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ASHES OF CANADIAN 'STAR TREK' FAN TO BE SENT INTO SPACE ALONG WITH THOSE OF TV SERIES' STARS

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

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January 02, 2024 09:39 am | Updated 09:39 am IST

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The family of a mother of eight who was a huge "Star Trek" fan has ensured the final frontier will be her ultimate resting place. | Photo Credit: Special arrangement

The family of a mother of eight who was a huge "Star Trek" fan has ensured the final frontier will be her ultimate resting place.

Gloria Knowlan was 86 at the time of her death 12 years ago. A small quantity of ashes from her cremated body are to be in one of 250 memorial capsules [set to be launched into space](#) later this month..

Launch organizers are hoping the rocket carrying the capsules will wind up approximately 330 million kilometers (205 million miles) from Earth, roughly past the orbit of Mars.

The remains or DNA samples of "Star Trek" creator Gene Roddenberry, his wife, Majel Barrett Roddenberry, and Original Series stars Nichelle Nichols, DeForest Kelley and James Doohan also are expected to make the trip.

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Their final journey will take place through American company Celestis Inc., which has offered what it calls "memorial space flights" for more than two decades.

Knowlan's son said his mother dove headlong into things she loved, including the show, after his father died in 2002. Her love of "Star Trek" prompted her to collect replica starships and deck out her Christmas tree each year with a homemade alien spacecraft known as the Borg cube, complete with working lights.

Rod Knowlan said he thinks his mother would be "just tickled" by the idea that a part of her remains were going to space alongside some of the people she saw on TV.

"She was a fan of 'Star Trek,' of the concept, from the outset, he said in a telephone interview.

For prices ranging from a few thousand dollars to \$13,000, Celestis Inc. takes small capsules of human remains or DNA to space and either returns them, drops them in Earth's orbit or takes them to the moon as a tribute to late loved ones.

Co-founder and CEO Charles Chafer said the rocket carrying Knowlan's remains, scheduled to take off from Cape Canaveral, Fla. on Jan. 8, will mark the first time the company has offered a trip into "deep space, meaning the capsules won't eventually fall to Earth.

"I believe it's an awful lot like why people choose to be scattered at sea," Chafer said. "There's a calling there. There's something about the sea that either interests them or attracts them as a location for a memorial service."

The capsules will be taken into space by the commercially owned and aptly named Vulcan rocket.

Chafer said the main purpose of the trip is for the rocket to test its capabilities to become the first commercial spacecraft to land on the moon and his company's cargo is getting taken along to serve a "secondary" purpose.

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SIGN OF THE FUTURE: THE HINDU EDITORIAL ON ISRO'S PSLV C58 MISSION

Relevant for: Science & Technology | Topic: Achievements of Indians in science & technology

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January 02, 2024 12:30 am | Updated 09:03 am IST

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Two missions the Indian Space Research Organisation (ISRO) has launched in the five months since its success with Chandrayaan-3 have both been scientific in nature: the [Aditya L-1 space probe to study the sun](#) and the X-ray Polarimeter Satellite (XPoSat) to study polarised X-rays emitted in astrophysical phenomena. [ISRO launched the XPoSat, in a two-part mission, onboard a Polar Satellite Launch Vehicle \(PSLV\) on its C58 flight on January 1](#). The relative timing of these launches may be a coincidence but it is heartening because the ratio of scientific to technological missions ISRO has launched is skewed in favour of the latter, at the expense of research in the sense of discovery. Those science-oriented missions have all been exceptional in their own right. For example, XPoSat is only the second space-based experiment to study X-ray polarisation, and at higher x-ray energies than the other, NASA's Imaging X-ray Polarimetry Explorer. Its POLIX payload, realised by the Raman Research Institute, will track X-rays in the 8-30 kilo-electron-volt (keV) energy range and observe emissions from around 50 sources in five years. The XSPECT payload, by ISRO's U.R. Rao Satellite Centre, will study X-rays of energy 0.8-15 keV and changes in continuous X-ray emissions. Together, they are expected to shed light on intense X-ray sources such as pulsars and black holes.

Then again, the science-technology skew is a reminder that ISRO among the world's spacefaring organisations has unique needs and priorities. This is exemplified by the second part of the C58 mission. After launching XPoSat in a 650-km circular orbit around the earth, the fourth stage of the rocket lowered itself into a 350-km-high orbit and unfurled solar panels, becoming a rudimentary satellite and orbital testbed for the 10 payloads it carried. These are a radio payload by the K.J. Somaiya Institute of Technology and a device to measure ultraviolet radiation from [L.B.S. Institute of Technology for Women](#); a 'green' cubesat propulsion unit, a 'green' monopropellant thruster, a tantalum-based radiation shield, a heater-less hollow cathode, and a nanosatellite platform, all from private entities; and an interplanetary dust counter, a fuel-cell power system, and a high-energy cell from ISRO centres. This is only the third time ISRO has operated the PSLV fourth stage in this way. As such, the C58 mission represents a union of the aspirations of professional scientists, aspiring students of science, and India's private spaceflight sector. This again is a vignette of the demands of ISRO itself as it navigates an era in which a permanent lunar station seems inevitable, drawing as much on technological capabilities as — based on scientific missions — humankind's knowledge of the universe.

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DEEPAKES DECEIVE VOTERS FROM INDIA TO INDONESIA BEFORE ELECTIONS

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

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January 03, 2024 08:47 am | Updated 08:47 am IST

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India, Indonesia and Bangladesh have recently passed laws to more closely police online content and penalise social media sites for content deemed misinformation [File] | Photo Credit: REUTERS

Divyendra Singh Jadoun was busy making artificial intelligence-based visual effects and voice clones for film and television in India, when he began getting calls from politicians: could he create AI videos, or deepfakes, for their election campaign?

With a hotly-contested local election in his home state of Rajasthan last November, and a national election due by May this year, the opportunity for his company, The Indian Deepfaker, is tremendous. But Jadoun was reluctant.

"The technology to create deepfakes is so good now, it can be done almost instantaneously, with very little effort - and people cannot tell if it's real or fake," said Jadoun, 30.

"There are no guidelines on deepfakes, and that's worrying, as it has the potential to influence how a person votes," he told the Thomson Reuters Foundation.

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Instagram reels of Indian Prime Minister Narendra Modi singing in regional languages have gone viral recently, as have TikTok videos of Indonesian presidential candidates Prabowo Subianto and Anies Baswedan speaking in fluent Arabic.

But they were all created with AI, and posted with no label.

With elections due in India, Indonesia, Bangladesh and Pakistan in the coming weeks, misinformation is rife on social media platforms, with deepfakes - video or audio made using AI and broadcast as authentic - being particularly concerning, say tech experts and authorities.

In India, where more than 900 million people are eligible to vote, [Modi has said deepfake videos are a "big concern"](#), and authorities have warned social media platforms they could lose their safe-harbour status that protects them from liability for third-party content posted on their sites if

they do not act.

In Indonesia - where more than 200 million voters will go to the polls on February 14 - deepfakes of all three presidential candidates and their running mates are circulating online, and have the potential to influence election outcomes, said Nuurrianti Jalli, who studies misinformation on social media.

"From microtargeting of voters with disinformation to spreading false narratives at a scale and speed unachievable by human actors alone, these AI tools can significantly influence voter perceptions and behaviour," she said.

"In environments where misinformation is already prevalent, AI-generated content can further skew public perception and influence voting behaviour," added Jalli, an assistant professor at Oklahoma State University's media school.

Deepfake images and videos churned out by generative AI tools such as Midjourney, Stable Diffusion and OpenAI's Dall-E popped up ahead of elections from New Zealand to Turkey and Argentina last year, with growing concerns about their impact on U.S. presidential polls in November.

AI makes the creation and spread of disinformation faster, cheaper and more effective, the U.S. non-profit Freedom House said in a recent report.

In Bangladesh - where Prime Minister Sheikh Hasina is set for her fourth straight term after polls on January 7 - deepfake videos of female opposition politicians Rumin Farhana in a bikini and Nipun Roy in a swimming pool have emerged.

While they were debunked quickly, they are still circulated, and even poor-quality deepfake content is misleading people, said Sayeed Al-Zaman, an assistant professor of journalism at Bangladesh's Jahangirnagar University, who studies social media.

"Given the low levels of information and digital literacy in Bangladesh, deepfakes can be potent carriers of political propaganda if crafted and deployed effectively," he said. "But the government does not appear concerned."

The ministry of information did not respond to a request for comment.

In Pakistan, where an election is scheduled for February 8, Imran Khan, who is in prison on an official secrets acts case after being ousted as prime minister last year, used a AI-generated image and voice clone to address an online election rally in December, which drew more than 1.4 million views on YouTube and was attended live by tens of thousands.

While Pakistan has drafted an AI law, digital rights activists have criticised the lack of guardrails against disinformation, and to protect vulnerable communities including women.

"The threat that disinformation poses to elections and the overall democratic process in Pakistan cannot be stressed upon enough," said Nighat Dad, co-founder of the non-profit Digital Rights Foundation.

"In the past, disinformation on online platforms has managed to sway voting behaviour, party support, and even influenced legislation change. Synthetic media will make this easier to do," she added.

At least 500,000 video and voice deepfakes were shared on social media sites globally in 2023, estimated DeepMedia, a company developing tools to detect synthetic media.

Platforms have struggled to keep up.

Meta, which owns Facebook, Instagram and WhatsApp, said it aims to remove synthetic media when the "manipulation is not apparent and could mislead, particularly in the case of video content."

Google, which owns YouTube, said in November that the video sharing platform requires "creators to disclose altered or synthetic content that is realistic, including using AI tools, and we'll inform viewers about such content through labels".

But countries including India, Indonesia and Bangladesh have recently passed laws to more closely police online content and penalise social media sites for content deemed misinformation, so platforms are "holding their punches", said Raman Jit Singh Chima, Asia policy director at advocacy group Access Now.

In these countries, "this election cycle is actually worse than the last cycle - platforms are not set up to handle problems, and they are not being responsive and proactive enough. And that's a very dangerous sign," he said.

"There is a danger that the world's attention is only on the U.S. election, but the standards being applied there, the effort being made there should be duplicated everywhere," he added.

In India, where Modi is widely forecast to win a third term, Jadoun - who had declined to make deepfake campaign videos for the state elections - is gearing up to make them for the general election.

These will be personalised video messages from politicians for party workers, not voters, that can be sent on WhatsApp.

"They can really have an impact, because there are hundreds of thousands of party workers and they will, in turn, forward them to their friends and family," he said.

"But we will add a watermark to show that it is made with AI, so there is no misunderstanding. That's important."

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DHRUVA SPACE'S TECH DEMONSTRATION PAYLOAD FUNCTIONING WELL

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January 04, 2024 12:16 am | Updated 03:07 am IST - HYDERABAD

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The team of Dhruva Space with ISRO Chairman S. Somanath.

Hyderabad-based Dhruva Space has announced that its 'P30 Satellite Platform' launched as 'Launching Expeditions for Aspiring Payloads - Technology Demonstrator' (LEAD-PD) payload onboard ISRO's PSLV-C58 Orbital Experimental Module 3 (POEM-3) mission is functioning well.

The launch took place at 9.10 a.m. on January 1 from Satish Dhawan Space Centre (SDSC) in Sriharikota, Andhra Pradesh. LEAP-TD mission featured a derivative of the Dhruva Space P-30 satellite platform integrated to ISRO's PSLV which enabled in-orbit scientific experiments using the spent PS4 stage as an orbital platform, said an official release on Wednesday.

A hosted payload service comprises a portion of a satellite, such as a sensor, instrument or a set of communications transponders that are owned by an entity other than the primary satellite operator. This operates independent of the main spacecraft, but shares the satellite's power supply, transponders, and in some cases, ground systems.

