfastly on course.

The deepest point in the oceans, the Mariana Trench, is 11,000 m deep. Why has a depth of 6,000 m been chosen?

The decision to target a depth of 6,000 m for the DOM holds strategic significance. India has committed to the sustainable extraction of valuable resources, including polymetallic nodules and polymetallic sulphides. ISA has allocated a 75,000-sq.-km region in the central Indian Ocean and an additional 10,000 sq. km at 26° S to India for this purpose.

Polymetallic nodules, which contain precious metals like copper, manganese, nickel, iron, and cobalt, are found approximately 5,000 m deep, and polymetallic sulphides occur at around 3,000 m in the central Indian Ocean. Therefore, our interests span depths of 3,000-5,500 m. By equipping ourselves to operate at a depth of 6,000 m, we can effectively cater to both the Indian Exclusive Economic Zone and the central Indian Ocean.

It is said that exploring the deep oceans is more challenging than exploring outer space. Can you elaborate on some of the important challenges of India's DOM?

Indeed, exploring the depths of the oceans has proved to be more challenging than exploring outer space. The fundamental distinction lies with the high pressure in the deep oceans. While outer space is akin to a near perfect vacuum, being one meter underwater puts as much pressure on an object of one square meter area as if it were carrying about of 10,000kg of weight, which is equivalent to a huge adult elephant.

Operating under such high-pressure conditions requires the use of meticulously designed equipment crafted from durable metals or materials. Additionally, electronics and instruments find it simpler to function in a vacuum or in space. Conversely, inside the water, poorly designed objects collapse or implode.

Landing on the ocean bed also presents challenges due to its incredibly soft and muddy surface. This factor renders it exceedingly difficult for heavy vehicles to land or manoeuvre, as they would inevitably sink.

Moreover, extracting materials requires them to be pumped to the surface, an undertaking that demands a large amount of power and energy. Unlike controlling rovers on distant planets, remotely operated vehicles prove ineffective in the deep oceans due to the absence of electromagnetic wave propagation in this medium. Visibility also poses a significant hurdle as natural light can penetrate only a few tens of metres beneath the surface, whereas space observations are facilitated through telescopes.

All these intricate challenges are further compounded by factors like variations in temperature, corrosion, salinity, etc., all of which must also be dealt with.

This is where NIOT plays an important role. Since its establishment in 1993, NIOT has provided scientific engineering solutions for a wide variety of earth-system-related issues. These solutions span beach restoration and buoy observations to the creation of vehicles tailored for polar regions and lakes. One of the pillars, which revolves around developing technologies for deep-ocean crewed missions and mining systems, has been progressing well.

Please tell us about the Matsya6000. Where does this keep us on the global front?

The Matsya6000 is India's flagship deep-ocean human submersible that aims to reach the

ocean bed at a depth of 6,000 m. Accompanied by three crew members, called "aquanauts", the submersible carries a suite of scientific tools and equipment designed to facilitate observations, sample collection, basic video and audio recording, and experimentation.

The primary mission of Matsya6000 revolves around exploration. Notably, countries such as the U.S.A., Russia, China, France, and Japan have already achieved successful deep-ocean crewed missions. India is poised to join the ranks of these nations by demonstrating expertise of and capability for deep-ocean crewed missions. As a country, this makes us very proud. It is also important to note that our focus remains on developing these technologies indigenously, aligned with the vision of 'Atmanirbhar Bharat'.

A remotely operable vehicle built by the National Institute of Ocean Technology, Chennai, as part of India's 'Deep Ocean Mission'. | Photo Credit: Ravindran R./The Hindu

Matsya6000 seamlessly combines the best and most feasible features of remote operated vehicles (ROVs) and autonomous remote vehicles (AUVs). Although its sub-sea endurance is limited, it offers an excellent intervention mechanism and operates untethered. This feature positions it ideally for deep-sea observation missions.

The interior of Matsya6000 is designed to accommodate three humans travelling within a specialised sphere with a diameter of 2.1 m. The human sphere would weigh approximately 28 tonnes and have a short-sleeved environment with life support, where oxygen is supplied and carbon dioxide is scrubbed away.

Constructed from a titanium alloy, the sphere is engineered to withstand pressures of up to 6,000 bar. It is equipped with propellers enabling movement in all six directions and features three viewports that allow the crew to observe its surroundings in real-time.

There will be about 12 cameras and 16 lights powered by lithium polymer batteries with an energy budget of 1 kWh. Communication is achieved through sound – an acoustic phone and modem. The navigation and positioning systems are state-of-the-art, too.

The overall dimensions of Matsya are 9 m in length, 3 m in breadth, and 5 m in height. Importantly, it will not be actively lowered through sinking; instead, it will function as a free-floating system, for energy efficiency. It can move at a speed of about 5.5 km/hr using underwater thrusters, which is adequate.

With Matsya, India will be the only country to have an entire ecosystem of underwater vehicles encompassing deep-water ROVs, polar ROVs, AUVs, deep-water coring systems, and more.

Please tell us about the Indian deep-ocean mining system 'Varaha'. Which other countries have successfully taken up deep-sea mining so far?

ISA has granted deep-ocean exploration and mining contracts to several countries, including China, France, Germany, Japan, Russia, South Korea, and India. Our own deep-ocean mining vehicle, 'Varaha', is a self-propelled track-based seabed mining system.

It operates on the flexible riser technique: the mining vehicle is lowered to the ocean bed from a surface ship using a high-strength flexible cord system. Once the vehicle reaches the ocean bed, it will be able to move around while the surface ship moves in tandem.

Positioned at a pre-surveyed mineral-rich site, Varaha uses a high-power pressure pump system to facilitate the extraction of precious polymetallic nodules. These nodules are pumped from the

ocean bed to the surface ship.

Last year, NIOT successfully conducted deep-sea locomotion trials of 'Varaha' at a depth of 5,270 m in the central Indian Ocean. Over a span of 2.5 hours, the surface ship covered a distance of 120 m with Varaha. This achievement marked the world's deepest dive for an underwater mining machine.

'Varaha' was able to collect the polymetallic nodules from the ocean bed during the trial. An environmental impact assessment for this operation has been submitted to international authorities, signifying the successful completion of stage 1.

Nonetheless, much work remains in stage 2, which includes the extraction of valuable minerals. In this stage, our mining system has to make a slurry by combining polymetallic nodules with ocean water on the ocean bed using a powerful crusher. Then, the mineral slurry will be pumped up to the surface (5,000-6,000 m) through a riser.

Given that the power supply – of about 1 MW per hour – can only be supplied from the surface ship, the pump must be very powerful. More power would mean very high riser friction. The slurry has to be transported so that the minerals can be extracted. We are working on addressing all these aspects, and our progress is promising.

I would like to add that the Ministry of Earth Sciences, various national institutes, and academia all involved as part of DOM have demonstrated excellent collaboration, knowledge exchange, and pooling of human capital. This embodies the very essence of the scientific zeal that defines our nation. By 2025, we are confident of moving the DOM ahead. Our commitment to success and service remains unwavering.

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oceans / minerals / mining / metal and mineral

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MALWARE MALICE: THE HINDU EDITORIAL ON THE APPLE CYBERATTACK ALERT

Relevant for: Security Related Matters | Topic: Basics of Cyber Security and related matters

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November 02, 2023 12:30 am | Updated 12:30 am IST

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In a thriving democracy, the Opposition and the press are vital components of a structure controlled by a ruling establishment that requires accountability for it to be effective. That over a dozen Opposition leaders and journalists received email alerts from Apple that their devices were targeted by "state-sponsored attackers" suggests that this could be a repeat of what these members of the first and fourth estate went through in the Pegasus episode recently. In early 2022, an article in The New York Times detailed how Pegasus, a spyware developed by the Israel-based NSO Group, was used as a tool to advance Israeli interests, as Tel Aviv offered it to other countries which used it against Opposition leaders, journalists and dissidents. In July 2021, a reporters' consortium, the Pegasus Project, found that at least 40 journalists, cabinet Ministers and other officials in India were possibly subject to surveillance using Pegasus software. A Supreme Court of India panel, however, found no conclusive evidence of the spyware on the 29 phones that it had examined; but the apex court also noted, tellingly, that the Union government was not cooperating with the panel. Unlike the Indian government's lackadaisical and dismissive approach towards the NSO group and its products — which The NYT reported as allegedly bought by the Indian government from Israel as part of a $2 billion package including sophisticated weapons and intelligence gear in 2017 — other governments in the West implemented stringent steps following the disclosures on spyware use.

Apple's iPhones are used by nearly 20% of smartphone users worldwide, and by nearly 7% of such users in India, largely for their diverse facilities and robust security provisions. Researchers had found that spyware software such as Pegasus had targeted iPhones and the operating system iOS as early as 2016, and Apple had come up with updates to fix Pegasus exploits, besides going on to sue NSO. The company clarified that the alerts sent now did not accuse a "specific state actor"; it also said that it would not be able to disclose how the targets were discovered, but reiterated that the alerts had to be taken seriously. Yet, with the specific targets being Opposition leaders and journalists, the question whether it is the ruling establishment that is subjecting them to surveillance is important. This can only be verified by an independent and empowered investigation, involving the apex court again, which should, this time around, compel the Union government to cooperate. More immediately, the government must come clean on its dealings with NSO and its use of software provided by such agencies and also emulate steps taken by other governments in proscribing such entities.

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AI AND THE ISSUE OF HUMAN-CENTRICITY IN COPYRIGHT LAW

Relevant for: Science & Technology | Topic: Science and Technology- developments and their applications and effects in everyday life

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November 02, 2023 12:08 am | Updated 12:33 am IST

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'Many of the traditional economic arguments such as the need to incentivise authors and inventors through copyright or patents, do not hold with the autonomous creative output of AI systems, since machines are not influenced by such incentives' | Photo Credit: Getty Images/iStockphoto

The Executive Order in the United States, issued by the Biden administration on October 30, on 'Safe, Secure, and Trustworthy Artificial Intelligence (AI)', illustrates the changing attitude of global leaders towards AI regulation. Implementation and the use of AI without the necessary safeguards can have enormous implications for the future of humanity, and the changes in regulatory approaches are a welcome development.

One of the many areas wherein AI has raised tough questions is ownership and enforcement of intellectual property (IP) rights. For example, while generative AI tools such as ChatGPT and Midjourney allow people with minimal creative skills to produce reasonably beautiful outputs with the help of a couple of text prompts, their use has raised a number of copyright-related questions. These include whether the use of copyrighted materials, including texts and images, as training data infringes the rights of millions of authors and artists on the Internet. A related query revolves around copyright ownership over output generated by AI, autonomously or with inputs from humans.

A recent decision of the United States District Court for the District of Columbia in Stephen Thaler vs Shira Perlmutter is remarkable because it provides some insights on whether copyright can exist in work autonomously created by AI. In this case, Mr. Thaler owned an AI system named 'Creativity Machine' which he claimed had autonomously created a piece of visual art. In his application for copyright registration before the U.S. Copyright Office, 'Creativity Machine' was mentioned as the author of the work. Mr. Thaler also added that the copyright of the work would be transferred to him, as the owner of 'Creativity Machine'.

The copyright office rejected the application on the ground that the submitted work lacked human authorship. His pleas to the Office to reconsider its decision were also rejected on the same rationale. He challenged the rejection before the District Court subsequently. The primary legal question before the Court was whether a work autonomously generated by an AI system could be copyrightable. After reviewing the relevant statutory provisions, case laws, and

theoretical justifications for copyright protection, the court concluded that human creativity was essential to copyright protection.

The court's line of reasoning is in tune with the general position of the U.S. Copyright Office thus far vis-à-vis work created autonomously by an AI system. In a document entitled 'Copyright Registration Guidance: Works Containing Material Generated by Artificial Intelligence', released in March 2023, the copyright office had categorically stated that "copyright can protect only material that is the product of human creativity. Fundamentally, the term 'author,' used in both the Constitution and the Copyright Act, excludes nonhumans".

The office also clarified that copyright applicants had a duty to disclose the inclusion of AI-generated content in any application, followed by detailed guidelines on doing so in registration forms. Recently, it also initiated a public consultation on various copyright-related questions posed by AI.

Compare the U.S. episode with the prevailing situation in India. In 2020, the Indian Copyright Office registered a work of art called 'Suryast', for which an AI system named "RAGHAV Artificial Intelligence Painting App" was listed as a coauthor. The Copyright Office had previously rejected an application in which the same system had been listed as the sole author. While India has not effected any legislative changes in the Copyright Act 1957, the Copyright Office ignored the human authorship requirement in Indian copyright law when granting registration with an AI system as a co-author.

When the matter became controversial, the office sent a notice to the human co-author in the application declaring its intent to withdraw the registration. But the data from the Indian Copyright Office website suggests that the work concerned continues to remain registered. The Copyright Office is also yet to articulate mandatory disclosure requirements on the use of AI or even initiate broader consultations on this important issue.

It may also be useful to review the current scenario in light of the recommendations of the 161st Report of the Department-Related Parliamentary Standing Committee on Commerce entitled 'Review of the Intellectual Property Rights Regime in India' (July 2021). The report had suggested reviewing the Copyright Act 1957 and the Patent Act 1970 to "incorporate the emerging technologies of AI and AI-related inventions in thir ambit".

A careful reading of the report suggests some of its recommendations aim to relax the standards for securing copyright and patents. But these recommendations do not appear to be informed by any study of IP-related challenges and needs of the AI innovation ecosystem in India. The committee did not consider the potential adverse implications of such an approach for the startup ecosystem in India. This is alarming.

IP rights confer monopoly protection, and as any monopoly rights can have extensive negative consequences on society, we need to be cautious about extending, in a straightforward way, existing IP protections to AI-generated work. Many of the traditional economic arguments such as the need to incentivise authors and inventors through copyright or patents, do not hold with the autonomous creative output of AI systems, since machines are not influenced by such incentives.

In sum, policymakers and courts in India also need to assume a more cautious approach against diluting the human-centricity in copyright law.

There needs to be a cautious approach in extending existing IP protections to work generated by Artificial Intelligence

Arul George Scaria is an Associate Professor at the National Law School of India University (NLSIU)

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ENVIRONMENTAL FACTORS DETERMINE HEIGHT OF CHILDREN IN LMICS

Relevant for: Science & Technology | Topic: Biotechnology, Genetics & Health related developments

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November 04, 2023 09:20 pm | Updated 09:20 pm IST

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Environmental factors such as socio-economic status, nutrition and infection load influence childhood growth | Photo Credit: Prashant Nakwe

In a significant finding, scientists have discovered that environmental factors play a greater role than genetic variants in determining the height of children in low and middle income countries (LMICs) in contrast to those from European nations, where genetic aspects predominate in regulating childhood height.

This was expounded in a study carried out by the Hyderabad-based Centre for Cellular and Molecular Biology (CSIR-CCMB) along with several other national and international institutions. The study was recently published in the journal *Nature Communications*.

While human height is strongly influenced by fixed genetic and variable environmental factors, the authors of the study noted that the contribution of modifiable epigenetic factors is under-explored. Epigenetic factors are external influences, including lifestyle, nutrition and environment that affect the way genes work. Epigenetic changes affect gene regulation and alter gene expression but not the DNA sequence.

Many environmental factors, including socio-economic status, nutrition and infection load are believed to influence childhood growth which plays a critical role in determining one's height. Quoting the World Health Organization, 2021 estimates which indicated that a large proportion of stunted children reside in LMIC, particularly in South Asia and sub-Saharan Africa where undernutrition and associated co-morbidities are more prevalent compared to high income countries (HICs), the study observed "this offers a potential explanation for the disparity in height variation attributed to non-genetic factors between LMIC and high-income countries".

Although the impact of environmental exposure during early childhood is believed to be quite significant with long-term consequences, there are no genome-wide epigenetic investigations on height in childhood especially in low and middle income countries. Epigenetic processes such as DNA methylation and histone modifications can influence gene expression. Methylation basically is a chemical modification of DNA molecules used by cells to regulate gene expression. It can be influenced by environmental factors such as diet, drugs, stress and exposure to chemicals and toxins.

In this study, the scientists did an epigenome-wide association analysis and genome-wide association study to independently investigate links between DNA methylation and genetic variants with childhood height in five cohorts—three from India, one from Gambia and another one from the U.K. (high income country —HIC). The scientists found a novel, robust association between methylation in the SOCS3 gene and height in children from low- and middle-income countries which was replicated in the HIC cohort but with a lower effect size. "Overall, our study provides strong evidence of genome-wide DNA methylation associations with height in children from LMIC", the study observed. Interestingly, the established 12,000 genetic variants were also associated with height in Indians but their effect was significantly lower compared to the European and American counterparts.

According to Dr. Giriraj Chandak, Sir J C Bose Fellow at CCMB, the genetic risk variations are largely similar for Europeans and Indians, although the magnitude differs between the two ancestries. However, the genetic risk appears to have been modified due to environmental factors in children in LMIC. Apparently, the environmental cues that trigger the epigenetic processes in children in low and middle income countries are different in Indians and thus not influencing the epigenetic regulation of height in Europeans, he added.

(*Y. Mallikarjun is a freelancer writing on science and health*)

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ADITYA-L1 CAPTURES FIRST GLIMPSE OF SOLAR FLARES

Relevant for: Science & Technology | Topic: Space Technology & related matters

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November 07, 2023 08:17 pm | Updated 10:32 pm IST - Bengaluru:

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This image provided by NASA shows the sun emitting a significant X3.2-class flare erupting from the lower half of the sun. File image for representation. | Photo Credit: AP

The High Energy L1 Orbiting X-ray Spectrometer (HEL1OS) payload, onboard the Aditya-L1 spacecraft, has captured the first glimpse of solar flares.

Aditya-L1, the first space-based Indian mission to study the sun, was launched on September 2 and is currently on its journey to the destination of sun-earth L1 point (L1).

The Indian Space Research Organisation (ISRO) on Tuesday said the HEL1OS payload has captured the first high-energy X-ray glimpse of solar flares.. "During its first observation period on October 29, the High Energy L1 Orbiting X-ray Spectrometer (HEL1OS) on board Aditya-L1 recorded the impulsive phase of solar flares. The recorded data is consistent with the X-ray light curves provided by NOAA's GOES [National Oceanic and Atmospheric Administration's Geostationary Operational Environmental Satellites] ," ISRO said.

The space agency added that the HEL1OS, commissioned on October 27, "is set to monitor the sun's high-energy X-ray activity with fast timing and high-resolution spectra. HEL1OS data enables researchers to study explosive energy release and electron acceleration during impulsive phases of solar flares".

HEL1OS was developed by the Space Astronomy Group of the U. R. Rao Satellite Centre, ISRO, Bengaluru.

Aditya-L1 will arrive at the L1 point in January 2024 and the satellite will spend its mission life orbiting around L1 in an irregularly shaped orbit. L1 is about 1.5 million km from the earth.

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CHINA PROPOSES CYBERSECURITY CHECK FOR AUDITORS IF NATIONAL SECURITY INVOLVED

Relevant for: Security Related Matters | Topic: Basics of Cyber Security and related matters

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November 13, 2023 06:17 pm | Updated 06:17 pm IST - BEIJING

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China's finance ministry has proposed that auditors undergo or conduct additional cybersecurity checks when their work involves national security. | Photo Credit: Reuters

China's finance ministry has proposed that auditors undergo or conduct additional cybersecurity checks when their work involves national security.

A draft of the new measures, made public on Friday, also lays out how accounting firms should manage data that relates to Chinese firms.

Over the past two years, China's cybersecurity authority has established policies that outline how all businesses should handle and implement security assessments and checks.

The new measures apply specifically to auditors that have been hired by domestic firms or are conducting cross-border work. The chief partner of an auditing firm is the person responsible for data security, the draft rules say.

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The draft is open for public consultation until Dec. 11.

PricewaterhouseCoopers, Deloitte, KPMG and EY - the world's big four auditing firms - did not immediately respond to requests for comment.

Concern about data security has prompted Chinese authorities to step up scrutiny of auditors in recent years.

Rules issued in May already stipulate that state-owned companies and listed enterprises should strengthen checks on accountants' ability to manage information security.

Beijing has asked some state-owned firms to stop using the four big global accounting firms as it seeks to curb the influence of Western auditors, Bloomberg News reported in February.

The United States and China last year reached a deal to settle a long-running dispute over auditing compliance of U.S.-listed Chinese firms, agreeing to conduct audit inspections in Hong

Kong as China hesitates to grant full access to U.S. regulators.

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INS SUMEDHA MISSION DEPLOYED AT WALVIS BAY, NAMIBIA

Relevant for: Science & Technology | Topic: Defence related developments

INS Sumedha in continuation with Indian Navy's mission-based deployment to West Africa and Atlantic made a port call at Walvis Bay, Namibia from 10-13 November 23. This port call is a manifestation of India's warm ties with Namibia, its commitment to enhance maritime security and demonstrate solidarity with friendly nations.

During the visit, the Commanding Officer paid courtesy calls on Namibian dignitaries and senior defence officers, including Navy Commander, Namibia Navy. Professional interactions aimed at exchanging best practices, cross deck visits and social engagements were also conducted with Namibia Navy during the ship's stay in harbour.

India and Namibia have enjoyed warm and friendly bilateral relations sharing common values of democracy, development and secularism. A number of bilateral arrangements for co-operation and military exchange exist between the two countries. As part of its defence cooperation, India, over the years, has extended training to a large number of Namibian military officers at various military institutions in India.

Indian Navy ships are regularly deployed as part of Indian Navy's mission of building 'Bridges of Friendship' and strengthening international cooperation with friendly countries as well as to address maritime concerns across the globe. The current visit seeks to accentuate India's solidarity with friendly countries and, in particular, strengthen existing bonds of friendship with Namibia.