The current mission has validated the P-30 platform and its various subsystems in-orbit including an on-board computer, Ultra High Frequency (UHF) TT&C Module, Beacon in UHF, Attitude Control System with a Reaction Wheel from Comat, and Power Distribution Board.

The mission success was also confirmed by the way of reception of telemetry and beacon data at the ground station of Indian Institute of Space Science & Technology (IIST), Trivandrum, and through the data received from the POEM platform itself as well.

The space 'qualification' of LEAP-TD has paved the way for hosted payload solutions for space missions, signifying Dhruva Space's readiness to offer these services to the global market through its LEAP initiative. The first LEAP satellite mission (LEAP-1) has already been conceived and is slated to be launched soon.

"Our hosted payload offering enables reduced timelines, rapid access to space, shared operations, development and launch, cost savings, risk reduction and various levels of payload command and control through Dhruva our TT&C ground facilities. We are proud to be delivering this vital capability, and welcome a new era of hosted payload missions capability," said CEO Sanjay Nekkanti. COO Krishna Teja Penamakuru said the firm had worked diligently to

indigenously develop and test the P-30 nanosatellite technology.

PSLV's Orbital Experimental Module or POEM has standard interfaces and packages for power generation, telemetry, tele-command, stabilisation, orbit keeping and orbit manoeuvring and hence, can be used to design, develop and validate experimental payloads. IN-SPACe (Indian National Space Promotion and Authorisation Centre, in collaboration with ISRO, had announced the opportunity to host payload on POEM missions, the release added.

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ISRO TO PERFORM CRUCIAL MANOEUVRE ON JANUARY 6, 2024 TO BIND ADITYA-L1 INTO L1 ORBIT

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

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January 04, 2024 06:49 pm | Updated January 05, 2024 01:55 am IST - Bengaluru

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L1 is about 1.5 million km from the Earth and the distance of L1 from Earth is approximately 1% of the Earth-Sun distance. | Photo Credit: ANI

With the Aditya L1 spacecraft expected to reach the Lagrangian point (L1) on January 6 the Indian Space Research Organisation (ISRO) will attempt a crucial manoeuvre to bind the spacecraft to an orbit around L1.

Aditya-L1 the first Indian space based observatory to study the Sun was launched on September 2, 2023 from the Satish Dhawan Space Centre in Sriharikota.

Subsequently, ISRO Telemetry Tracking and Command Network (ISTRAC) in Bengaluru carried out four earth-bound manoeuvres between September 3 and September 15.

Aditya-L1 on September 19 underwent the Trans-Lagrangian1 insertion manoeuvre, marking the beginning of its 110-day trajectory to the destination around the L1 point.

L1 is about 1.5 million km from the Earth and the distance of L1 from Earth is approximately 1% of the Earth-Sun distance.

On January 6 at approximately around 4 pm ISRO Scientists and Engineers from the Mission Operations Complex of ISTRAC will perform the crucial manoeuvre which will bind Aditya-L1 to an orbit around L1.

The propulsion system of the spacecraft comprises the 440 Newton Liquid Apogee Motor (LAM) engine plus eight 22 Newton thrusters and four 10 Newton thrusters which will be intermittently fired to perform the manoeuvre.

According to ISRO a satellite placed in the halo orbit around the L1 point has the major advantage of continuously viewing the Sun without any occultation/eclipse. This will provide a greater advantage of observing the solar activities continuously.

Aditya-L1 carries seven payloads to observe the photosphere, chromosphere, and the

outermost layers of the Sun (the corona) using electromagnetic and particle detectors.

Using the special vantage point of L1, four payloads will directly view the Sun and the remaining three payloads will carry out in-situ studies of particles and fields at the L1.

Aditya-L1 has a mission life of five years during which its payloads are expected to provide the most crucial information to understand the problem of coronal heating; coronal mass ejection; pre-flare and flare activities and their characteristics; dynamics of space weather; and propagation of particles and fields.

There are currently four operational spacecraft at L1 which are WIND, Solar and Heliospheric Observatory (SOHO), Advanced Composition Explorer (ACE) and Deep Space Climate Observatory (DSCOVER).

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GROUP REPRESENTING TIKTOK, META AND X SUES OHIO OVER NEW LAW LIMITING KIDS' USE OF SOCIAL MEDIA

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

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January 06, 2024 10:53 am | Updated 10:53 am IST - OHIO

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The group has won lawsuits against similar restrictions in California and Arkansas [File] | Photo Credit: AP

A trade group representing TikTok, Snapchat, Meta and other major tech companies sued Ohio on Friday over a pending law that requires children to get parental consent to use social media apps.

The law was part of an \$86.1 billion state budget bill that Republican Governor Mike DeWine signed into law in July. It's set to take effect January 15. The administration [pushed the measure as a way to protect children's mental health](#), with Republican Lt. Gov. Jon Husted saying at the time that social media was "intentionally addictive" and harmful to kids.

The NetChoice trade group filed its lawsuit against GOP Attorney General Dave Yost in U.S. District Court for the Southern District of Ohio. It seeks to block the law from taking effect.

The litigation argues that Ohio's law — which requires social media companies to obtain a parent's permission for children under 16 to sign up for social media and gaming apps — unconstitutionally impedes free speech and is overbroad and vague.

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The law also requires social media companies to provide parents with their privacy guidelines, so that families can know what content will be censored or moderated on their child's profile.

"We at NetChoice believe families equipped with educational resources are capable of determining the best approach to online services and privacy protections for themselves," Chris Marchese, director of the organisation's litigation centre, said in a statement. "With NetChoice v. Yost, we will fight to ensure all Ohioans can embrace digital tools without their privacy, security and rights being thwarted."

The group has won lawsuits against similar restrictions in California and Arkansas.

Husted, who leads Ohio's technology initiatives and championed the law, called Friday's lawsuit "cowardly but not unexpected."

"In filing this lawsuit, these companies are determined to go around parents to expose children to harmful content and addict them to their platforms," Husted said in a statement.

He alleged the companies know their algorithms are harming children "with catastrophic health and mental health outcomes."

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INDIAN NAVY'S SWIFT RESPONSE TO THE HIJACKING ATTEMPT OF MV LILA NORFOLK IN THE NORTH ARABIAN SEA

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

Indian Navy swiftly responded to the hijacking incident onboard Liberian flagged Bulk Carrier MV *Lila Norfolk* deploying considerable strength of assets (both ships and aircraft) and an aggressive intent to counter attack by pirates.

INS Chennai guided missile destroyer arrived at the scene of action by 1515h. Continuous aerial recce of MV *Lila Norfolk* was undertaken by MQ9B (Sea Guardian), P8I and integral helicopters. Subsequently, the Indian Navy Marine Commandos boarded MV *Lila Norfolk* and undertook thorough sanitisation of the upper decks, machinery compartments and living spaces. The team did not find any pirates onboard. Forceful warnings by the Indian Naval aircraft to the vessel and likely Interception by *IN* warship, probably compelled the pirates to escape during the night hours.

All 21 crew of MV *Lila Norfolk* have been rescued and are safe. Indian Naval forces are investigating the suspected vessels in the area. Presently, the crew of MV is engaged in restoring propulsion, power supply and steering gear. Thereafter, MV *Lila Norfolk* will recommence her passage to her destination under escort of the Indian Naval Warship.



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'FROM MOONWALK TO SUN DANCE', DR JITENDRA SINGH LAUDS SUCCESSFUL INSERTION OF ADITYA-L1 TO HALO ORBIT

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

From Moonwalk to Sun Dance, Aditya L1 marks ISRO's success trilogy with three success stories, one after the other, in quick succession... Chandrayaan 3, XPoSAt and Aditya L1 at the Lagrange point.

This was the instant first response of Union Minister for Space, Dr Jitendra Singh soon after Aditya L1 reached its designated destination at the Lagrange point.



In a tweet which went viral, the Minister said "From Moon walk to Sun Dance! What a glorious turn of year for Bharat! Under the visionary leadership of PM Narendra Modi, yet another success story scripted by Team ISRO. AdityaL1 reaches its final orbit to discover the mysteries of the Sun-Earth connection".

In a series of media interviews, Minister said that the success of Aditya L1 is going to be a path breaking effort to discover the mysteries of the Sun, which were hitherto either not understood or became a part of the fairy tales and folktales.

India also has a special stake in the study of Sun phenomena because of the large number of satellites in space, said Dr Jitendra Singh. The Minister also took the example of the private space exploration company SpaceX losing 40 satellites in a go, after being hit by a solar storm a day after launch, to underline how important the understanding of solar phenomena is. Pointing out the importance of the mission, the Minister said that all scientists in the space exploration field are eagerly waiting for inputs from the Aditya L1 mission.



Dr Jitendra Singh also said that this mission will help us in understanding Solar heating, Solar storms, Solar flares and Coronal Mass Ejections among other solar phenomena.

The Minister also said that the Aditya L1 mission is not only indigenous but also a very cost effective mission, just like Chandrayaan, with a budget of only Rs. 600 Crore. Dr Jitendra Singh said that even though talent was never lacking in the country, the missing link of enabling milieu was created under the leadership of Prime Minister Narendra Modi.

The Halo Orbit insertion (HOI) of Aditya L1 was achieved at approximately 4:00 PM today. The final phase of maneuver involved firing of control engines for a short duration. The orbit of Aditya L1 spacecraft is located roughly 1.5 million Kilometres from earth on a continuously moving Sun – Earth line, with an orbital period of about 177.86 earth days. The specific halo orbit is selected to ensure a mission lifetime of 5 years, minimizing station keeping maneuvers and thus fuel consumption and ensuring a continuous, unobstructed view of the sun.

The halo orbit insertion of the spacecraft presented a critical mission phase, which demanded precise navigation and control. The success of this insertion not only signifies ISRO's capabilities in such complex orbital maneuvers, but it gives confidence to handle future interplanetary missions.



Aditya L1 was designed and realized at UR Rao Satellite Centre (URSC) with participation from various ISRO centers. The payloads onboard Aditya L1 were developed by Indian scientific laboratories, IIA, IUCA and ISRO. The Aditya L1 spacecraft was launched by PSLV-P57 on September 2, 2023. The spacecraft underwent a cruise phase lasting approximately 110 days to reach the halo orbit.

SNC/ST

From Moonwalk to Sun Dance, Aditya L1 marks ISRO's success trilogy with three success stories, one after the other, in quick succession... Chandrayaan 3, XPoSat and Aditya L1 at the Lagrange point.

This was the instant first response of Union Minister for Space, Dr Jitendra Singh soon after Aditya L1 reached its designated destination at the Lagrange point.

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In a tweet which went viral, the Minister said "From Moon walk to Sun Dance! What a glorious turn of year for Bharat! Under the visionary leadership of PM Narendra Modi, yet another success story scripted by Team ISRO. AdityaL1 reaches its final orbit to discover the mysteries of the Sun-Earth connection".

In a series of media interviews, Minister said that the success of Aditya L1 is going to be a path breaking effort to discover the mysteries of the Sun, which were hitherto either not understood or became a part of the fairy tales and folktales.

India also has a special stake in the study of Sun phenomena because of the large number of satellites in space, said Dr Jitendra Singh. The Minister also took the example of the private space exploration company SpaceX losing 40 satellites in a go, after being hit by a solar storm a day after launch, to underline how important the understanding of solar phenomena is. Pointing out the importance of the mission, the Minister said that all scientists in the space exploration field are eagerly waiting for inputs from the Aditya L1 mission.

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Dr Jitendra Singh also said that this mission will help us in understanding Solar heating, Solar storms, Solar flares and Coronal Mass Ejections among other solar phenomena.