INS Sumedha is the third of the indigenously developed Naval Offshore Patrol Vessel (NOPV) of Saryu class deployed for multiple roles independently and in support of Fleet Operations. The ship is equipped with several weapon systems, sensors, state-of-art-the-navigation and communication systems and Electronic Warfare system. Sumedha has undertaken various Fleet support operations, coastal and offshore patrolling, ocean surveillance and HADR missions in the past including the recently conducted Op Kaveri for evacuation of Indian diaspora from war hit Sudan in April 23.
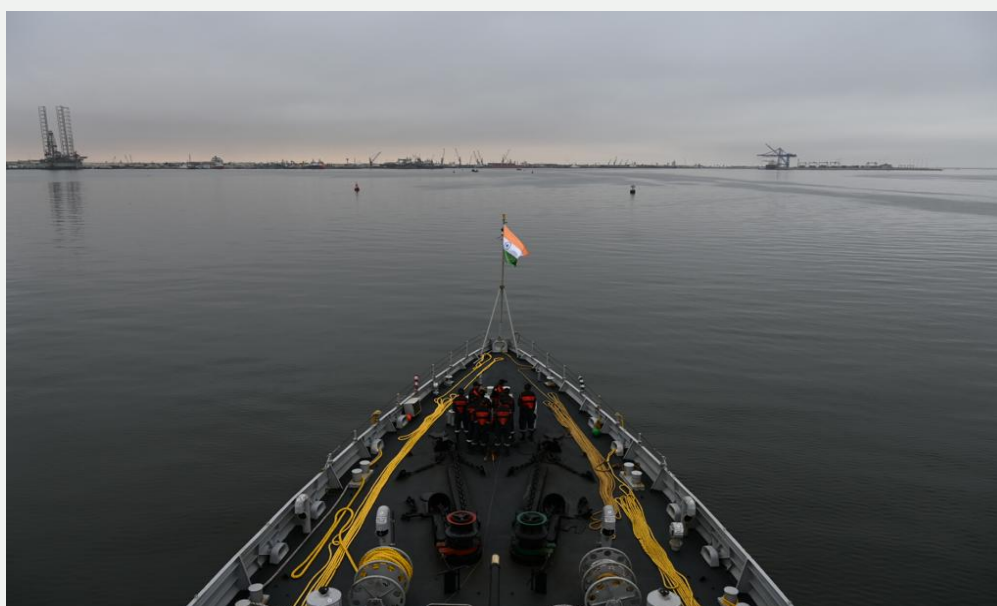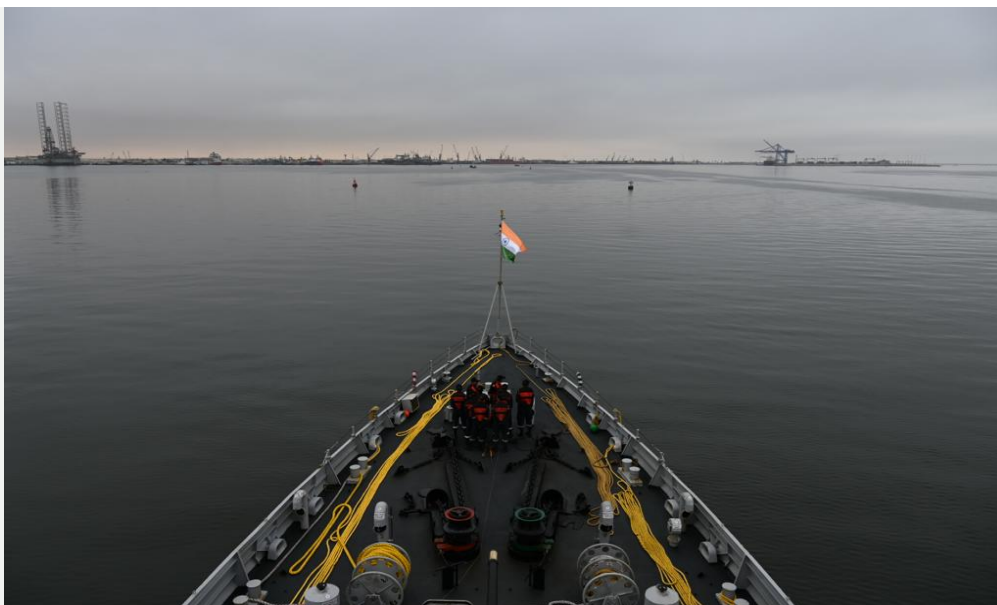
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INS Sumedha in continuation with Indian Navy's mission-based deployment to West Africa and Atlantic made a port call at Walvis Bay, Namibia from 10-13 November 23. This port call is a manifestation of India's warm ties with Namibia, its commitment to enhance maritime security and demonstrate solidarity with friendly nations.

During the visit, the Commanding Officer paid courtesy calls on Namibian dignitaries and senior defence officers, including Navy Commander, Namibia Navy. Professional interactions aimed at exchanging best practices, cross deck visits and social engagements were also conducted with Namibia Navy during the ship's stay in harbour.

India and Namibia have enjoyed warm and friendly bilateral relations sharing common values of democracy, development and secularism. A number of bilateral arrangements for co-operation and military exchange exist between the two countries. As part of its defence cooperation, India, over the years, has extended training to a large number of Namibian military officers at various military institutions in India.

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YOUTUBE TAKES AIM AT AI GENERATED IMPOSTERS IN VIDEOS

Relevant for: Science & Technology | Topic: Science and Technology- developments and their applications and effects in everyday life

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November 14, 2023 11:43 pm | Updated November 15, 2023 12:40 am IST - San Francisco

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YouTube also plans to start requiring creators to disclose when realistic video content was made using AI so viewers can be informed with labels. File | Photo Credit: Reuters

YouTube on Tuesday said it will soon allow users to request that artificial intelligence-created imposters be removed from the platform, and will require labels on videos featuring realistic-looking "synthetic" content.

New rules aimed at AI-generated video material will go into force in the coming months as fears mount over the technology being abused to promote scams and misinformation, or even to falsely depict people appearing in pornography.

"We'll make it possible to request the removal of AI-generated or other synthetic or manipulated content that simulates an identifiable individual, including their face or voice," YouTube product management vice presidents Emily Moxley and Jennifer Flannery O'Connor said in a blog post.

In evaluating removal requests, the Alphabet-owned site will consider whether videos are parodies and whether the real people depicted can be identified.

YouTube also plans to start requiring creators to disclose when realistic video content was made using AI so viewers can be informed with labels.

"This could be an AI-generated video that realistically depicts an event that never happened, or content showing someone saying or doing something they didn't actually do," Moxley and O'Connor said in the post.

"This is especially important in cases where the content discusses sensitive topics, such as elections, ongoing conflicts and public health crises, or public officials."

Video makers violating the disclosure rule may have content removed from YouTube or be suspended from its partner program that shares ad revenue, according to the platform.

"We're also introducing the ability for our music partners to request the removal of AI-generated music content that mimics an artist's unique singing or rapping voice," Moxley and O'Connor

added.

Elsewhere on the internet, Meta last week said that advertisers will soon have to disclose on its platforms when AI or other software is used to create or alter imagery or audio in political ads.

The requirement will take effect globally at Facebook and Instagram at the start of next year, parent company Meta said.

Advertisers will also have to reveal when AI is used to create completely fake yet realistic people or events, according to Meta.

Meta will add notices to ads to let viewers know what they are seeing or hearing is the product of software tools, the company said.

"The world in 2024 may see multiple authoritarian nation states seek to interfere in electoral processes," warned a recent blog post from Microsoft's chief legal officer Brad Smith and corporate vice president Teresa Hutson, whose company runs the trailblazing generative AI platform ChatGPT.

"And they may combine traditional techniques with AI and other new technologies to threaten the integrity of electoral systems."

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U.S. President Joe Biden signs the Artificial Intelligence Safety, Security, and Trust executive order on October 30, 2023. | Photo Credit: AP

The story so far: Artificial intelligence (AI) is making advancements globally even as governments struggle to establish a regulatory framework for the evolving technology. Joining the global efforts to govern AI, United States President Joe Biden last month issued an executive order to promote the "safe, secure, and trustworthy" use and development of AI by addressing broad issues related to privacy, misinformation and discrimination.

The order, signed by Mr. Biden on October 30, lays down a preliminary set of guidelines for American companies and federal agencies to follow when dealing with the design, acquisition and deployment of advanced AI systems, with security as its core, and before making such technologies available to the public. Mr. Biden has insisted that the order is the "most significant action" any government in the world has ever taken on AI safety, and also called upon the Congress to pass bipartisan legislation to stop Big Tech platforms from collecting the personal data of citizens.

The latest action follows the AI Bill of Rights issued by President Biden last October, and voluntary commitments from technology giants to comply with safety standards for AI. Before this, the Trump administration had also issued an EO in 2019 which laid out basic standards for the use of AI.

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The President manages the operations of the executive branch of the U.S. federal government through executive orders (EO). These are signed, written and published directives from the President to the executive branch. Only a sitting U.S. President can issue such orders to clarify and further existing laws, or overturn an existing EO by issuing another order to that effect. An EO is not a legislation and doesn't require the approval of the Congress. It can, however, be subject to review by either Congress or courts, or both.

Executive orders have primarily dealt with regular administrative affairs and the internal operations of federal agencies. However, in recent times, Presidents have used such orders to implement policies and programmes. Mr. Biden has issued over 120 executive orders since he took over as the U.S. President in 2021.

Artificial intelligence, as defined in the order, is "any computer system or application that performs tasks that normally require human intelligence, such as perception, reasoning, learning, decision making, or natural language processing." The EO signed by Mr. Biden lists eight principles and issues directions that companies must follow while dealing with AI tools and tech. As per the text of the order, the issued directions will be implemented and fulfilled anywhere between 90 days to 365 days.

Here's how President Biden's landmark Executive Order on AI will ensure America leads the way in this period of technological change while keeping Americans safe. pic.twitter.com/SvBPxiZk3M

Emphasising the safety and security of AI due to its growing capabilities and potential implications, the order invokes the Defense Production Act, which is mainly used in critical moments such as war. The Act was last used during the COVID-19 pandemic.

Companies developing powerful AI models that could pose a risk to national security, economic security, or public health and safety will have to notify the U.S. federal government when training such a system and share results of safety tests. Separately, the heads of government agencies will have to publish an annual report on potential risks related to the use of AI in critical infrastructure areas, including an assessment of how technology could be deployed to render infrastructure systems more vulnerable to critical failures, and physical and cyber attacks.

To ensure that AI systems are safe, secure and trustworthy, the order sets standards for testing such models and addressing risks to critical infrastructure and cybersecurity. As per the order, the National Institute of Standards and Technology will set the standards for extensive red-team testing (structured testing to identify potential flaws and vulnerabilities in an AI system) to ensure safety before public release, while the Department of Homeland Security will apply those standards to critical infrastructure sectors and establish the AI Safety and Security Board.

The Department of Energy and Homeland Security will, meanwhile, deal with serious chemical, biological, radiological, nuclear, and cybersecurity risks associated with the development of AI tools and technologies. The department is also tasked with r finding ways to mitigate such threats. . Notably, the mandate does not apply to AI systems that have already been developed and are available to the public.

Image for representation only

The order further directs action to safeguard the privacy of Americans and protect them from AI-enabled fraud such as deepfakes, which use AI-generated audio and visual content. The Department of Commerce has been tasked with developing standards to label AI-generated content to make its detection easier— also known as watermarking.

So far, such labelling has proved ineffective as AI-generated videos and images involving children have flooded the Internet in the absence of a definitive regulation. The order also directs federal agencies to utilise developed tools to ensure that the public is aware that they have received authentic information from official sources.

It promotes ethical use of AI by the military and intelligence community. The National Security Council and White House Chief of Staff will develop a National Security Memorandum for actions on AI and security to ensure that the military and intelligence community use AI "safely, ethically, and effectively" in their missions.

In the EO, the President addresses privacy concerns while acknowledging a limited ability to

pass laws. The order urges the U.S. Congress to pass new data privacy laws to protect citizens, especially children. Directions include enhancing research and technologies that prioritise privacy, and framing guidelines for federal agencies to evaluate the effectiveness of privacy norms in AI systems.

"Artificial intelligence's capabilities in these areas can increase the risk that personal data could be exploited and exposed. To combat this risk, the federal government will ensure that the collection, use, and retention of data is lawful, and secure, and mitigates privacy and confidentiality risks. Agencies shall use available policy and technical tools, including privacy-enhancing technologies where appropriate, to protect privacy and to combat the broader legal and societal risks — including the chilling of First Amendment rights — that result from the improper collection and use of people's data," reads the order.

Besides privacy, there are also equity and civil rights at risk when it comes to AI. Mr. Biden acknowledged in his speech ahead of the signing that AI can lead to discrimination, bias and other abuses if the right safeguards are not in place. "From hiring to housing to healthcare, we have seen what happens when AI use deepens discrimination and bias, rather than improving quality of life. Artificial intelligence systems deployed irresponsibly have reproduced and intensified existing inequities, caused new types of harmful discrimination, and exacerbated online and physical harms," he noted.

The order issues directions to prevent the use of algorithms to exacerbate discrimination, including certain guidelines for landlords and federal contractors. The Department of Justice and Federal Civil Rights Offices have been tasked with working on best practices for investigating and prosecuting civil rights violations related to AI.

The order lists ways to advance the responsible use of AI in healthcare to maximise its benefits, including the development of affordable and life-saving drugs. Mr. Biden explains: "To protect patients, we'll use AI to develop cancer drugs that work better for and cost less. We'll also launch a safety programme to make sure AI health systems do not harm." It also calls for creating resources to support AI-enabled educational tools, such as personalised tutoring in schools. AI best practices for sentencing will be framed to promote fairness in the criminal justice system.

It calls for the development of a new criminal justice system and best practices to determine how AI can be used in sentencing, parole, early release, surveillance and forensic analysis.

Additionally, with AI transforming the workplace, Mr. Biden called for the development of principles and best practices to ensure maximum benefits and minimal negative impact of AI for workers.

The Biden order includes provisions to attract talent to the country to "advance American leadership" in the global race to regulate AI. It promises researchers and students access to key resources and data, and grants for research in critical areas like healthcare and climate change.

To promote a fair, open and competitive AI ecosystem, it provides for technical assistance and resources for small developers and entrepreneurs in commercialising AI breakthroughs. Notably, AI is expected to modernise and streamline visa processes to attract highly skilled individuals, including immigrants, to study, stay, and work in the U.S.

To support the safe and secure deployment and use of AI worldwide, the order directs the State and Commerce Departments to lead efforts to establish international frameworks for harnessing the benefits of AI and managing its risks. It further calls for the implementation of vital AI

standards with international partners, ensuring that the technology is safe, secure, trustworthy and interoperable.

Guidelines will be issued for agencies regarding the responsible use of AI, including standards to protect rights, improve AI infrastructure, and strengthen its deployment. Mr. Biden has also issued a direction to convene an AI and Technology Talent Task Force to accelerate and track the hiring of AI and AI-enabling talent across the government.

The executive order has evoked mixed reactions from various stakeholders, with some critics calling it toothless and vague and other expressing optimism and hailed it as a step in the right direction.

The American Civil Liberties Union argues that the order makes important strides, such as requiring agencies to protect civil rights and civil liberties in any use of AI in governmental programmes, but fails to meaningfully address AI use in national security and offers insufficient protection from law enforcement uses of AI.

Albert Fox Cahn of the Surveillance Technology Oversight Project, a tech privacy advocacy nonprofit, contends that the worst forms of invasive technologies like AI deserve bans and not just regulations. "Many of these proposals are simply regulatory theatre, allowing abusive AI to stay on the market… the White House is continuing the mistake of over-relying on AI auditing techniques that can be easily gamed by companies and agencies," he said , as per a *Gizmodo* report.

Microsoft President Brad Smith, meanwhile, has called the executive order "another critical step forward" in the governance of AI technology.

Today's executive order is another critical step forward in the governance of AI technology. This order builds on the White House Voluntary Commitments for safe, secure, and trustworthy AI and complements international efforts through the G7 Hiroshima Process. AI promises to…

Digital rights advocacy group, Fight for the Future, termed the order a "positive step," but added that it was "hard to say that the document, on its own, represents much progress."

"Biden has given the power to his agencies to now actually do something on AI. In the best-case scenario, agencies take all the potential actions that could stem from the EO, and use all their resources to implement positive change for the benefit of everyday people. But there's also the possibility that agencies do the bare minimum, a choice that would render this EO toothless and waste another year of our lives while vulnerable people continue to lose housing and job opportunities, experience increased surveillance at school and in public, and be unjustly targeted by law enforcement, all due to biased and discriminatory AI," the group said in a statement.

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PART OF CHANDRAYAAN-3 LAUNCH VEHICLE MAKES UNCONTROLLED RE-ENTRY INTO EARTH'S ATMOSPHERE: ISRO

Relevant for: Science & Technology | Topic: Science and Technology- developments and their applications and effects in everyday life

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November 16, 2023 01:33 am | Updated 02:57 am IST - Bengaluru

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A file photo of ISRO's Launch Vehicle Mark-III (LVM3) M4 rocket carrying 'Chandrayaan-3' ahead of the lift off from the launch pad at Satish Dhawan Space Centre, in Sriharikota. | Photo Credit: PTI

The cryogenic upper stage of the LVM3 M4 launch vehicle, which successfully injected the Chandrayaan-3 spacecraft into the intended orbit on July 14 this year, made an uncontrolled re-entry into the Earth's atmosphere on Wednesday, the ISRO said.

"The probable impact point was predicted over the North Pacific Ocean. The final ground track did not pass over India," the Indian Space Research Organisation (ISRO) said in a statement.

This rocket body was part of the LVM-3 M4 launch vehicle, it said.

It re-entered the Earth's atmosphere around 14:42 IST.

The re-entry of the rocket body took place within 124 days of its launch. The post-mission orbital lifetime of the LVM3 M4 cryogenic upper stage is, thus, fully compliant with the "25-year rule" for low-Earth orbit objects as recommended by the Inter-Agency Space Debris Coordination Committee (IADC), the ISRO said.

Post Chandrayaan-3 injection, the upper stage had also undergone "passivation" to remove all residual propellant and energy sources to minimise the risks of accidental explosions as per the space debris mitigation guidelines prescribed by the United Nations and IADC, it was stated.

"Passivation and post-mission disposal of this rocket body in adherence to the internationally accepted guidelines once again reaffirms India's commitment to preserve the long-term sustainability of outer space activities," the ISRO added.

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GAMMA-RAY BURST IN FARAWAY GALAXY DISTURBED EARTH'S UPPER ATMOSPHERE

Relevant for: Science & Technology | Topic: Space Technology & related matters

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November 17, 2023 08:22 pm | Updated 08:22 pm IST

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An undated artistic impression depicts the effect of a powerful blast of gamma rays that provoked a significant disturbance in Earth's ionosphere, the result of a gamma-ray burst (GRB) from a star's supernova explosion in a galaxy almost two billion light-years away. | Photo Credit: Reuters

About two billion years ago in a galaxy far beyond our Milky Way, a big star met its demise in a massive explosion called a supernova that unleashed a huge burst of gamma rays, which pack the most energy of any wave in the electromagnetic spectrum.

Those waves traversed the cosmos and finally reached Earth last year. This gamma-ray burst, researchers said on Tuesday, caused a significant disturbance in Earth's ionosphere, a layer of the planet's upper atmosphere that contains electrically charged gases called plasma.

Scientists previously determined that this was the strongest such burst ever detected.

The ionosphere is situated about 30-600 miles (50-950 km) above Earth's surface, stretching to the very edge of space. It helps form the boundary between the vacuum of space and the lower atmosphere inhabited by people and Earth's other denizens.

The gamma rays from the burst impacted Earth's atmosphere for a span of about 13 minutes on Oct. 9, 2022. They were detected by the European Space Agency's Integral (International Gamma-Ray Astrophysics Laboratory) space observatory and various satellites orbiting close to Earth.

The gamma rays caused a strong variation in the ionosphere's electric field, according to Mirko Piersanti, a space weather researcher at the University of L'Aquila in Italy and lead author of the research published in the journal *Nature Communications*.

"It was similar to what happens in general during a solar flare event," Piersanti said, referring to powerful bursts of energy from the sun.

But the gamma-ray burst occurred a vast distance away - with the rays traveling about two billion light years - compared to the sun's relative closeness, showing how even faraway events can influence Earth. A light year is the distance light travels in a year, 5.9 trillion miles (9.5 trillion

km).

Instruments on Earth showed that the gamma rays disturbed the ionosphere for several hours and even set off lightning detectors in India. The disturbance reached into the lowest layers of the ionosphere.

Scientists since the 1960s have been measuring gamma-ray bursts - outpourings of energy released in supernovas or the merging of two neutron stars, which are the dense collapsed cores of massive stars. A burst as strong as the one detected last year would be expected to reach Earth about once every 10,000 years, according to scientists.

The ionosphere, which helps protect life on Earth by absorbing harmful ultraviolet rays from the sun, is highly sensitive to changing magnetic and electrical conditions in space, usually connected to solar activity. It also expands and contracts in response to solar radiation.

While this gamma-ray burst did not cause deleterious effects for life on Earth, it has been hypothesized that a strong one originating within the Milky Way and pointed right at us could pose a danger - including mass extinctions - by subjecting Earth's surface to a flood of harmful ultraviolet radiation.

However, "the probability that this happens is really negligible," said astronomer and study co-author Pietro Ubertini of the National Institute for Astrophysics in Italy.