The Minister also said that the Aditya L1 mission is not only indigenous but also a very cost effective mission, just like Chandrayaan, with a budget of only Rs. 600 Crore. Dr Jitendra Singh said that even though talent was never lacking in the country, the missing link of enabling milieu was created under the leadership of Prime Minister Narendra Modi.

The Halo Orbit insertion (HOI) of Aditya L1 was achieved at approximately 4:00 PM today. The final phase of maneuver involved firing of control engines for a short duration. The orbit of Aditya L1 spacecraft is located roughly 1.5 million Kilometres from earth on a continuously moving Sun – Earth line, with an orbital period of about 177.86 earth days. The specific halo orbit is selected to ensure a mission lifetime of 5 years, minimizing station keeping maneuvers and thus fuel consumption and ensuring a continuous, unobstructed view of the sun.

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HOW VOICE CLONING THROUGH ARTIFICIAL INTELLIGENCE IS BEING USED FOR SCAMS

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

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January 08, 2024 08:30 am | Updated 09:20 am IST

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For representative purposes. | Photo Credit: Getty Images

A few years ago, voice cloning through [Artificial Intelligence \(AI\)](#) was just a phenomenon of mild amusement. AI-generated songs by famous artistes like Drake and Ariana Grande were floating around online. However, fears around the AI software were realised when AI voice cloning-related scams burgeoned. In April last year, a family living in Arizona, U.S., was threatened to pay ransom for a fake kidnapping pulled off by an AI cloned voice. And scams weren't the end of it. Easy access to AI voice clones also spawned disinformation.

Earlier in January, 4chan users started flocking to free AI voice cloning tools to generate celebrity hate speech, wherein Harry Potter actress Emma Watson read out a portion of the Mein Kampf and conservative political pundit Ben Shapiro made racist comments against Democrat politician Alexandra Ocasio-Cortez.

Similar incidents have made their way in India. A report titled 'The Artificial Imposter' published in May last year revealed that 47% of surveyed Indians have either been a victim or knew someone who had fallen prey to an AI generated voice scam. The numbers are almost twice the global average of 25%. In fact, India topped the list with the maximum number of victims to AI voice scams. Even as several cases went unreported, some came to light. In December, a Lucknow resident fell prey to a cyberattack that used AI to impersonate the voice of the victim's relative, requesting the person to transfer a substantial amount through UPI. Another report in August stated that a man from Haryana was duped of 30,000 after a call was made from a scamster who used an AI app to sound like the victim's friend in dire need of money due to an accident.

Indians have been found to be particularly vulnerable to scams of this nature. According to McAfee, 66% of Indian participants admitted that they would respond to a voice call or a phone call that appeared to be from a friend or family member in urgent need of money, especially if the caller was supposedly a parent (46%), spouse (34%) or their child (12%). The report stated that messages that claimed the sender had been robbed (70%), involved in a car accident (69%), lost their phone or wallet (65%) or needed financial aid while travelling abroad (62%) were the most effective excuses.

While these tools aren't perfect, scammers have relied on creating a sense of exigency to glide over these flaws. The report also shared that 86% Indians were prone to sharing their voice data online or via voice notes at least once a week which has made these tools potent.

Once a scammer finds an audio clip of an individual, all it takes is to upload their voice clip to the online program that is able to replicate the voice accurately barring some intonations. There's a host of these applications online with popular ones like Murf, Resemble and Speechify. While most of these providers have a monthly subscription fee from under \$15 for basic plans to \$100 for premium options, they have a free trial period.

Also read: [Stephen Fry shocked at cloning of his voice, warns about AI](#)

An especially lauded one has been a year-old AI startup called ElevenLabs that was founded by former Google and Palantir employees. The Andreessen Horowitz-backed firm has been releasing a steady stream of tools. In October last year, it released a product called AI Dubbing which can translate even long-form speech into 20 different languages.

In mid-December, former Pakistani Prime Minister Imran Khan's political party used an AI-generated speech from the now imprisoned leader in an attempt to rally for votes virtually. Mr. Khan had reportedly sent his party a shorthand script from jail which was later edited and then dubbed by ElevenLabs.

Prominent tech companies also have a hand in the AI voice game now. Recently, Meta launched SeamlessM4T, an open-source multilingual foundational model that can understand nearly 100 languages from speech or text and generate translations in real-time. Apple introduced a voice cloning feature in iOS 17 intended to help people who may be in danger of losing their voice say to a degenerative disease.

ChatGPT, the poster boy for AI chatbots also has a voice transcription feature that can be used for cloning. But OpenAI has been careful to partner with specific parties to prevent the illegal use of these capabilities.

YouTube took a similar route and announced Dream Track which partners with just 100 creators in the U.S. that would allow them to create song clips featuring AI vocals with permission from pop stars like Demi Lovato, Sia and John Legend.

The speed and easy access of these tools have sent alarm bells ringing. In November last year, the U.S. Federal Trade Commission or FTC launched a Voice Cloning Challenge which asked the public to send in their ideas to detect, evaluate and monitor cloned devices. Just yesterday, the contest posted a prize of \$25,000 for the winner. The FTC is also considering the adoption of a recently-proposed Impersonation Rule that will help deter deceptive voice cloning.

But the pace at which generative AI releases are moving has regulators gasping for air. On January 2, researchers from Massachusetts Institute of Technology (MIT) and Tsinghua University in Beijing, China, and members of AI startup MyShell released OpenVoice, an open-source voice cloning tool that is almost instant and offers granular controls to modify one's voice that isn't found on other such platforms.

And the segment is only expected to grow exponentially. A report by Market US has revealed that the global market for these applications stands at \$1.2 billion in 2022 and is estimated to touch almost \$5 billion in 2032 with a CAGR above 15-40%.

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A NEW HIGH: THE HINDU EDITORIAL ON THE ADITYA-L1 MISSION AND ISRO OUTREACH

Relevant for: Science & Technology | Topic: Achievements of Indians in science & technology

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January 08, 2024 12:30 am | Updated 08:29 am IST

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On January 6 evening, a stream of commands transmitted by scientists and engineers of the Indian Space Research Organisation (ISRO) were translated by a computer onboard the Aditya-L1 spacecraft into manoeuvres that guided it into orbit around an imaginary point in space. Thus, [Aditya-L1 reached its destination, around the L1 Lagrange point](#), from where it will have an unfettered view of the sun for its expected lifetime of five years. Aditya-L1 is an observatory-class solar mission that will study the sun with seven instruments: VELC, a coronagraph to study the uppermost layer of the sun's atmosphere; SUIT, an ultraviolet imaging telescope; SoLEXS and HELIOS, to study solar flares and coronal mass ejections; ASPEX and PAPA, to study the solar wind and plasma; and a set of digital magnetometers to measure properties of the magnetic field around the spacecraft. ISRO picked the L1 Lagrange point — 1.5 million km from the earth in the earth-sun direction and one of five Lagrange points in the earth-sun system — because the gravitational influences of the two bodies interact such that a smaller body here will not experience a net tug towards either. So, Aditya-L1 can stay at L1 while expending little fuel. Its scientific mission will begin in a month or so, once its thrusters' emissions drift away.

As such, Aditya-L1 supplements India's storied history of observing the sun — dating back to the Kodaikanal Solar Observatory, which commenced operations in 1901 — by lofting it into space. It also follows the [XPoSat mission](#), launched on January 1 to become only the world's second [X-ray polarimetry satellite](#), and eight years after AstroSat, which reached several highs of its own. An important issue with such achievements is public perception. For example, while Aditya-L1 and AstroSat are big strides from India's point of view, they pale in comparison to the imaging abilities of the James Webb Space Telescope, which is operated by three space agencies. Yet, many continue to expect the Indian spacecraft to capture hi-res photographs of the cosmos and are disillusioned when it does not. This is not fair (setting aside the fact that not all instruments are imagers). ISRO can do more, too, by expanding its own and its collaborating institutes' public outreach efforts, such as by hosting open days focused on specific missions and commissioning science communication on new results at regular intervals. Everyone should be able to celebrate a new high, but especially the people at large, so ISRO should also consider including components on missions that feed public interest. All these efforts will require funds, but considering the love ISRO has been getting from the government of late, it may just be a matter of asking.

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WHAT TO EXPECT IN CRYPTO AND BLOCKCHAIN IN 2024?

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

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January 09, 2024 09:26 am | Updated 10:06 am IST

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As the world rang in the new year, Bitcoin touched \$45,000, a high last seen during the spring of 2022 [File] | Photo Credit: REUTERS

As the world rang in the new year, Bitcoin touched \$45,000, a high last seen during the spring of 2022. Though many may be tempted to call the end of a crypto winter or bear market, the geopolitical situation is highly unstable and existing price cycles are not set in stone.

While it is nearly impossible—as well as irresponsible—to bet on prices or trends in the sector, the facts we already have on hand can help one understand the kind of headlines we might see in the newspapers as 2024 plays out.

The ex-CEO of the failed cryptocurrency exchange FTX was convicted of all seven fraud-related charges in November 2023 [and is expected to be sentenced in March this year](#). Sam Bankman-Fried could spend anywhere from several years to the rest of his life in jail as his debtors and liquidators try to figure out how to recover their lost savings.

The court's sentence will set a precedent, showing other crypto entrepreneurs the dangers of playing fast and loose in the face of U.S. financial regulations, even if they are operating out of the U.S.

(For top technology news of the day, [subscribe](#) to our tech newsletter Today's Cache)

Bitcoin, the largest cryptocurrency by market capitalisation, [hit the \\$45,000 mark for the first time since 2022](#), finally triggering some optimism in the market. While financial influencers and others may push investors to enter the market at this point or buy crypto more aggressively by pointing to the market's recovery and the coin's past highs which crossed \$65,000 in 2021, investors should never trade with the intention of making a quick profit—unless they are experienced traders who have researched the underlying blockchain technology.

Coin crashes can happen in a matter of minutes, so while euphoria is growing and traders are fearful of missing out on opportunities, investors should be especially cautious and not get swept away due to peer pressure.

Three or four years ago, the average Indian crypto trader could get away with making investments via foreign crypto exchanges and collecting their profits without paying any taxes. However, regulators and lawmakers are tightening the screws every year. In light of the U.S. government's actions against Binance, the world's largest crypto exchange, users can also expect the Indian administration to clamp down on the exchange's activities soon enough.

In fact, the [Financial Intelligence Unit India \(FIU IND\) late last year issued show-cause notices to Binance](#) as well as foreign providers such as Kucoin, Huobi, Bitfinex and MEXC Global, claiming that they were not operating legally. Indian users who have accounts with these exchanges or other crypto companies seen as having Chinese links will likely find it far more difficult to carry on as usual in 2024.

People who help validate Bitcoin transactions with the help of complex code-solving equipment and energy-intensive hardware are rewarded for their efforts. While the current prize amount for this task is 6.25 BTC (around \$275,512.5 as of early January), this sum halves every four or so years in an event called the 'Bitcoin halving.'

This means it will become less profitable for people to mine Bitcoin over time, and could affect the way both individuals and mining companies invest in the asset. The next Bitcoin halving is expected to happen in the first half of this year, which could trigger more volatility in the market.

More than 100 countries, including India, are currently exploring the development or implementation of Central Bank Digital Currencies (CBDCs) for reasons ranging from easy cross-border transactions to offering residents a homegrown alternative to cash and credit cards. Unlike cryptocurrencies such as Bitcoin and Dogecoin, CBDCs are tightly regulated by the country's government and central bank, and they are not meant to be held as investments.

While many people—such as potential users of the European Union's Digital Euro—are concerned about how CBDCs will affect their digital and financial privacy, [IMF Managing Director Kristalina Georgieva last year urged countries](#) to step on the gas and move forward with their CBDCs to avoid behind left behind.