The effects of this gamma-ray burst were studied with the help of the China Seismo-Electromagnetic Satellite (CSES), also called Zhangheng, a Chinese-Italian mission launched in 2018.

"Here we were lucky since we used the power of the EFD (electric field detector) instrument on board the CSES that is able to measure the electric field with unprecedented resolution," Piersanti said.

Ubertini said the disturbance that occurred in the ionosphere was not seen by anyone on the ground.

"Nobody detected anything, but we don't know if it could have been possible to see some visible signal looking at the right time at the sky," Ubertini said.

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SCIENTISTS DISCERN INTERNAL STRUCTURE OF MYSTERIOUS DWARF PLANET ERIS

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An artist's concept of the dwarf planet Eris and its moon Dysnomia is seen in this undated illustration released by NASA. The sun is the small star in the distance. | Photo Credit: Reuters

Dwarf planet Eris, similar in size to its better-known cosmic cousin Pluto, has remained an enigma since being discovered in 2005 lurking in the solar system's far reaches. While Pluto was explored by NASA's New Horizons spacecraft during a 2015 flyby, Eris - about 40% further from the sun - has never been visited.

But scientists are gaining a fuller understanding of Eris and its differences with Pluto thanks to research that discerns details about this frigid remote world's internal structure and composition based on its orbital relationship with its moon Dysnomia.

Eris, the researchers said on Wednesday, appears to have a rocky interior below a shell of ice. Pluto also has an icy exterior with rock below, but possesses a higher ice content and is thought to harbor an underground liquid ocean.

"We already knew that Eris is more rock-rich than Pluto, but what we didn't know was whether Eris had separated the rock from the ice," said University of California Santa Cruz planetary scientist Francis Nimmo, lead author of the study published in the journal Science Advances.

"That means that Eris got hot enough at some point in its history to melt, so that all the rock sank to the center. The ice is not motionless but is experiencing a slow churning motion, driven by leftover heat from the inside. Most likely there is no liquid ocean inside Eris," Nimmo added.

Eris has a diameter of about 1,445 miles (2,326 km), slightly smaller than Pluto's 1,473 miles (2,370 km). By comparison, the diameter of Earth's moon is about 2,160 miles (3,475 km). Because of its greater concentration of rock, which is denser than ice, Eris has about 25% more mass than Pluto.

"As I like to think of it, take Pluto and add every single asteroid in the asteroid belt, and you get Eris. Pluto is puffed up by ice, while Eris is mostly rock with a little bit of ice on the outer side," said Caltech astronomer and study co-author Mike Brown, one of the three scientists who discovered Eris.

Named after the ancient Greek goddess of discord, Eris orbits at an average of about 68 times further from the sun than Earth, taking 557 years to complete one orbit. Pluto orbits at an average of about 39 times Earth's distance from the sun.

Dysnomia, named after the mythological daughter of Eris, is about 440 miles (700 km) in diameter and composed mostly of ice.

"Just like the Earth-moon system, tides on Eris slowly push Dysnomia away and slow down the spin of Eris. This process has gone to completion: Eris and Dysnomia always present the same face to the other," Nimmo said.

Pluto has this same arrangement with its moon Charon, while the Earth-moon system differs.

"The moon always presents the same face to the Earth, but the Earth does not return the favor," Nimmo said.

Standing on Eris, it would look like dusk at midday due to its great distance from the sun, which would appear like no more than a particularly bright star in the sky.

"On Eris, you could block out the sun with the head of a pin," Brown said.

Eris and Pluto reside beyond Neptune, the outermost of our solar system's eight plants. The International Astronomical Union, which sets definitions for planetary science, recognizes five dwarf planets - Ceres, Haumea and Makemake, in addition to Eris and Pluto - though dozens more may qualify. Eris is the most massive of them.

The new findings fill in some blanks about Eris.

"It helps to put Eris in the context of all of the information that we've learned about Pluto, with its big mountains and giant impact basin, and forces us to remember: each of the largest dwarf planets is unique and we should be cautious about inferring too much from what we know about Pluto," Brown said.

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GERMANY, FRANCE AND ITALY REACH AGREEMENT ON FUTURE AI REGULATION

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November 19, 2023 05:51 am | Updated 07:30 am IST - BERLIN:

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An agreement on how artificial intelligence should be regulated in the future has been reached by Germany, France and Italy. Photo for representational purpose | Photo Credit: Reuters

An agreement on how artificial intelligence should be regulated in the future has been reached by Germany, France and Italy, according to a joint paper seen by Reuters, which is expected to accelerate negotiations at the European level.

The three governments are in favour of binding voluntary commitments for both large and small AI providers in the European Union.

The European Commission, the European Parliament and the EU Council are currently negotiating how the bloc should position itself in this new field.

The Parliament presented an "AI Act" in June, with the aim of averting safety risks from AI applications and avoiding discriminatory effects, but without slowing down the innovative power of this new technology in Europe.

During the discussions, the European Parliament proposed that the code of conduct should initially only be binding for major AI providers, which are primarily from the U.S.

However, the three EU governments have warned against this apparent competitive advantage for smaller European providers. This could lead to less trust in the security of these smaller providers and therefore fewer customers, they said.

The rules of conduct and transparency should therefore be binding for everyone, they added.

Initially, no sanctions should be imposed, according to the paper.

However, if violations of the code of conduct are identified after a certain period of time, a system of sanctions could be set up. In the future, a European authority would monitor compliance with the standards, the paper said.

Germany's Economy Ministry, which is in charge of the topic together with the Ministry of Digital

Affairs, said laws and state control should not regulate AI itself, but rather its application.

The development of AI models that are not yet in use, or have not yet been launched on the market, should not be regulated separately by the state.

The German government is hosting a digital summit in Jena, in the state of Thuringia, on Monday and Tuesday which will include representatives from politics, business and science.

Issues surrounding AI will be on the agenda when the German and Italian governments hold talks in Berlin on Wednesday.

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INDIAN CYBERSPACE SEEING INCIDENTS AT HIGHER RATE THAN GLOBAL AVERAGE: NATIONAL CYBERSECURITY COORDINATOR

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The Indian cyberspace has seen cyber incidents at an average of 2,127 times during the past six months, which is much more than the global average of 1,108. Representational file image. | Photo Credit: Reuters

The [Indian cyberspace](#) has seen nearly double the number of cyber incidents as compared to the global average, National Cybersecurity Coordinator M.U. Nair said on November 19..

Addressing a session on 'Aligning Technologies to Future Conflicts' at the Synergia Conclave 2023, Mr. Nair said ransomware attack payments of nearly $1.54 billion have been made on an average over the past 10 months, which has doubled since 2022.

"These payments are just the tip of an iceberg since several of these incidents go unreported," he said.

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Mr. Nair said the Indian cyberspace has seen cyber incidents at an average of 2,127 times during the past six months, which is much more than the global average of 1,108.

Mr. Nair said it's time for countries to rally together to contain and limit disruptive practices on cyberspace.

"There are a large number of initiatives in this direction under the UN and regional forums where nations are looking for solutions to cyberspace which is not confined to national boundaries," he said.

Mr. Nair said several international initiatives are addressing the evolving challenges of cybersecurity. One notable effort is the UN Group of Governmental Experts (UN GGE) on advancing responsible state behaviour in cyberspace, appointed by the United Nations General Assembly, he said.

In 2021, the UN GGE adopted a report that contributes significantly to the development of

international cybersecurity, he said.

"Key recommendations from the UN GGE include the development of international norms and principles, promotion of international cooperation, and strengthening of national cybersecurity capabilities."

"Additionally, an ad hoc committee is collaborating on a comprehensive international convention to counter the use of ICTs for criminal purposes," he added.

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THE CHIMAERAS OF NATURE AND THEIR PROMISE TO GROW HUMAN ORGANS

Relevant for: Science & Technology | Topic: Biotechnology, Genetics & Health related developments

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November 19, 2023 03:30 pm | Updated 04:10 pm IST

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In a recent landmark study, scientists have reported successfully producing a live infant chimeric monkey of the species Macaca fascicularis. Representative individual shown above, April 23, 2022. | Photo Credit: Sharp Photography (CC BY-SA 4.0)

At present, more than 3 lakh people are waiting for an organ transplant in India alone; the global number is far higher, with no respite in sight. There is an alarming disparity in the number of organ donors and the number of recipients – and animals have played an important part in filling this gap.

The successful application of animal insulin and the more recent use of animal heart valves in human surgeries have saved human lives. Researchers have also made attempts to grow full human organs inside the bodies of animals using advancements in induced pluripotent stem cells (iPSCs) technology.

At the same time, controversy continues to beset this field, most of it centred on the use of human iPSCs in animal embryos and the creation of chimeric animals, the results of which we are yet to fully comprehend. However, humans are not new to the concept of chimaeras. Mythology abounds with a rich collection of these beguiling beings.

A genetic chimaera is a single organism composed of cells of more than one distinct genotype (or genetic makeup). The animal kingdom has several examples of varying degrees of chimerism. The half-sider budgerigar, a type of common parakeet widely adopted as pets, has different colours on either side of its body due to chimerism. The anglerfish displays an extreme degree of symbiotic chimerism in which the male fish fuses with and is eventually absorbed into the female fish, mixing their genetic makeups into a single animal. Marine sponges are known to have up to four distinct genotypes in a single organism.

A photograph of a half-sider budgerigar. | Photo Credit: Susan Dennis, public domain

Natural chimaeras among humans are well documented in the medical literature. They occur when the genetic material in one cell changes and gives rise to a clonal population of cells different from all the other cells. The fusion of two fertilised zygotes early in the embryonic stage can also lead to a condition in which two genetic makeups coexist in a single individual. Chimerism can also result from twin or multiple pregnancies evolving into a single foetus or a

twin foetus being absorbed into a singleton.

Researchers have also documented individuals living with two blood types. In fact, blood-group chimerism during multiple births is relatively common. Most chimaeras are detected during routine blood tests in hospitals or when family members undergo tests ahead of an organ transplant. Pregnant women have been known to harbour the genetic material of her foetus in the bloodstream during the pregnancy. (Such foetal DNA can be used to screen for genetic defects and congenital abnormalities using non-invasive prenatal testing.)

Studies have also recorded a phenomenon called microchimerism, in which traces of the foetus's genetic material are observed in mothers' tissues many years after childbirth, resulting in two different genetic materials in a single person.

Individuals undergoing treatments like bone marrow transplants usually have their bone marrow destroyed and replaced by that from a suitable donor. Since the donor's bone marrow contains stem cells, they will produce blood cells that will subsequently repopulate the recipient's blood-cell repertoire. Eventually, the recipient will have blood cells that resemble the donor's and will be different from the genetic makeup of the recipient's other tissues – resulting in a chimeric individual.

Solid organ transplants in humans are bound to produce individuals with two unique genetic makeups as well. The makeup of the donor's organs will be significantly different from that of the recipient's other tissues, also resulting in chimerism.

Previously, chimaeras have been induced in laboratory settings, of rat-mouse, human-pig, and human-cow. These were in a bid to develop model systems that could 'generate' human organs of a suitable size, anatomy, and physiology. While rat-mouse chimerics had a near-normal lifespan, human-pig chimaeras had to be terminated in three to four weeks.

While such studies have shown promise for growing organs destined for transplant, they are also limited by the fact that rats, mice, pigs and cows are evolutionarily distant from humans, and will pose biological and technical challenges when being used to grow human organs.

In a recent landmark study published in the journal *Cell*, scientists reported the successful generation of a live chimaera in non-human primates – species that are actually evolutionarily close to humans. This is the first time scientists have succeeded in producing a live infant chimeric monkey.

In studies with Cynomolgus monkeys, a.k.a. long-tailed macaques (*Macaca fascicularis*), researchers extracted embryonic stem cells from one-week-old embryos. They modified the DNA in these cells to include a green fluorescent protein (GFP).

These GFP-marked embryonic stem cells were then injected into recipient embryos that were implanted into surrogate female monkeys, which delivered six full-term offspring. Using detectors, the researchers located the GFP signal in the tissues of one aborted male foetus and in one live-birth male. The latter signal originated from the donor cells that had been injected into the recipient's embryo.

The chimeric monkey had to be euthanised after ten days for health reasons. Extensive genome-sequencing investigations conducted with its cells showed a high degree of chimerism in its tissues, including eyes, fingernails, brain, heart, kidney, liver, gonads, and placenta.

As such, this study opens new doors for scientists to use non-human primates to create

chimaeras that could become models for basic and translational biomedical applications in the near future. Just like other advances in science, this study wasn't without limitations and ethical quandaries – and which we must address before thinking about the human biomedical applications.

The authors are senior consultants at the Vishwanath Cancer Care Foundation and adjunct professors at IIT Kanpur.

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A RENEWED FOCUS ON EMERGING TECHNOLOGIES

Relevant for: Science & Technology | Topic: Science and Technology- developments and their applications and effects in everyday life

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November 21, 2023 12:40 am | Updated 12:40 am IST

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Indian Army Chief General Manoj Pande addresses a gathering during the Chanakya Defence Dialogue. File | Photo Credit: ANI

Emerging technologies, an euphemism for capabilities that rely on a combination of cyber technology, Artificial Intelligence (AI), unmanned systems, and advanced computing, is in vogue among most militaries. The Indian military is seemingly alive to this development. At the Chanakya Defence Dialogue, the Chief of the Army Staff, General Manoj Pande, said that the Army had identified 45 niche technologies in the field of military applications. Similarly, under 'UDAAN', the Indian Air Force (IAF) is using AI, cyber and virtual reality to address its operational, logistical, and training needs. The Navy, too, says that it is moving forward with emerging technologies, which includes an Integrated Unmanned Roadmap, while also encouraging indigenisation under project 'Swavlamban'.

Not to be left out, the Defence Ministry, through 'AIDef', has showcased its initiatives in this realm, which includes the Defence AI Council and the Defence AI Project Agency. Both these efforts are aimed towards incorporating AI into various allied organisations, such as Defence Public Sector Undertakings and the Defence Research and Development Organisation. However well-intentioned these efforts maybe, the Ministry and the services need to think more creatively about their approach to emerging technologies. More specifically, for these initiatives to be successful, the military must be cognisant that technology is not a silver bullet and should not be imagined as a 'plug and play' — readily adjusted to existing practices. Instead, it needs to be accompanied by organisational and doctrinal changes and a willingness to share data with the civilian environment.

To some, emerging technologies is just the latest fad. Indeed, most accounts of the Russia-Ukraine war attest to the old-fashioned dominance of the artillery, manoeuvre warfare, and infantry tactics. At a more conceptual level, however, emerging technologies represent a dilemma that militaries have faced since time immemorial — how to best respond to change.

Effectively integrating emerging technologies requires the military to work more closely with civilians than ever before. The scholar Michael Raska identifies this aspect of "collaborative defence", whereby the military partners with scientists, academics, technologists, entrepreneurs and the wider industry, as critical in incorporating such capabilities. From that perspective, India's defence organisations and the military still have some way to go.

To be fair, the Indian military's focus on these emerging technologies is not new. India's first drone platforms were inducted in the late-1990s by the Army followed by more procurements in the 2000s by the IAF and Navy. Military leaders have recognised the cyber threat for some time, pointing to issues such as 'information warfare'. Through its indigenous space programme, India has launched communication satellites to improve its military communications capabilities. GSAT-7, a Navy-specific communication satellite, was launched in 2013, and GSAT-7A for the IAF in 2018. In the same year, the government established the Defence Cyber Agency and the Defence Space Agency to address threats from new domains. While these are welcome developments, there are still significant shortcomings in the military's approach to this domain.

First, jointness, defined as interoperability between the three services, remains problematic. The Chief of Defence Staff has an explicit mandate to create joint theatre commands. While the strategic community waits for such a development, the need for interoperability is essential especially among the host of emerging technologies. Second, there is a need to revisit existing human resources practices. For the most part, the Indian military prioritises generalisation over specialisation. This might work in conventional operations, but specialised technology requires greater technical expertise. The services should therefore give extended tenures and create promotion pathways for officers intellectually inclined towards this domain. Air Vice Marshal Anil Golani (retired) has made a convincing argument in favour of 'disruptive HR.' Last, both civilian defence organisations and the military needs to be more open with sharing data, especially to fully realise the promise of AI. Traditionally, secrecy concerns have stymied data availability. However, one can create a structure with adequate safeguards, which allows civilians to work alongside the military to overcome such concerns.

Fully realising the potential of emerging technologies requires altering existing organisations and approaches. Such changes should begin from the Defence Ministry. Instead of letting its efforts led by generalist officers, the Ministry should be more open to incorporating technocrats and qualified personnel, if necessary, from the private sector and wider industry. This is especially germane in defence production. In turn, the military must create pathways not just for its own officers but also to allow civilians to work alongside them as technology professionals. It needs to think creatively about the need for separate cadres to tap into the promise of such technologies.

The current efforts in defence reforms in India has put the military on the road to perhaps its biggest transformation yet. Realising the promise of this vision would require greater willingness to engage with the talent that resides outside existing defence organisations.

Nishant Rajeev, Anit Mukherjee and Rajeswari Pillai Rajagopalan are the co-editors of a recent ORF-RSIS report 'Momentous Changes: Defence Reforms, Military Transformation, and India's New Strategic Posture'

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NEW REGULATION TO TACKLE DEEPFAKES SOON; VAISHNAW MEETS SOCIAL MEDIA PLATFORMS

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November 23, 2023 05:50 pm | Updated 05:50 pm IST

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Deepfakes have emerged as a new threat to democracy, the minister said. | Photo Credit: AP

Terming deepfakes as a new threat to democracy, IT Minister Ashwini Vaishnaw on Thursday said that the government will come up with new regulations soon to tackle deepfakes.

The minister, who met social media platforms on the deepfake issue on Thursday, said that companies have agreed on the need for clear actionable work in areas such as detection, prevention, strengthening of reporting mechanism, and raising user awareness.

"We will start drafting regulation today itself, and within a short time we will have a new set of regulations for deepfakes ... this could be in the form of amending existing framework or bringing new rules, or new law," Vaishnaw told reporters.

Deepfakes have emerged as a new threat to democracy, the minister said.

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"We will have our next meeting in the first week of December that will be on follow-up action on today's decisions, and also on what should be included in the draft regulation," Vaishnaw said. Deepfakes refer to synthetic or doctored media that is digitally manipulated and altered to convincingly misrepresent or impersonate someone, using a form of artificial intelligence.

Recently, several 'deepfake' videos targeting leading actors went viral, sparking public outrage and raising concerns over the misuse of technology and tools for creating doctored content and fake narratives.

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ISRO TO CONDUCT TRUSTED WORKHORSE PSLV'S 60TH FLIGHT BY END OF DECEMBER

Relevant for: Science & Technology | Topic: Space Technology & related matters

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November 24, 2023 07:40 pm | Updated November 25, 2023 01:34 am IST - THIRUVANANTHAPURAM

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Indian Space Research Organisation's (ISRO) Aditya-L1, India's maiden solar mission, on board PSLV-C57 lifts off from the launch pad at Satish Dhawan Space Centre, in Sriharikota, on Sept. 2, 2023. | Photo Credit: PTI

The Indian Space Research Organisation (ISRO), which is celebrating the 60th anniversary of the first sounding rocket launch from Thumba this week, is preparing for another 'big 60.'

The Polar Satellite Launch Vehicle (PSLV), often dubbed the "reliable workhorse" of the space agency given its sparkling success rate, is set to have its 60th flight soon.

ISRO is hoping to have the 60th PSLV launch by December end this year, according to S. Unnikrishnan Nair, Director of Vikram Sarabhai Space Centre (VSSC), the lead ISRO unit for launch vehicles at Thumba here.

This mission will have as payload the XPoSAT, short for X-ray Polarimeter Satellite. This, according to ISRO, is the country's "first dedicated polarimetry mission to study various dynamics of bright astronomical X-ray sources in extreme conditions." ISRO will employ a PSLV variant which uses two strap-on motors for the 60th flight.

A four-stage expendable launch vehicle, the PSLV stands 44.4 metres tall and is powered by two solid propellant and two liquid propellant stages. The PSLV had its first developmental flight — PSLV-D1 — 30 years ago on September 20, 1993, but it was unsuccessful.

The commercial launches began after two more developmental flights, both of which were successful. The PSLV has been used to launch several high-profile ISRO missions, including the Chandrayaan-1 moon mission, the Mangalyaan Mars Orbiter Mission, and the more recent Aditya-L1 solar probe. The PSLV-C37 mission is credited with placing 104 satellites in orbit. The 50th PSLV launch took place on December 11, 2019, with the PSLV-C48 mission. The PSLV-C57/Aditya-L1 mission on September 2, 2023, marked the 59th flight of the launch vehicle.

If ISRO had not avoided numbering a mission 'C13' (PSLV-C12 was followed by C14!)- the C57 mission in September would have been the 60th flight of the launch vehicle.