The flip side of increased crypto adoption is a rise in crypto crime, as scammers and hackers exploit people's interest in the new technology to devise novel ways of stealing their money. India's crypto regulations are still nascent as the government treats the sector with suspicion, making it easier for scammers to take advantage of Indian crypto traders who now lack a safety net, and harder for the victims to recover from such incidents or report them to knowledgeable authorities.

[As sites such as X \(formerly Twitter\) allow users to advertise cryptocurrency scams](#) while high-risk companies advertise their services with the help of more mainstream channels, not just crypto traders but everyday internet users will also have to educate themselves about blockchain basics, to keep their funds safe. As crypto prices rise and assets become valuable, cybercriminals are more motivated to extract your life savings.

The generative AI boom triggered by large language models (LLMs) such as ChatGPT has touched almost every sector imaginable, and crypto is no exception. For better or worse, engineers and entrepreneurs are looking at how AI tools could help predict the market's movements—or even influence it.

Zooming out, however, the combination of blockchains and AI could lead to new Web3 products being released or existing services getting an upgrade. (For example, the Brave browser provides AI-powered summaries of search results similar to Google, [even as it rewards users](#)

[with crypto for viewing ads and supports cryptocurrency transactions.](#))

Expect to see more such fusion and products which offer features you never realised you needed—or wanted.

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U.S.'S FIRST MOON LANDING ATTEMPT IN 50 YEARS IN JEOPARDY AFTER 'CRITICAL' FUEL LEAK

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

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January 08, 2024 11:37 pm | Updated January 09, 2024 05:16 am IST - CAPE CANAVERAL, U.S.A.

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An illustration of the Peregrine lunar lander | Photo Credit: AP

The [first U.S. moon landing in more than 50 years](#) appeared to be doomed after a private company's spacecraft developed a "critical" fuel leak just hours after Monday's launch.

Pittsburgh-based Astrobotic Technology managed to orient its lander toward the sun so the solar panel could collect sunlight and charge its battery, as a special team assessed the status of what was termed "a failure in the propulsion system."

It soon became apparent, however, that there was "a critical loss of fuel," further dimming hope for what had been a planned moon landing on February 23.

"We are currently assessing what alternative mission profiles may be feasible at this time," the company said in a statement.

The problem was reported about seven hours after Monday's predawn liftoff from Cape Canaveral Space Force Station. United Launch Alliance's Vulcan rocket provided the lift for Astrobotic's lander, named Peregrine, putting it on a long, roundabout path to the moon.

A propulsion system problem "threatens the ability of the spacecraft to soft land on the moon," the company said. The lander is equipped with engines and thrusters for maneuvering, not only during the cruise to the moon but for lunar descent.

Astrobotic was aiming to be the first private business to successfully land on the moon, something only four countries have accomplished. A second lander from a Houston company is due to launch next month. NASA gave the two companies millions to build and fly their own lunar landers.

The space agency wants the privately owned landers to scope out the place before astronauts arrive while delivering tech and science experiments for the space agency, other countries and universities as well as odds and ends for other customers. Astrobotic's contract with NASA for the Peregrine lander was \$108 million and it has more in the pipeline.

Before the flight, NASA's Joel Kearns, deputy associate administrator for exploration, noted that while using private companies to make deliveries to the moon will be cheaper and quicker than going the usual government route, there will be added risk. He stressed that the space agency was willing to accept that risk, noting Monday: "Each success and setback are opportunities to learn and grow."

The last time the U.S. launched a moon-landing mission was in December 1972. Apollo 17's Gene Cernan and Harrison Schmitt became the 11th and 12th men to walk on the moon, closing out an era that has remained NASA's pinnacle.

The space agency's new Artemis program — named after the twin sister of Apollo in Greek mythology — looks to return astronauts to the moon's surface within the next few years. First will be a lunar fly-around with four astronauts, possibly before the end of the year.

Highlighting Monday's moonshot was the long-delayed initial test flight of the Vulcan rocket from Cape Canaveral Space Force Station. The 202-foot (61-meter) rocket is essentially an upgraded version of ULA's hugely successful workhorse Atlas V, which is being phased out along with the company's Delta IV. Jeff Bezos' rocket company, Blue Origin, provided the Vulcan's two main engines.

ULA declared success once the lander was free of the rocket's upper stage, nearly an hour into the flight and before the spacecraft's propulsion system malfunctioned and prevented the solar panel from properly pointing toward the sun.

Landing on the moon has long been a series of hits and misses. The Soviet Union and the U.S. racked up a string of successful moon landings in the 1960s and 70s, before putting touchdowns on pause. China joined the elite club in 2013 and India in 2023. But last year also saw landers from Russia and a private Japanese company slam into the moon. An Israeli nonprofit crashed in 2019.

Next month, SpaceX will provide the lift for a lander from Intuitive Machines. The Nova-C lander's more direct one-week route could see both spacecraft attempting to land within days or even hours of one another.

Besides flying experiments for NASA, Astrobotic drummed up its own freight business, packing the 6-foot-tall (1.9-meter-tall) Peregrine lander with everything from a chip of rock from Mount Everest and toy-size cars from Mexico that will catapult to the lunar surface and cruise around, to the ashes and DNA of deceased space enthusiasts, including "Star Trek" creator Gene Roddenberry and science fiction writer Arthur C. Clarke.

The Navajo Nation recently sought to have the launch delayed because of the human remains, saying it would be a "profound desecration" of a celestial body revered by Native Americans. Astrobotic chief executive John Thornton said the December objections came too late but promised to try to find "a good path forward" with the Navajo for future missions.

One of the spaceflight memorial companies that bought room on the lander, Celestis, said in a statement that no single culture or religion owns the moon and should not be able to veto a mission. More remains are on the rocket's upper stage, which was boosted into a perpetual orbit around the sun reaching as far out as Mars.

Cargo fares for Peregrine ranged from a few hundred dollars to \$1.2 million per kilogram (2.2 pounds), not nearly enough for Astrobotic to break even. But for this first flight, that's not the point, according to Thornton.

“A lot of people’s dreams and hopes are riding on this,” Mr. Thornton said days before the flight.

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WITH ADITYA-L1 SPACECRAFT PLACED IN HALO ORBIT, FOCUS IS ON DATA COLLECTION ON SUN

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

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January 09, 2024 08:09 pm | Updated 08:32 pm IST - Bengaluru:

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Now that Aditya-L1 has arrived at the L1 point, it will take another 3 months for all its scientific payloads to become fully operational. Photo: X/@ISROSpaceflight

With the [Indian Space Research Organisation \(ISRO\)](#) successfully placing the [Aditya-L1 spacecraft in a halo orbit around the Lagrangian point \(L1\) on January 6](#), the focus is now on the operation of the scientific instruments and data collection.

Aditya-L1 is a satellite dedicated to the comprehensive study of the sun with seven payloads.

The seven payloads aboard the satellite are: Visible Emission Line Coronagraph (VELC), Solar Ultraviolet Imaging Telescope (SUIT), Solar Low Energy X-ray Spectrometer (SoLEXS), High Energy L1 Orbiting X-ray Spectrometer (HEL1OS), Aditya Solar wind Particle Experiment (ASPEX), Plasma Analyser Package For Aditya (PAPA) and Advanced Tri-axial High Resolution Digital Magnetometers.

Now that [#AdityaL1](#) has arrived at the L1 point, it will take another 3 months for all its scientific payloads to become fully operational.

While some payloads (eg. SUIT) were turned on by [#ISRO](#) during the cruise to L1, over the next 3 months the rest of the instruments will... pic.twitter.com/npxvMQsDm6

According to the ISRO, a satellite placed in the halo orbit around the L1 point has the major advantage of continuously viewing the sun without any occultation/eclipses.

This will provide a greater advantage of observing the solar activities and its effect on space weather in real time. The spacecraft carries seven payloads to observe the photosphere, chromosphere and the outermost layers of the sun (the corona) using electromagnetic and particle and magnetic field detectors.

The payloads have been switched on and some of them have already collected data.

The Supra Thermal and Energetic Particle Spectrometer instrument, a part of the ASPEX payload, had begun the collection of scientific data in September 2023.

The HEL1OS has recorded the impulsive phase of solar flares; Aditya Solar wind Particle Experiment (ASPEX) payload has also commenced its operations; the Solar Ultraviolet Imaging Telescope (SUIT) instrument has successfully captured the first full-disk images of the sun in the 200-400 nm wavelength range.

The Visible Emission Line Coronagraph (VELC), which is the primary payload of the spacecraft, was also switched on during the cruise phase.

VELC, developed by the Indian Institute of Astrophysics (IIA), Bengaluru, will be able to observe the corona continuously from the L1. VELC would be sending 1,440 images of the sun in a day.

“The VELC payload was switched on and tested during the cruise phase. Once the spacecraft is in halo orbit we have to carry our tests to ensure that everything is alright before we commence the experiments. Once we make sure that the instrument is pointed towards the centre of the sun we have to carry out all the calibration observations and the performance of all the electronic components onboard would also be tested,” Ramesh. R, principal investigator of the VELC payload, told *The Hindu*.

Mr. Ramesh added that the VELC payload is most likely to start sending images by the end of January.

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RELAXED ASSUMPTIONS CAN THROW BETTER LIGHT ON COLD DARK MATTER OF THE UNIVERSE

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

Scientists have found a new approach to explore cold dark matter (CDM), a hypothetical dark matter that constitutes 25 percent of the current Universe.

In the current universe, nearly 70 per cent constitutes dark energy whereas 25 per cent is dark matter – about both of which there is scanty knowledge, till date. The nature of dark matter and its interactions with the rest of the matter remains a mystery. Scientists have, so far, been able to study a miniscule area of the Universe which comprises everything -- the galaxies, stars, constellations, and meteors to name a few. It is very difficult to determine what the constituents of cold dark matter are. The confusion is escalated because of the two models used to study CDM namely the particle physics model and the cosmological model were not in agreement.

The cosmological model provides a description of the largest-scale structures and dynamics of the universe and allows study of fundamental questions about its origin, structure, evolution, and ultimate fate while the particle physics model describes the most basic building blocks of the universe. The success rate of the standard cosmological model has been good in recent decades.

One of the promising candidates of CDM is the Weakly Interacting Massive Particles (WIMP). Such particle arises naturally in extensions of standard model of particle physics and predict the correct energy density of the CDM for plausible range of interaction strength (WIMP miracle). However, inspite of intensive searches and orders of magnitude improvement in the sensitivity of lab experiments (e.g. Xenon based experiments), WIMP has not yet been detected. In addition, the parameter space suggested by the WIMP miracle had mostly been ruled out.

In a recently published paper by Raman Research Institute (RRI), an autonomous institute of the Department of science and Technology (DST) have confirmed the relevance of WIMP by relaxing certain earlier assumptions and hence proved that theorising dark matter from particle physics was possible.

Professor Shiv Sethi from the Raman Research Institute (RRI) and his collaborator, Abineet Parichha, a former student at the Indian Institute of Science Education and Research, Mohali, proved the relevance of WIMP by considering an unstable WIMP in their analysis relaxing earlier assumptions of the stability of particles. The authors demonstrated that this allows them to satisfy all the existing observational and experimental constraints on the nature of cold dark matter. In addition, this hypothesis is testable from cosmological data. This model is at variance with the dark matter experiments and the research makes it clearer that the assumption of a massive, stable WIMP needs to be altered.

“We considered a model wherein the WIMP decays and one of the decay products of WIMPs acts as cold dark matter at late times. From theoretical perspective, this scenario allows us to expand the permissible space of parameters. Additionally, we show that such a model leaves observable signatures on the Cosmic Microwave Background and the high redshift neutral hydrogen data,” said Prof. Sethi, senior faculty of Astronomy and Astrophysics at RRI.

The dark matter paradigm based on WIMP brought into consonance the standard models of particle physics and cosmology. However, this remarkable agreement was short-lived as

experiments to detect cold dark matter in the relevant mass range have failed. The current work proposes viable scenarios which show the two model might still be compatible.

“We found that the WIMP model is still viable under the relaxed assumptions. In addition, the data from space telescope James Webb Space Telescope (JWST) might be indicating more exciting possibilities in the dark matter sector,” Prof Sethi said.

Paper link - <https://arxiv.org/abs/2305.10315>

SNC/PK

Scientists have found a new approach to explore cold dark matter (CDM), a hypothetical dark matter that constitutes 25 percent of the current Universe.

In the current universe, nearly 70 per cent constitutes dark energy whereas 25 per cent is dark matter – about both of which there is scanty knowledge, till date. The nature of dark matter and its interactions with the rest of the matter remains a mystery. Scientists have, so far, been able to study a miniscule area of the Universe which comprises everything -- the galaxies, stars, constellations, and meteors to name a few. It is very difficult to determine what the constituents of cold dark matter are. The confusion is escalated because of the two models used to study CDM namely the particle physics model and the cosmological model were not in agreement.

The cosmological model provides a description of the largest-scale structures and dynamics of the universe and allows study of fundamental questions about its origin, structure, evolution, and ultimate fate while the particle physics model describes the most basic building blocks of the universe. The success rate of the standard cosmological model has been good in recent decades.

One of the promising candidates of CDM is the Weakly Interacting Massive Particles (WIMP). Such particle arises naturally in extensions of standard model of particle physics and predict the correct energy density of the CDM for plausible range of interaction strength (WIMP miracle). However, inspite of intensive searches and orders of magnitude improvement in the sensitivity of lab experiments (e.g. Xenon based experiments), WIMP has not yet been detected. In addition, the parameter space suggested by the WIMP miracle had mostly been ruled out.

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DRDO CONDUCTS SUCCESSFUL FLIGHT-TEST OF NEW GENERATION AKASH MISSILE OFF ODISHA COAST

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

Defence Research and Development Organisation (DRDO) conducted a successful flight-test of the New Generation AKASH (AKASH-NG) missile from the Integrated Test Range (ITR), Chandipur off the coast of Odisha at 1030 hrs on January 12, 2024. The flight-test was conducted against a high-speed unmanned aerial target at very low altitude. During the flight-test, the target was successfully intercepted by the weapon system and destroyed. It has validated the functioning of the complete weapon system consisting of the missile with indigenously developed Radio Frequency Seeker, Launcher, Multi-Function Radar and Command, Control & Communication system.



The system performance was also validated through the data captured by a number of Radars, Telemetry and Electro Optical Tracking System deployed by ITR, Chandipur. The flight-test was witnessed by senior officials from DRDO, Indian Air Force (IAF), Bharat Dynamics Limited (BDL) and Bharat Electronics Limited (BEL). The AKASH-NG system is a state-of-the-art missile system capable of intercepting high speed, agile aerial threats. The successful flight test has paved the way for User trials.

Raksha Mantri Shri Rajnath Singh has complimented the DRDO, IAF, PSUs and the Industry for the flight-test. The successful development of the system will further enhance the air defence capabilities of the country, he said.

Secretary Department of Defence R&D and Chairman DRDO Dr Samir V Kamat also congratulated the teams associated with the successful flight test of AKASH-NG.

ABB/Savvy

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EXPRESS VIEW: HERE COMES THE SUN

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

India's space-based solar observatory, Aditya-L1, is poised to provide new insights into the dynamics of the Sun. On Saturday, ISRO inserted the spacecraft into its destination orbit, L1 or Lagrange point, a patch between the Earth and the Sun, about 1.5 million km away.

It's a place where the gravity of the planet and the Sun and the centripetal force of the satellite cancel out one another, creating a stable point for the observatory.

A spacecraft at L1 can observe the Sun without eclipses or obstructions. This is another feather in [ISRO's](#) cap — it is only the third space agency to place a spacecraft at this patch. Placing Aditya at a halo orbit in L1 was a task enormously more complicated than putting a satellite in a celestial orbit around the Earth or any other planetary body.

The conventional orbits are either circular or elliptical. The orbit at L1 is almost perpendicular to the line joining the Earth and the Sun. Scientists say that ISRO would need to carry out periodic manoeuvres to keep the spacecraft in its orbit.

So far, Indian scientists have been studying the Sun from ground-based telescopes. These enable observation of the star's visible surface but not its atmosphere. Aditya-L1 aims to observe the Sun's corona — the outermost part of its atmosphere — and understand its extreme heat.

The mission could provide clues to resolving a long-standing mystery: Why is the not-so-bright corona of the star closest to us a million degrees Celsius hot when the temperature on its surface is about 5,500 degrees Celsius? The mission could help scientists understand how the Sun's radiation, flow of particles and magnetic fields affect the Earth.

Solar flares have the potential to damage electronic equipment on satellites. About 7,000 satellites orbiting the Earth currently have a crucial role in several fields, ranging from telecommunications to weather prediction. The information gathered by India's solar observatory could help scientists find ways to understand these bursts of radiation and even predict them.

Aditya will also study "space weather" that results from solar storms using four instruments that are pointed at the star and three others that will monitor the solar wind and the effects of these storms on the sun's magnetic field. All this could enrich the understanding of climatic changes in the coming decades.

Aditya's primary mission is expected to last five years. However, the spacecraft's location at the extremely stable L1 could result in a much longer lifetime. NASA and the European Space Agency's SOHO probe, for example, was expected to last about two years. But it has operated for 27 years from L1.

The challenge, however, will be to keep Aditya-L1 in its desired configuration for the rest of its life. The coming years promise to be exciting ones for India's space research agency.

END

CALL FOR PRE-PROPOSALS FOR SETTING T-HUBS TO BE LAUNCHED

Relevant for: Science & Technology | Topic: IT, Internet and Communications

A call for pre-proposals for setting up Thematic Hubs (T-Hubs) will be launched by Secretary, Department of Science and Technology (DST), Professor Abhay Karandikar, tomorrow, on the sidelines of the 9th edition of the India International Science Festival in Faridabad, Haryana.

The pre-proposal will invite academia institutions/ R&D Labs to submit innovative pre-proposals in consortia mode aligned with objectives of the National Quantum Mission (NQM) to setup T-Hubs in Quantum Computing, Quantum Communication, Quantum Sensing & Metrology and Quantum Materials & Devices.

The pre-proposals should demonstrate the applications of quantum technologies. The highlights of the call will be elaborated upon by Senior Adviser DST and Secretary SERB, Dr Akhilesh Gupta.

Recently, at the 1st meeting of Mission Governing Board (MGB) of National Quantum Mission (NQM) the committee approved the decision to invite Call for Pre-proposals for setting up of four thematic hubs (T-Hubs) under NQM in consortia format. The launch of the pre-proposals will be undertaken as a follow up to the approval, given the centrality of the NQM.

The Union Cabinet approved the NQM on 19th April 2023 being implemented by DST with a total outlay of Rs.6003.65 Crore for a period of eight years. The Mission aims to seed, nurture and scale up scientific and industrial R&D and create a vibrant & innovative ecosystem in Quantum Technology (QT). This will accelerate QT led economic growth, nurture the ecosystem in the country and make India one of the leading nations in the development of Quantum Technologies & Applications (QTA).

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WHY IS JAPAN'S 'MOON SNIPER' LANDING MISSION IMPORTANT?

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January 19, 2024 12:49 pm | Updated 03:32 pm IST - TOKYO

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JAXA will start a 20-minute touchdown phase on its one-way mission from 1500 GMT Friday [File] | Photo Credit: REUTERS

Japan aims to become the fifth country to put a spacecraft on the moon when it attempts the precision landing of the Smart Lander for Investigating Moon (SLIM) probe on Friday.

Dubbed the "moon sniper", SLIM will put to the test an experimental technology the Japan Aerospace Exploration Agency (JAXA) says is unprecedented and essential to searching for water, and other factors that could sustain life on the moon.

JAXA will start a 20-minute touchdown phase on its one-way mission from 1500 GMT Friday, trying to land on a site roughly the size of two athletic tracks located on the slope of a crater just south of the lunar equator.

More than two decades in development, the SLIM project is JAXA's second lunar landing attempt. It lost contact with the OMOTENASHI lander shortly after launch in 2022.

SLIM is designed to land within 100 metres (328 feet) of its target, versus the conventional accuracy of several kilometres for lunar landers. As the probe descends onto the surface, it recognises where it is flying by matching its camera's images with existing satellite photos of the moon. This "vision-based navigation" enables a precise touchdown, JAXA says.

The precision landing technology will become a powerful tool in future exploration of hilly moon poles - seen as a potential source of oxygen, fuel and water - and boosts a lunar lander's chance of survival by helping it select the best location for solar power generation, according to JAXA.

Only four nations - the former Soviet Union, the United States, China and India - and no private companies have achieved the soft landing on the moon's surface.

JAXA has twice landed on small asteroids, but landing on the moon is more difficult due to its gravity. Last year, probes from Russia and Japanese startup ispace inc. crashed into the moon's surface. A lander from U.S. startup Astrobotic last week suffered a fuel leak, forcing it to abandon a touchdown attempt.

Manufacturing a lightweight moon lander with less fuel consumption was another objective of the SLIM project, as Japan aims to carry out more frequent missions in the future by reducing launch costs. SLIM weighs 700 kg (1,540 lb) at launch, less than half of India's Chandrayaan-3 that in August made a historic touchdown on the moon's south pole.

In March, JAXA manually destroyed the initial model of new flagship rocket H3 after launch due to engine ignition trouble.

The failure caused widespread delays in Japan's satellite launches and space missions, including SLIM and another joint lunar polar exploration project with India, which is now slated for 2025.

JAXA also failed to launch an Epsilon small rocket in 2022, followed by an engine explosion during a test in July.

JAXA has completed the investigation into the first H3 rocket's failure last year and set the launch date of its second model to February 15.

A number of lunar landers will be headed to the moon this year. U.S. startup Intuitive Machines aims to launch its IM-1 lander in mid-February. China plans to send its Chang'e-6 spacecraft to the far side of the moon in the first half of 2024 to retrieve samples from an ancient basin. Tokyo-based ispace has said it would launch its second moon mission this year.

NASA plans the launch of its lunar polar exploration rover VIPER in November. The U.S. space agency last week announced fresh delays to its Artemis moon program, scheduling for 2026 its first astronaut lunar landing in half a century.

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STATUS OF JAPAN MOON-LANDER SLIM UNCLEAR WITH SOLAR PANEL GLITCH

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January 20, 2024 07:47 am | Updated 11:05 am IST

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An H-IIA rocket lifts off on September 7, 2023 from the Tanegashima Space Centre on Tanegashima island, Kagoshima prefecture, the SLIM probe. | Photo Credit: AFP/Handout

Japan became the fifth country in history to [reach the moon](#) when one of its spacecrafts without astronauts successfully made a soft landing on the lunar surface early Saturday.

However, space officials said they need more time to analyze whether the Smart Lander for Investigating Moon, or SLIM, achieved its mission priority of making a pinpoint landing. They also said the craft's solar panel had failed to generate power, which could shorten its activity on the moon.

Space officials believe the SLIM's small rovers were launched as planned and that data was being transmitted back to the earth, said Hitoshi Kuninaka, head of the Institute of Space and Astronautical Science, a unit of Japan's space agency.

But he said that SLIM's solar battery wasn't generating power and that it had only a few more hours of battery life. He said that the priority now was for the craft to gather as much data about its landing and the moon as possible on the remaining battery.