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FALSE ALARM: THE HINDU EDITORIAL ON THE OUTBREAK OF INFLUENZA-LIKE ILLNESS IN CHINA

Relevant for: Science & Technology | Topic: Biotechnology, Genetics & Health related developments

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November 25, 2023 12:25 am | Updated 12:25 am IST

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Nearly four years after the novel SARS-CoV-2 coronavirus emerged in Wuhan, the capital of the Hubei Province in China, resulting in the deadliest pandemic that the world has faced in 100 years, the news of an outbreak of influenza-like illness in Beijing, Liaoning, and other places in China since mid-October has raised concerns about the emergence of yet another new virus. In what appears to be a replay of the early days of the COVID-19 pandemic when China showed little interest in alerting the WHO quickly, China's National Health Commission failed to report to the WHO the large number of undiagnosed pneumonia cases among children. The other striking similarities to the 2019 outbreak are the reportage of the clusters in local media and ProMED, a publicly available surveillance system for infectious diseases outbreaks, more than a month after the respiratory illnesses spiked, and the WHO becoming aware of the issue only through media reports. Finally, like in 2019, the WHO was forced to request China for detailed epidemiologic and clinical information, as well as laboratory results of pneumonia cases in children. One reason for China's reluctance to keep the global health body informed could be that the surge in respiratory illness was driven by known pathogens, including influenza and common bacterial and viral infections. On November 23, the details shared with the WHO by China indicated that the spike in cases and hospitalisations among children were due to *Mycoplasma pneumoniae* pneumonia since May, and RSV, adenovirus and influenza virus since October. While the multiple pathogens that caused illnesses in children this year are not novel nor the clinical presentations unusual, the surge in cases has occurred "earlier in the season than historically experienced". This could be because it is China's first full winter season after COVID-19 restrictions were removed in December last year.

China has claimed that the increased detection and reporting of respiratory illness in children was primarily due to enhanced outpatient and inpatient surveillance for respiratory illnesses covering a large variety of viruses and bacteria, including *Mycoplasma pneumoniae*. But this does not explain its failure to voluntarily keep the WHO informed about the unusually high number of cases last month. While China had reported a *Mycoplasma pneumoniae* pneumonia surge in October, the reasons for the current outbreaks were less clear till the WHO requested for information. China is duty-bound to keep the WHO informed in time without being asked.

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GENERIC DRUGS TO TREAT FOUR RARE DISEASES LAUNCHED

Relevant for: Science & Technology | Topic: Biotechnology, Genetics & Health related developments

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November 24, 2023 09:38 pm | Updated November 25, 2023 01:32 am IST - NEW DELHI

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Tablets of Avigan, a drug approved as an anti-influenza drug. | Photo Credit: Reuters

Providing relief to patients with rare diseases across India, the Union Health Ministry has made available generic drugs to support the care and treatment of four ailments: Tyrosinemia-Type 1, Gauchers Disease, Wilson's Disease, and the Dravet-Lennox Gastaut Syndrome. This means that the cost of these drugs will be slashed by anywhere between 60 and 100 times of their current market value.

The Ministry is also in the process of making available drugs for more rare diseases, including Phenylketonuria and Hyperammonemia, over the next few months. "The approvals for these drugs are awaited," said V.K. Paul, NITI Aayog's member with expertise on health issues. He added that this initiative would also result in patients' costs dropping from crores annually to mere lakhs. Additionally, a sickle cell disease drug formulation will now be made available for children.

A rare disease is a health condition of particularly low prevalence that affects a small number of people. It collectively afflicts 6-8% of the population in any country at any given time, so India could have 8.4 crore to 10 crore such cases, according to the Ministry. Nearly 80% percent of these diseases are genetic in nature.

"To bring in these drugs a special initiative was taken, and discussions were held with academia, pharma industries, organisations, the Drug Controller, and the Department of Pharmaceuticals. Thirteen rare diseases were prioritised. We particularly worked on sickle cell disease, and on the syrup for children under five who can't be administered tablets," said Health Minister Mansukh Mandaviya.

"This venture is purely a non-commercial venture guided only with the motive to serve those in acute need. For years, the Health Ministry through various schemes has been trying to financially help as many patients as possible but this is a more sustainable measure for not just patients in India but also worldwide," he said.

Dr. Paul added that the Ministry was also engaging with companies who are selling patented rare disease drugs. "We are actively looking at how best to work for patients who urgently need these medicines," he explained.

Several companies -- including Biophore India, Laurus Labs, Azico Biophore, MSN Pharmaceuticals, Akums Drugs and Pharmaceutical – have come forward to take part in the venture.

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WHAT FACTORS LED TO THE TURMOIL AT OPENAI?

Relevant for: Science & Technology | Topic: Science and Technology- developments and their applications and effects in everyday life

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November 26, 2023 12:15 am | Updated 01:39 am IST

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OpenAI CEO Sam Altman. Mr. Altman, the founder and CEO of the company that runs ChatGPT, was ousted by its board of directors on November 17, 2023 only to be reinstated on November 21, 2023. | Photo Credit: AFP

The story so far: OpenAI, the company that is at the cutting edge of the AI revolution, almost ceased to exist over the last weekend. Sam Altman, the founder and CEO of the company that runs ChatGPT, was ousted by its board of directors on Friday, November 17 only to be reinstated on Tuesday, November 21, and the board unceremoniously disposed of. The intervening few days saw two interim CEOs, a bristling Satya Nadella, a gleeful Elon Musk, and over 700 employees in open revolt. The cause of this chaos can be traced to a contradiction that exists at the heart of OpenAI.

OpenAI was founded in 2015 as a non-profit organisation by a group that included the then 30-year-old Sam Altman, Elon Musk, and Infosys, among others, with the vision that Artificial Intelligence research must be kept open, safe and available to everyone. A note dated December 11, 2015 on OpenAI's website reads: "Our goal is to advance digital intelligence in the way that is most likely to benefit humanity as a whole, unconstrained by a need to generate financial return." Incidentally, this note was penned jointly by Greg Brockman, another co-founder who was also fired from his post of Chairman of the board on Friday, and Illya Sutskever, OpenAI's chief scientist and board member, who was reportedly a main organiser of the boardroom putsch. OpenAI may have spurned financial returns but AI research is a costly affair. The Generative Pre-Trained Transformers or GPT models that sit at the heart of many AI tools need to be trained on vast amounts of data, which require massive amounts of 'compute' or computing power. The compute at the scale required by large AI models can be bought from server farms operated by corporations such as Amazon, Microsoft and Google.

In 2018, OpenAI's biggest source of funds dried up when Mr. Musk left the board citing a conflict of interest with Tesla. A year later, OpenAI under Mr. Altman's supervision started a for-profit wing that would go on to build monetisable consumer AI technology such as ChatGPT and Dall-E. Mr. Brockman and Mr. Sutskever put out another note at that time saying that such a venture was necessary so that the company could "invest billions of dollars in upcoming years into large-scale cloud compute, attracting and retaining talented people, and building AI supercomputers". The for-profit venture essentially reported to the non-profit organisation led by a board that is hypersensitive about the commercial exploitation of AI. This tussle between two opposing principles in the same organisations came to a head with the release of ChatGPT for free in

November 2022, and the [public got a taste](#) of what AI is capable of. The flood of users that followed brought with it investors as well.

Microsoft was with OpenAI before it had made a name for itself. Between 2019 and 2022, it is reported to have pumped in up to $3 billion in Open AI — an investment that appeared prescient once ChatGPT appeared on the scene and OpenAI's valuation shot up to $29 billion. In January 2023, Microsoft added $10 billion to the kitty, mostly as much-needed computing power from its Azure cloud computing platform. CEO Satya Nadella was lauded as a visionary for the early investment and Microsoft went on to integrate ChatGPT into its Bing search engine — a move one step ahead of search giant Google, which was once seen as the leader in AI research. Given its level of involvement in OpenAI, the board's coup attempt on Friday blindsided Microsoft. While Mr. Nadella stated that he will continue to work with OpenAI, he made it abundantly clear that he wanted Mr. Altman back at the helm. When an initial round of negotiation between Mr. Altman and the board the day after he was fired failed, Mr. Nadella announced that [he would hire Mr. Altman and Mr. Brockman](#) to run an AI research centre within Microsoft, along with any OpenAI employee that jumped ship. This is exactly what 702 staffers, including CTO Mira Murati who was initially appointed as interim CEO, threatened to do if Mr. Altman and Mr. Brockman were not brought back and the board did not quit. The employees may have been driven by loyalty, as well as the knowledge that their stock options may drop significantly without Mr. Altman's commercial drive. With OpenAI's creations sitting exclusively on Azure platforms and all of its employees on board, Microsoft would have essentially "acquihired" the most important AI company of the moment. However, that would also mean it would have to take direct responsibility for any AI goof-ups — which government regulators are keenly watching.

After its initial CEO pick Ms. Murati sided with Mr. Altman and pushed for his return, the OpenAI board roped in Emmet Shear, a co-founder of the Twitch streaming platform, as interim CEO. However, internal divisions seem to have developed in the board, with Mr. Sutskever repenting his role in the fiasco and signing the employees' letter demanding Mr. Altman's return. The pressure from employees and investors and its own divisions seemed to finally have an effect, as the board announced the return of Mr. Altman as CEO on Tuesday and its own reconstitution, with all the coup instigators except one — Quora CEO Michael D'Angelo — having resigned. Mr. Sutskever has been dropped from the board but reportedly remains in his employee position.

While it may seem like a place led solely by money and technology, Silicon Valley also has its philosophies, a key one being 'effective altruism'. Simply put, effective altruism looks at ways in which any intervention, monetary or technical, can be most effective. The practitioners of this philosophy among the Silicon Valley elite have an obsession with the possible negative impacts of AI and reducing the risk associated with it. OpenAI's charter itself speaks of safely building an AGI, or Artificial General Intelligence, an AI capable of reasoning like humans unlike the generative AIs that we have that only create based on what it has 'learned'. Effective Altruists tend to push back against the 'techno optimists' and 'accelerationists', who believe that the benefits of technology outweigh the bad and that all technological developments need to be accelerated as it is the way forward for mankind. The effective altruism proponents on OpenAI's board seem to have been spooked by the rapid commercialisation of the company and feared that it was deviating from its original purpose, playing into the hands of accelerationists. They may have been trying to recapture the narrative but bungled up the effort.

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INDIAN COAST GUARD CONDUCTS 9TH NATIONAL LEVEL POLLUTION RESPONSE EXERCISE (NATPOLREX-IX) OFF VADINAR, GUJARAT

Relevant for: Science & Technology | Topic: Defence related developments

The 9th National Level Pollution Response Exercise (NATPOLREX-IX) was conducted by the Indian Coast Guard on 25 Nov 2023 off Vadinar, Gujarat. DG Rakesh Pal, Director General Indian Coast Guard, and the Chairman NOSDCP reviewed the preparedness of all agencies during the exercise. Representatives of various ministries and departments of central and coastal state governments, ports, oil handling agencies, and other stakeholders participated in the exercise. More than 31 foreign observers and 80 delegates participated in the exercise.

The NATPOLREX-IX accomplished its objective of testing the level of preparedness and coordination between various resource agencies to respond to a marine oil spill invoking provisions of the National Oil Spill Disaster Contingency Plan or NOSDCP.

The ICG deployed surface as well as air platforms including Pollution Response Vessels (PRVs), Offshore Patrol Vessels (OPVs), indigenous Advanced Light Helicopter Mk-III, and Dornier Aircraft configured for marine pollution response. The event also showcased India's industrial prowess in terms of the 'Make in India' thrust under Prime Minister Shri Narendra Modi's vision of 'Aatmanirbhar Bharat'. The stakeholders like major ports also deployed their maritime assets for showcasing synergized efforts in combating marine pollution.