Japan follows the United States, the Soviet Union, China and India in reaching the moon.

Kuninaka said he believes that Japan's space program at least achieved "minimum" success.

SLIM landed on the moon at about 12:20 a.m. Tokyo time on Saturday (1520 GMT Friday).

There was a tense wait for news after the Japan Aerospace Exploration Agency's mission control initially said that SLIM was on the lunar surface, but that it was still "checking its status." No further details were given until a news conference nearly two hours later.

For the mission to be considered fully successful, space officials need to confirm whether SLIM made a pinpoint landing. Kuninaka said that while more time is needed, he personally thinks it was most likely achieved, based on his observation of data showing the spacecraft's movement until the landing and its ability to transmit signals after landing.

SLIM, which was aiming to hit a very small target, is a lightweight spacecraft about the size of a passenger vehicle. It was using “pinpoint landing” technology that promises far greater control than any previous moon landing.

While most previous probes have used landing zones about 10 kilometers (six miles) wide, SLIM was aiming at a target of just 100 meters (330 feet).

A landing of such precision would be a world's first, and would be crucial technology for a sustainable, long-term and accurate space probe system, said Hiroshi Yamakawa, president of Japan Aerospace Exploration Agency, or JAXA.

Japan needs the technology to secure its place and contribute in international space projects, Yamakawa said.

The project was the fruit of two decades of work on precision technology by JAXA.

SLIM, nicknamed “the Moon Sniper,” started its descent at midnight Saturday, and within 15 minutes it was down to about 10 kilometers (six miles) above the lunar surface, according to the space agency, which is known as JAXA.

At an altitude of five kilometers (three miles), the lander was in a vertical descent mode, then at 50 meters (165 feet) above the surface, SLIM was supposed to make a parallel movement to find a safe landing spot, JAXA said.

The spacecraft was testing technology to allow moon missions to land “where we want to, rather than where it is easy to land,” JAXA has said. The spacecraft also was supposed to seek clues about the origin of the moon, including analyzing minerals with a special camera.

The SLIM, equipped with a pad each on its five legs to cushion impact, was aiming to land near the Shioli crater, near a region covered in volcanic rock.

The closely watched mission came only 10 days after a moon mission by a U.S. private company failed when the spacecraft developed a fuel leak hours after the launch.

SLIM was launched on a Mitsubishi Heavy H2A rocket in September. It initially orbited the earth and entered lunar orbit on Dec. 25.

Japan hopes to regain confidence for its space technology after a number of failures. A spacecraft designed by a Japanese company crashed during a lunar landing attempt in April, and a new flagship rocket failed its debut launch in March.

JAXA has a track record with difficult landings. Its Hayabusa2 spacecraft, launched in 2014, touched down twice on the 900-meter-long (3,000-foot-long) asteroid Ryugu, collecting samples that were returned to the earth.

A successful pinpoint landing by SLIM, especially on the moon, would raise Japan's profile in the global space technology race.

Takeshi Tsuchiya, aeronautics professor at the Graduate School of Engineering at the University of Tokyo, said it was important to confirm the accuracy of landing on a targeted area.

“It is necessary to show the world that Japan has the appropriate technology in order to be able to properly assert Japan's position in lunar development,” he said. The moon is important from

the perspective of explorations of resources, and it can also be used as a base to go to other planets, like Mars, he said.

SLIM was carrying two small autonomous probes — lunar excursion vehicles LEV-1 and LEV-2, which officials say were believed to have been released just before landing.

LEV-1, equipped with an antenna and a camera, is tasked with recording SLIM's landing. LEV-2, is a ball-shaped rover equipped with two cameras, developed by JAXA together with Sony, toymaker Tomy and Doshisha University.

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IT MINISTRY ISSUES DRAFT ROAD MAPS FOR CRITICAL TECH SECTORS

Relevant for: Science & Technology | Topic: IT, Internet and Communications

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January 20, 2024 09:20 pm | Updated January 21, 2024 12:39 am IST - NEW DELHI

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The cybersecurity roadmap of the Ministry of Electronics and Information Technology seeks to develop “Social Media Analytics” by 2026. File | Photo Credit: Reuters

The Ministry of Electronics and Information Technology this week put out draft roadmaps for conducting indigenous research and development for cyber forensics, quantum computing technologies, mobile security, cryptography, and Internet of Things (IoT) security. The roadmaps, prepared by the Centre for Development of Advanced Computing, aim to solve a series of issues by different time spans between now and 2047, the centenary of Indian independence.

The cybersecurity roadmap, for instance, seeks to develop “Social Media Analytics” by 2026, while “Dark Web Forensics” has until 2030 for completion. Detection of child exploitation and human trafficking are marked as ongoing efforts that will start in 2027 and continue beyond 2047. GPS and vehicle forensics will be completed by 2027 and 2029, respectively, while banking fraud and UPI payment forensics solutions have until 2029 and 2030, respectively.

On the quantum computing side, the roadmap says that research and development efforts to develop quantum computers will carry on till 2034. The mobile security roadmap aims, on the other hand, to engage in fostering “enterprise-grade” security systems, creating an “indigenous system for secure [operating systems] and mobile device hardware.”

While these roadmaps envision activities that will stretch well into 2047 and beyond, the cryptography roadmap — which seeks to achieve domestic digital encryption development goals — says that goals for ‘asymmetric cryptography’ and for IoT devices should be completed by 2028-33, including “quantum-resistant cryptography,” which refers to encryption technologies that can withstand exponentially stronger decryption attempts.

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JAPAN, 5TH COUNTRY TO MOON-LAND, USED TECH THAT WILL SUPPORT FUTURE MISSIONS

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

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January 23, 2024 04:30 pm | Updated 04:30 pm IST

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This handout photo taken in 2022, received on January 18, 2024 from the Japan Aerospace Exploration Agency (JAXA) and credited to JAXA, Takara Tomy, Sony Group Corporation and Doshisha University shows the transformable lunar surface robot “SORA-Q” (operation verification model) installed on the private company’s lunar module for the Smart Lander for Investigating Moon (SLIM) mission, at an undisclosed location. Japan switched off its Moon lander almost three hours after a historic touchdown on January 20, to allow for a possible recovery of the craft, the space agency said on January 22, 2024. | Photo Credit: AFP

Japan landed its [Smart Lander for Investigating the Moon](#), or SLIM, craft on the surface of the Moon on Jan. 20, 2024. Despite a power issue with the lander, the event holds both political and technical importance. It’s Japan’s first lunar landing – making it only the fifth country in the world to successfully land on the Moon. This is a significant achievement and solidifies Japan’s position as a leader in space technology.

While the craft [landed successfully on the lunar surface](#) and deployed its rovers, SLIM’s solar cells were not functioning properly – meaning that the craft could likely [only operate for a few hours](#).

I’m a [scholar of international affairs](#) who studies space. Like NASA and other space agencies, the [Japan Aerospace Exploration Agency, or JAXA](#), wants to advance research and technology by demonstrating new techniques and collecting scientific data. The landing is also a part of something bigger – a [growing global interest in lunar activity](#).

Japan’s achievement isn’t only symbolic – Japan is demonstrating a number of new technologies with the lander. The name, Smart Lander for Investigating the Moon, refers to the spacecraft’s [new precision-landing technology](#).

This technology could assist future landings by allowing spacecraft to land in relatively small areas amid rocky or uneven terrain, rather than having to find large clearings. This ability will be particularly important in the future as countries focus on very specific [areas of interest](#) at [the lunar south pole](#).

The lander also carried two small rovers, each of which will demonstrate a new technology for moving on the Moon.

[Lunar Excursion Vehicle 1](#) includes a camera, as well as scientific equipment, and uses a hopping mechanism to maneuver on the Moon.

[Lunar Excursion Vehicle 2](#), developed in a partnership among government, industry, and academia, is a sphere small enough to fit in the palm of your hand. Once on the surface, its two halves separate slightly, allowing it to roll around.

SLIM is designed to land [within a 328-foot \(100-meter\) zone](#), far smaller than previous lunar landers which have had landing zones spanning multiple kilometers.

SLIM used a [vision-based navigation system](#) that took images of the lunar surface. Its system rapidly compared these images to crater patterns on lunar maps that JAXA developed with data from previous missions.

As countries identify areas that are most likely to hold useful resources, such as [water in the form of ice](#), precision landing technology will allow agencies to avoid nearby hazards and reach these areas without incident.

There is a geopolitical element to these activities. China, India and Japan – the three nations that have successfully landed on the Moon since 2000 – engage in regional competition across a number of areas, including space. In addition to regional considerations, these accomplishments help to establish nations as leaders on a global scale – capable of something that few nations have ever done.

Japan's launch comes only six months after [India's Moon landing](#) and just weeks after [a failed attempt](#) by a U.S. company, Astrobotic.

[Both Russia](#) and [the private company iSpace](#) made unsuccessful landing attempts in 2023. Japan's success in landing on the Moon – even with solar panel issues shortening the timeline for the mission – demonstrates that JAXA is a major player in this global endeavor.

Despite recent setbacks, such as [NASA announcing delays](#) to its next Artemis mission, the U.S. is still a clear leader in space and lunar exploration. NASA has [multiple spacecraft orbiting the Moon](#) right now, and it's already successfully launched the [SLS rocket](#), which is capable of taking humans back to the Moon.

NASA is developing very large and complex systems internally – like the [Gateway space station](#), planned to orbit near the Moon, and the infrastructure for the [Artemis human Moon missions](#). It's not uncommon for these large and complex efforts to experience some delays.

NASA has also turned many smaller-scale efforts over to commercial entities lately – like in the [Commercial Lunar Payload Services program](#) that supported Astrobotic's attempt. This is a new approach that involves some risk, but provides the opportunity for commercial innovation and growth of the [lunar economy](#) while giving NASA the ability to focus on big, complex aspects of the mission.

With regard to the Moon, JAXA has partnered with the U.S. and taken on a very important component of the Artemis missions – the development of a [pressurized lunar rover](#). This is a new and complex technology that will be critical to human missions on the Moon in coming years.

[Mariel Borowitz](#), Associate Professor of International Affairs, [Georgia Institute of Technology](#)

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THE NEED TO OVERHAUL A SEMICONDUCTOR SCHEME

Relevant for: Science & Technology | Topic: Indigenization of technology and developing new technology

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January 24, 2024 01:49 am | Updated 01:49 am IST

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India's \$10 billion Semicon India Program has had mixed results, at best. Photo: chips-dli.gov.in

The mid-term appraisal of the semiconductor Design-Linked Incentive (DLI) scheme is due soon. Since its announcement, the DLI scheme has approved only seven start-ups, markedly short of its target of supporting 100 over five years. This impact assessment, therefore, presents an opportunity for policymakers to appraise and revamp the scheme.

India's \$10 billion Semicon India Program has had mixed results, at best. There are three goals of India's semiconductor strategy. The first is to reduce dependence on semiconductor imports, particularly from China, and especially in strategic and emerging sectors, ranging from defence applications to Artificial Intelligence development. The second is to build supply chain resilience by integrating into the semiconductor global value chain (GVC). The third is to double down on India's comparative advantage: India already plays host to the design houses of every major global semiconductor industry player and Indian chip design engineers are an indispensable part of the semiconductor GVC.

These goals will help cement India's status as a semiconductor powerhouse. However, resources are limited. Therefore, priorities for industrial policy should ensure that we reap disproportionate benefits from our investments. Stimulating the design ecosystem is less capital-intensive than the foundry and assembly stages of the semiconductor GVC. Bolstering this stage can help establish strong forward linkages to an up-and-coming fabrication and assembly industry in India. Therefore, it is odd to note a concerted lack of policy scrutiny of the DLI scheme's lack of results, while Production-Linked Incentive schemes for foundries and assembly stages received quick revisions post notification.