Indian Coast Guard assumed responsibilities for protecting the marine environment in the maritime zones of India on 07 Mar 1986, when these responsibilities were transferred from the Ministry of Shipping. Subsequently, the Coast Guard prepared the NOSDCP for combating oil spill disaster at sea, which was approved by the Committee of Secretaries in 1993. Apart from drawing up the NOSDCP, the Coast Guard has established four Pollution Response Centers at Mumbai, Chennai, Port Blair and Vadinar.

A robust national system for oil spill response is critical to India's preparedness for oil spill disasters in Indian waters. Indeed, 75 percent of India's energy requirements are met by oil that is imported into our country by sea. Oil transportation by ships is fraught with inherent risks and requires preventive measures to be taken, both, by the ship owners as well as the oil receiving facilities inside the port. However, the threat of oil pollution through maritime accidents and unforeseen perils of the sea is omnipresent.

The Indian Coast Guard functions as the Central Coordinating Authority for response to Oil spills in Indian waters.

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ABB/Anand

The 9th National Level Pollution Response Exercise (NATPOLREX-IX) was conducted by the Indian Coast Guard on 25 Nov 2023 off Vadinar, Gujarat. DG Rakesh Pal, Director General Indian Coast Guard, and the Chairman NOSDCP reviewed the preparedness of all agencies during the exercise. Representatives of various ministries and departments of central and coastal state governments, ports, oil handling agencies, and other stakeholders participated in the exercise. More than 31 foreign observers and 80 delegates participated in the exercise.

The NATPOLREX-IX accomplished its objective of testing the level of preparedness and coordination between various resource agencies to respond to a marine oil spill invoking provisions of the National Oil Spill Disaster Contingency Plan or NOSDCP.

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WHAT ARE FIBRE OPTIC CABLES AND HOW DO THEY WORK?

Relevant for: Science & Technology | Topic: Science and Technology- developments and their applications and effects in everyday life

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November 27, 2023 10:00 pm | Updated 10:00 pm IST

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Telecom Italia optical fibre cables at a telephone exchange in Rome, Italy, December 20, 2013. | Photo Credit: Alessandro Bianchi/Reuters

During the unprecedented COVID-19 pandemic, the one thing that connected us virtually was the internet. Because of high-speed internet connections, we can now video chat with a friend, pay online, and attend classes or meetings from home. Have you wondered how these connections work?

Optical fibres are made of thin cylindrical strands of glass. The diameter of a typical fibre is close to the diameter of a human hair. These fibres can carry information, such as text, images, voices, videos, telephone calls, and anything that can be encoded as digital information, across large distances almost at the speed of light.

Receiving text messages and phone calls is a part of our everyday life, and most of us may have taken it for granted. But optical fibres are an essential part of this development in communication.

Ultra-thin fibres seem very fragile. But when manufactured correctly as a long thread surrounded by protectives, they serve the purpose in a durable way. They are strong, light, and flexible, and ideal to be buried underground, drawn underwater, or bent around a spool.

An optical fibre cable laid on the ocean floor. | Photo Credit: Getty Images/iStockphoto

Almost 60 years ago, physicist Charles Kao suggested that glass fibres could be a superior medium for telecommunication, replacing the copper wires of the time. Many people didn't believe him at first, but his prediction is a reality today. For his ground-breaking achievements concerning fibre optic communication, Dr. Kao received a part of the 2009 Nobel Prize in physics.

Light is an electromagnetic wave with a spectrum of frequencies. Visible light, X-rays, radio waves, and thermal radiation (heat) all lie on this spectrum. Humans see the world around us via sunlight, but it took us a long time to control and guide light through fibre optic cables – or "light pipes" – to send coded signals.

When a beam of light falls on a glass surface, it passes through partially while the rest is reflected away. When it passes through, its path bends because the refractive index of glass is different from that of air. The refractive index is the property of a medium that determines how fast light can travel in it.

When a beam travels in the reverse direction, i.e. from glass to air, it's possible that it won't enter the air. Instead, it will be completely reflected back within the glass. This phenomenon, known as total internal reflection, is the basis of guiding light across long distances without a significant loss of optical power. With proper adjustments, the light can be kept bouncing within the glass with very little escaping outside.

This is how signals encoded as electromagnetic waves can be fed into one end of an optical fibre, and they will reflect and bounce many times between the glass walls as they traverse several kilometres bearing the information in the signals.

A fibre optic communication system consists of three parts. A transmitter encodes information into optical signals (in the form of rapidly blinking light pulses of zeros and ones). An optical fibre carries the signal to its destination. There, a receiver reproduces the information from the encoded signal.

Optical waves allow a high data-transmission rate, up to several terabits per second in a single fibre. Unlike radio or copper-cable-based communication, fibre cables are also insensitive to external perturbations such as lightning and bad weather.

We have known about the intriguing effects of light in transparent media like water or glass, yet the systematic development of light-guiding can be traced only to the early 19th century. In 1840, Jean-Daniel Colladon at the University of Geneva first demonstrated that light's propagation can be restricted to a narrow stream of a water jet. Jacques Babinet observed a similar effect in France and extended the idea to bent glass rods.

You may have seen such effects in water fountains lit by colourful beams of light. John Tyndall is known for popularising the idea of Colladon's light fountains. Following a suggestion by Michael Faraday, he demonstrated the effect in a water jet at the Royal Society in London in 1854. The effect is also visible in plastic-fibre Christmas trees.

We can guide light using total internal reflection with materials that have a higher refractive index than air. As Babinet found, a better choice than water is thin glass rods thanks to their availability, durability, and convenience. Such glass objects found early application in medicine and defence.

In the 1920s, for example, Clarence Hansell and John Logie Baird showed a way to transmit images through glass fibres. Around the 1930s, doctors started using a bundle of thin fibres to inspect patients' internal organs and to illuminate teeth during surgical procedures.

Early optical fibres were prone to damage and leaky, and weren't suitable for long-distance transmission of light. In 1954, fibre development made a significant leap forward. Harold Hopkins and [Narinder Singh Kapany](#) at Imperial College London transmitted images using a 75-cm-long bundle of more than 10,000 optical fibres. Kapany was an Indian American physicist and a pioneer in the field.

Two years later, Lawrence E. Curtiss at the University of Michigan developed the first glass-clad fibres. His idea to coat the bare glass fibres with a cladding material with a low refractive index paved the way for long-distance data transmission. In the same year, Kapany coined the term

'fibre optics'.

In 1960, [Theodore Maiman](#) built the first laser – an excellent optical source – which further boosted research in optical communication. The development of lasers working at room temperature made it possible to code any information digitally into optical signals. However, sending such light signals across long distances was still a big challenge. Even the best optical fibres available at the time lost 99% of their power after only a few meters.

Representative photo of a clutch of fibre optic cables. | Photo Credit: kynnyistock.com/kynny

In 1966, Kao and his colleagues found that the signals were attenuated due to impurities in the glass rather than the light being scattered. He suggested melting high-purity fused silica at high temperatures and producing thin fibre threads from that. This way, the decay of light signals inside glass fibres could be reduced below 20 decibels per kilometre (dB/km) – meaning 1% of the signal could still be detected after a kilometre.

In 1971, the American glass-making company Corning Glass Works achieved this value in a finished cable.

Nowadays, glass fibres are manufactured using the fibre-drawing technique. First, a thick glass rod, called preform, of high purity and an engineered refractive index profile is prepared using chemical vapour decomposition. The preform is heated to about 1,600 degrees C until it melts and is then drawn into a thin, long fibre. The drawing process reduces the fibre's diameter while maintaining its length. The drawn fibre is coated with a protective layer to enhance strength and durability.

In India, the Fibre Optics Laboratory at the Central Glass and Ceramic Research Institute, Kolkata, has a facility to manufacture high-quality silica-based optical fibres. Today's optical fibres have a typical loss of less than 0.2 dB/km.

Fibre optics technology has since been widely used in telecommunication, medical science, laser technology, and sensing.

With a goal to securing communication and promoting quantum science, the Government of India announced a national mission in the Union Budget of 2020. The proposed budget for this 'National Mission on Quantum Technologies and Applications' is Rs 8,000 crore over a period of five years.

The possibilities of fibre optic networks are growing at an accelerated rate, reaching all the way into our homes. Along with quantum optics, fibre optic communication stands on the cusp of a new era.

Gayathry R. and Sebabrata Mukherjee are at the Department of Physics, Indian Institute of Science, Bengaluru.

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ISRO CHOSE TO LAND CHANDRAYAAN IN MOON'S SOUTH POLE REGION FOR WATER MOLECULES: VEERAMUTHUVEL

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Chandrayaan-3 Project Director P. Veeramuthuvel, who delivered the sixth memorial lecture of Manikam Ramaswami, and The Hindu Group of Publications Director N. Murali interact in Madurai on November 27, 2023. | Photo Credit: G. Moorthy

The Indian Space Research Organisation (ISRO) chose to land Chandrayaan in the south pole of moon because of the availability of more resources for fuel, said Chandrayaan-3 Project Director P. Veeramuthuvel on November 27.

He was delivering the 6th memorial lecture of Manikam Ramaswami at the Thiagarajar School of Management (TSM). During an interaction with students, Mr. Veeramuthuvel said India had a road map for its space programmes till 2047.

The ISRO wanted to set up its space station by 2035. The water molecules could be used as a resource for fuel and the organisation could make the best of the moon's escaping velocity of 2.38 km/second to reach other planets, making the moon a gateway.

Stating that any planet exploration was only for looking for new resources, he said if Helium-3 was tapped it could serve for future generations for producing power.

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"Lunar 25 was targeting closer to the point targeted by the ISRO and all future missions are targeted towards the pole," he added.

India chose to land in the south pole in the first time itself due to the availability of more resources.

Mr. Veeramuthuvel said the ISRO had a review process at every single stage, and during the Chandrayaan-3 mission, the team faced lot of challenges.

"Since it was a second attempt, failure was not an option. The only agenda we had was to have a soft landing, so everything was led towards that," he said.

Chandrayaan-3 had shown that one should not view failure as a setback, but as a lesson from which one could learn and come back stronger, he added.

Earlier, speaking on the occasion, The Hindu Group of Publications Director N. Murali, also a member of the TSM Board of Governors, showered encomiums on Manikam Ramaswami. Stating that Ramaswami was his neighbour in Chennai, Mr. Murali said he was a strict disciplinarian and a well-rounded individual.

Ramaswami believed in ethical business practices. "He was all not for only making profits, but was for sustainable development and inclusive growth," Mr. Murali said.

Ramaswami showed phenomenal growth after taking over the management of the textile business. As the Chairman of Southern India Mills' Association, he initiated changes in lopsided excise structure. Setting up of integrated textile parks and conducting textile fairs were his ideas.

Chairman, Board of Governors, TSM, BT. Bangera; college correspondent Valli Ramaswami; director Murali Sadasivam and college principal M. Selvalakshmi were present.

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