Prima facie, the DLI scheme fares well with its focus on providing access to design infrastructure, such as electronic design automation (EDA) tools, alongside financial subsidies for different steps of the chip design process. But there has been lacklustre uptake of the scheme. First, the scheme mandates that beneficiary start-ups maintain their domestic status for at least three years after receiving incentives, and for this they cannot raise more than 50% of their requisite capital via foreign direct investment. This is a significant barrier.

Costs for semiconductor design startups are also significant. Semiconductor R&D usually only pays off in the longer term, and the funding landscape for chip start-ups in India continues to be

challenging despite promising IP and business potential. Such capital requirements, combined with the lack of success stories caused by the absence of a mature start-up funding ecosystem for hardware products in India, reduce the risk appetite of domestic investors. Consequently, any shortfall in investment for DLI beneficiary start-ups could be bridged by equity financing bringing in foreign funds, if not for the scheme's riders on ownership.

The relatively modest incentives under the DLI scheme (capped at 15 Crore for Product DLI and 30 Crore for Deployment Linked Incentive, per application) would not make for a worthwhile trade-off for start-ups standing to lose out on access to crucial long-term funding. It is therefore crucial to delink ownership from the development of semiconductor design and adopt more start-up-friendly investment guidelines. This would also boost their financial stability and provide them global exposure.

The primary aim of the DLI scheme should be to cultivate semiconductor design capabilities in India, with the understanding that home-grown IP will organically evolve as local talent fosters the creation of indigenous companies over time. The scheme needs to be revised to focus on the broader objective of facilitating design capabilities for a wide array of chips within the country, so long as the entity engaging in the design development process is registered in India. The Union government's recent statement, that "(the product) should be an India-designed chip", implies a move in this direction. The financial outlay of the scheme must be enhanced substantially to support this policy shift.

The Centre for Development of Advanced Computing's role as the nodal agency appraising proposals by applicants under the DLI scheme merits a re-look too. As it is also a market player in the Indian chip design sector, clear concerns of a conflict of interest arise, as well as its capacity and suitability to be the implementing and regulating agency. The Karnataka government's Semiconductor Fabless Accelerator Lab (SFAL), with its specific partnerships with the Indian Electronics and Semiconductor Association, EDA vendors, IP, and testing companies, could be an appropriate blueprint for an implementing agency for DLI.

Also read | ['80% funds allocated for semiconductor manufacturing scheme remain unused'](#)

A similar agency under the auspices of the India Semiconductor Mission could aim to emulate SFAL's approach and provide affiliated start-ups access to a network of mentors, industry, and financial institutions, in addition to the disbursement of financial incentives under the scheme. It could inspire an expanded focus for a revamped DLI scheme attracting a broader range of semiconductor design start-ups (not just ones ready for volume production) and help them overcome initial hurdles in developing design ideas. A recalibrated policy focused on chip design steered by a capable institution can tolerate a certain failure rate and treat beneficiary start-ups as exploratory risk-taking vehicles to establish India's foothold in this high-tech sector.

Satya S. Sahu is a researcher with the Takshashila Institution's High-Tech Geopolitics Programme, Bengaluru; Pranay Kotasthane is a researcher with the Takshashila Institution's High-Tech Geopolitics Programme, Bengaluru

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NASA'S LITTLE HELICOPTER ON MARS HAS LOGGED ITS LAST FLIGHT

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January 26, 2024 04:49 am | Updated 04:49 am IST - CAPE CANAVERAL

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In this image made available by NASA, the Mars Ingenuity helicopter hovers above the surface of the planet during its second flight on April 22, 2021. On Thursday, Jan. 25, 2024, NASA announced that the 4-pound chopper can no longer fly because of rotor blade damage, and its mission is officially over. | Photo Credit: AP

NASA's little Mars helicopter has flown its last flight.

The space agency announced Thursday that the 4-pound (1.8-kilogram) [chopper named Ingenuity](#) can no longer fly because of rotor blade damage. While it remains upright and in contact with flight controllers, its \$85 million mission is officially over, officials said.

Originally intended as a short-term tech demo, Ingenuity logged 72 flights over three years at Mars. It accumulated more than two hours of flight time, traveling 11 miles (18 kilometres). That's more than 14 times farther than planned, according to NASA. It soared as high as 79 feet (24 metres) and hit speeds of up to 22.4 mph (36 kph).

"While we knew this day was inevitable, it doesn't make it any easier" to announce the end of the mission, said NASA's Lori Glaze. "It's almost an understatement to say that it has surpassed expectations."

Also Read | [NASA's Mars helicopter's third flight goes farther, faster than before](#)

Ingenuity hitched a ride on NASA's Perseverance rover, landing on Mars in 2021. It ended up serving as a scout for the rover and proved powered flight was possible in the thin Martian atmosphere.

Images beamed back this week from its last flight showed that one or more of its rotor blades suffered damage while landing and may have hit the surface. The blades are no longer usable, according to NASA.

The helicopter ascended to 40 feet (12 metres) on its final flight last week, hovering for a few seconds before descending. It mysteriously lost contact with the nearby rover — its communication relay — while still 3 feet (1 metre) off the ground. Once communication was restored, the damage was confirmed. The reason for the loss of communication is under

investigation.

Ingenuity's success prompted NASA in 2022 to add two mini helicopters to a future Mars mission.

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ISRO SUCCESSFULLY DEPLOYS MAGNETOMETER BOOM ON ADITYA-L1 IN HALO ORBIT

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

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January 26, 2024 12:25 am | Updated 12:49 am IST - Bengaluru

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The 6-metre long magnetometer boom on the Aditya-L1 satellite. | Photo Credit: X@isro

The Indian Space Research Organisation (ISRO) on Thursday, January 25, said that the 6-metre long magnetometer boom on the Aditya-L1 satellite has been successfully deployed.

The space agency said that the magnetometer boom was deployed in the Halo orbit at the Lagrange point L-1, on January 11, 2024. The boom had been in stowed condition for 132 days since the Aditya-L1 launch.

ISRO said that the boom carries two state-of-the-art, high-accuracy fluxgate magnetometer sensors that measure the low intensity interplanetary magnetic field in space.

“The sensors are deployed at distances of three and six metres from the spacecraft body. Mounting them at these distances minimises the impact of the spacecraft-generated magnetic field on measurements, and using two of them assists precise estimation of this influence. The dual sensor system facilitates cancelling out the spacecraft’s magnetic influence,” ISRO said.

The boom segments are constructed from carbon fibre reinforced polymer and serve as interfaces for the sensor mounting and mechanism elements.

The articulated boom mechanism comprises five segments interconnected through spring-driven hinge mechanisms, allowing for folding and deploying actions.

“The deployment occurs in an accordion fashion, controlled by a novel patented Kevlar closed control loop mechanism, with hinges locking the segments into the deployed configuration,” ISRO said.

It added that during the stowed condition, the boom is securely held in position by two hold-downs, transferring launch loads to the spacecraft body.

A thermal cutter-based release system is employed to execute the boom deployment on command.

“Data received through the telemetry switches confirm the hold-down release, first motion, and

locking of all hinges. The observed in-orbit deployment time was approximately 9 s, well within the predicted range of 8 to 12 s. All telemetry indications for hinge locking and hold-down release were within nominal parameters,” it added.

India’s maiden solar mission Aditya-L1 reached the L1 point on January 6, 127 days after it was launched on September 2, 2023. The point is located roughly 1.5 million km from earth and enables the spacecraft to view the sun continuously

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A NEW ALLOY DEVELOPED CAN ACT AS ALTERNATIVE MAGNETIC REFRIGERANT FOR MINIMIZING GREENHOUSE GAS EMISSIONS

Relevant for: Science & Technology | Topic: Indigenization of technology and developing new technology

Researchers have found a new alloy that can act as an effective magnetic refrigerant that can be an alternative cooling agent for minimizing greenhouse gas emissions and meet the global demand for higher energy efficiency for tackling global warming.

Magnetic refrigeration offers an energy-efficient and environment-friendly cooling technology as an alternative to the vapor-cycle refrigeration technology in use today. Hence efforts are on to fabricate magnetic refrigerators for household, industrial, and technological applications.

Magnetic cooling effect (MCE) is defined as the reversible temperature change of a magnetic material when it is subjected to an external applied magnetic field. In the magnetic refrigeration cycle, a magnetic field is applied on the magnetic material under an adiabatic process (no exchange of heat with the surrounding). Initially randomly oriented magnetic moments get aligned along the external magnetic field, resulting in the heating of the magnetic material. This heat is transferred from the material to the ambience. When the magnetic field is removed during adiabatic demagnetization, the magnetic moments of the material become randomized, resulting in a decrease in temperature below the ambient temperature. This process causes the material to absorb heat from the surrounding heat-transfer medium.

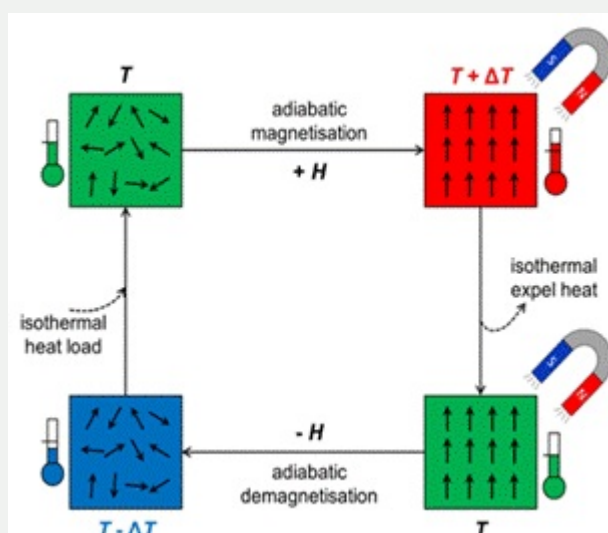


Fig 1. Schematic representation of magnetic refrigeration cycle from the internet

Current research is focused on developing new magnetic materials such as refrigerants. Three critical criteria need to be fulfilled. First, the material must be capable of operating for millions of cycles without any fatigue and failure, the material must have high thermal conductivity and the material should respond to external magnetic field of about 2 T (Tesla) which can be generated by permanent magnets.

Since most of the materials developed so far show giant magneto caloric effect (GMCE) only at fields as high as 5 T, there is an urgent need to look for materials in which GMCE is achieved in lower fields.

A team S.N. Bose National Centre for Basic Sciences, an autonomous institute of the department of science and Technology (DST) experimented with a certain type of alloys called all-transition metal based Heusler alloys ([magnetic intermetallics](#) with [face-centered cubic](#) crystal structure) in their search for material exhibiting giant reversible MCE.

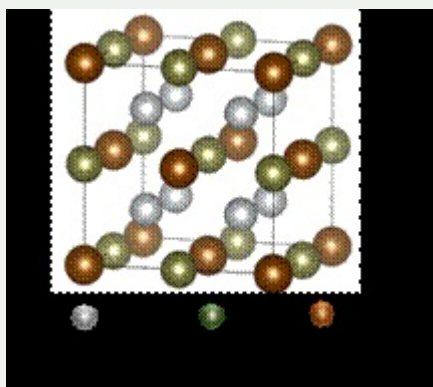


Fig 2. Four FCC lattices of full-Heusler Ni(Co)-Mn-Ti Heusler alloy

The team at S.N. Bose Centre has chosen Ni (Co)-Mn-Ti Heusler system because such systems often exhibit multifunctional properties with ultrahigh mechanical stability because of their intrinsic *d-d* hybridization.

In their study published in the journal Physical Review Materials they have found giant reversible MCE and magneto resistance (MR) in bulk $\text{Ni}_{35}\text{Co}_{15}\text{Mn}_{34.5x}\text{Cu}_x\text{Ti}_{15.5}$ ($x = 1, 2, \text{ and } 3$) under an applied magnetic field of 5 T and 7 T. Scientists have shown that Cu doping in the Mn site pulls the magnetic transition towards structural transitions and therefore the distance between them decreases. This is because Cu strengthens the metallic character of the Ni–Ti bond and at the same time weakens the magnetic Mn–Mn exchange interaction.

Polycrystalline samples of $\text{Ni}_{35}\text{Co}_{15}\text{Mn}_{34.5x}\text{Cu}_x\text{Ti}_{15.5}$ ($x = 1, 2, \text{ and } 3$) were prepared by arc melting technique. To ensure compositional homogenization, the samples were re-melted five to six times on each side. The melted ingots were wrapped with tantalum foil and sealed in an evacuated quartz tube. The samples were annealed at 1323 K for four days and quenched in ice water. The actual compositions of the samples were verified by energy dispersive x-ray.

Authors claimed from the temperature and field-dependent magnetization measurements that this investigated alloy yields giant reversible MCE parameters.

Change of fundamental ordering of spins and consequently the crystal and magnetic structure resulted in a significant change in the electrical resistance.

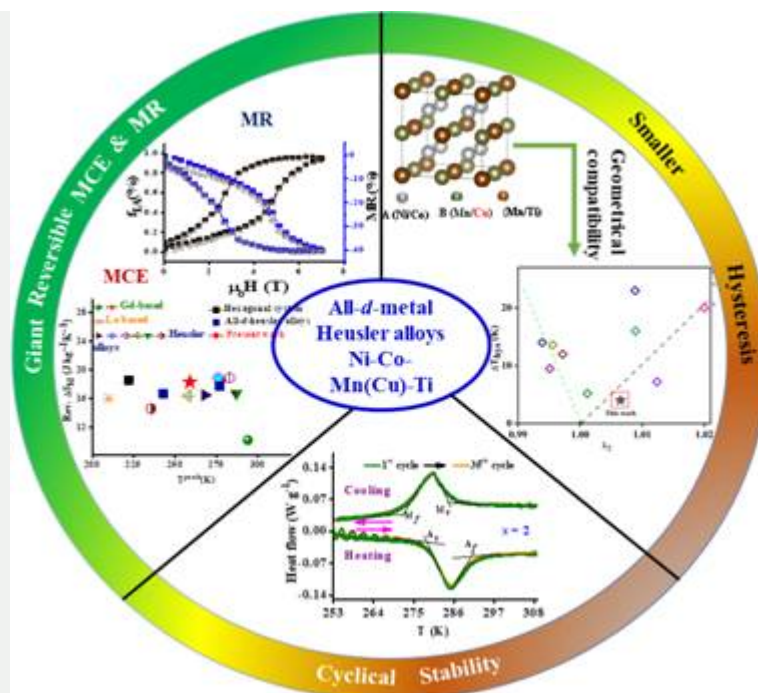


Fig 3: A statistical graphic of the overall results of the present work. The left section shows the maximum entropy changes for $H = 5\text{ T}$ versus peak temperature for different families of magnetocaloric materials.

The researchers claim that the obtained magnitude of reversible MCE and MR is the highest reported value so far in the all- d -metal Heusler family. The concurrent observation of refrigerant capacity and MR is also very rare in Heusler alloys. The search for the right kind of magnetic material has yielded positive results at the S.N. Bose Centre Lab. The synergistic combinations of giant MCE and MR by proper tailoring of Cu-doped Heusler alloys may lead to a diverse range of solid state-based technological applications.

Publication link: [10.1103/PhysRevMaterials.7.084406](https://doi.org/10.1103/PhysRevMaterials.7.084406)

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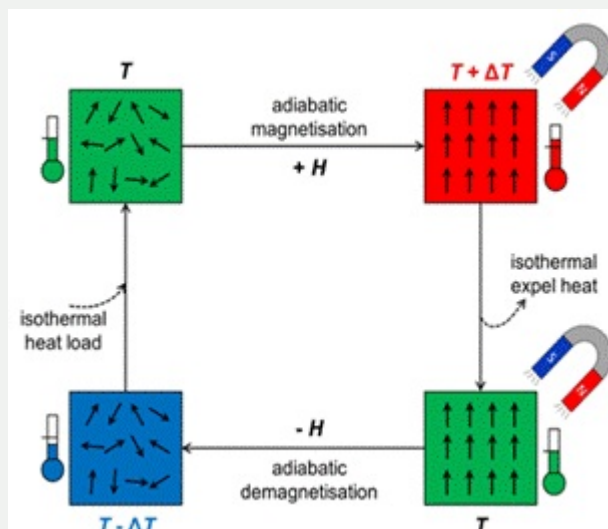


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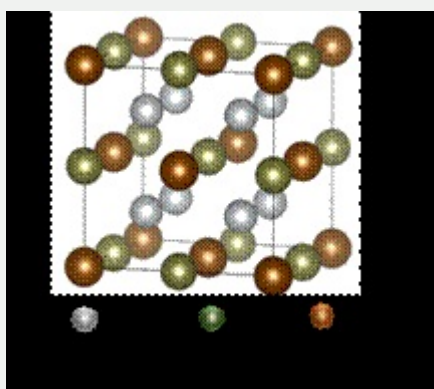


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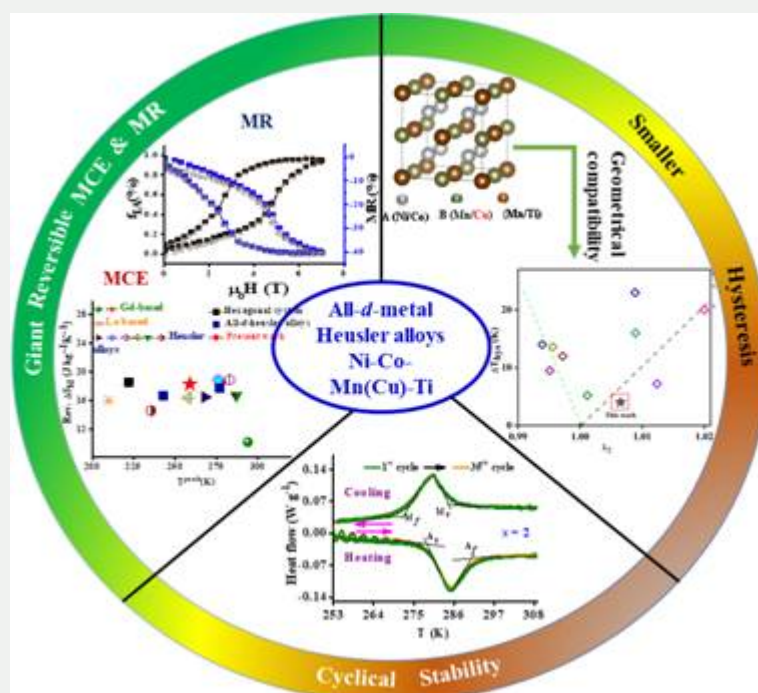


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MINIMAL RADIOACTIVE DISCHARGES FROM INDIAN NUCLEAR PLANTS: STUDY

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

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January 27, 2024 10:49 pm | Updated January 28, 2024 12:00 am IST

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A cooling tower at the Rajasthan Atomic Power Station, RAPS-5 in Rawatbhatta, Rajasthan. File | Photo Credit: The Hindu

Based on an analysis of radiological data of 20 years (2000-2020) from six nuclear power plants based in India, researchers at the Bhabha Atomic Research Centre (BARC), Mumbai have found that the radioactive discharges from the nuclear plants and the resultant potential environmental impact have been “minimal”. “The findings hold potential significance for reinforcing India’s commitment to advancing its nuclear power programme,” the authors write. “The minimal public doses underscore the safe operation of Indian nuclear power plants. The study’s findings have the potential to dispel unfounded beliefs, serving as a catalyst to reinforce India’s commitment to advancing its nuclear power programme, thus encouraging policymakers and the public to reconsider their perspectives.”

The period of study for the Kudankulam Nuclear Power Station is from 2013 to 2020. The other six power plants studied are: Tarapur Atomic Power Station, Madras Atomic Power Station, Kaiga Generating Station, Rajasthan Atomic Power Station, Narora Atomic Power Station, and Kakrapar Atomic Power Station. The results were published recently in the journal Science of the Total Environment.

While samples were collected and measured for a maximum radius of 30 km of each nuclear plant, the study found that the concentrations of fission products beyond 5 km radius was below the minimum detectable activity of the instruments used, implying that the monitored values were “insignificant”. The study has therefore focussed only on the concentrations of fission products and neutron-activated nuclides values within 5 km of each nuclear plant.

The gaseous waste that is released to the atmosphere through stacks consists of fission product noble gases, Argon 41, radioiodine, particulate radionuclides —cobalt-60, strontium-90, caesium-137 — and tritium. The liquid discharge consists of fission product radionuclides — radioiodine, tritium, strontium -90, caesium-137 — and activation products like cobalt-60. The radioactive discharges are carried out through dilution and dispersion and by “adhering to strict radiological and environmental regulatory regimes”.

As per the study, average gross alpha activity in air particulates at all the seven nuclear plants

was less than 0.1 megabecquerel (mBq) per cubic metre. “Though these gross values in air particulates appeared to be nearly the same across all the nuclear power plants, the Narora atomic power station (NAPS) exhibited higher maximum values than the other nuclear plants. This was attributed to the higher atmospheric dust load at NAPS compared to the other sites,” the authors write.

In the case of specific marker, the average radionuclides (iodine-131, caesium-137, and strontium-90) in air particulates across all the seven sites and the average iodine-131 activity concentration was below 1 mBq per cubic metre, while in the case of caesium-137 and strontium-90, the average concentrations were three orders lower and below 10 microbecquerel per cubic metre, they write.

In the case of rivers and lakes, the concentration of caesium-137 and strontium-90 were below 5 mBq per litre, while the concentration was less than 50 megabecquerel per litre in sea water near the nuclear plants.

In the case of sediments, caesium-137 concentration was maximum in the case of the Rajasthan Atomic Power Station, while strontium-90 concentration in the sediments recorded a maximum in the Narora atomic power station sediments. “These values are within the statistical variation of values observed in natural sediments, and do not show any trend of deposition or accumulation of activity in the environment,” they note.

The higher levels of caesium-137 seen at the Rajasthan Atomic Power Station is “likely due to the accumulation of caesium-137 discharged to the water bodies through scavenging and sedimentation process and because of the high distribution coefficient of the sediment at this site,” they write.

The authors stress that tritium was found “detectable above the minimum detectable activity in all the sites except in the Kudankulam Nuclear Power Station”. In the case of the Kudankulam power plant, tritium was “not detected in any single time during the period of study”, while its concentration was “relatively higher” at the Rajasthan Atomic Power Station.

Though the total doses have been lower than the regulatory limits, the total dose at the Rajasthan atomic power station, Madras atomic station and Tarapur atomic power station have been relatively higher. This is because at both the Rajasthan and Madras power stations, the “air-cooled reactor assemblies result in activation of natural argon to radioactive argon-41” before being released into the environment. The nuclear power plants constructed after the Rajasthan and Madras stations use carbon-dioxide instead of air in the annulus space between the calandria tube and pressure tube. This results in reduced production and release of argon-41 by other power plants.

Even though the total doses of Rajasthan, Madras and Tarapur power plants are below the regulatory limits and thus deemed to be safe to the public, efforts are being taken at all three sites to limit the doses further so as to keep the doses as low as reasonably achievable (ALARA), they note.

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