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ISRO's New Year launch: Special space observatory, X-ray telescope

#XpoSat #XrayPolarimetry #ISRO #IXPE #NASA #ScienceandTechnology #GS3

The Indian Space Research Organisation (ISRO) began the new year with the launch of its first X-ray Polarimeter Satellite (XpoSat), a space-based observatory to study X-ray polarisation and its cosmic sources — celestial bodies including black holes, neutron stars and magnetars.

The PSLV-C58 rocket, with primary payload XPoSat and 10 other satellites to be deployed in low-earth orbits, lift off from the Satish Dhawan Space Centre in Sriharikota at 9.10 am on Monday.

XpoSat is only the world's second such mission. In 2021, NASA had launched Imaging X-ray Polarimetry Explorer (IXPE) to operate and perform X-ray polarisation measurements within the soft X-ray band, whereas XPoSat will operate within the medium X-ray band.

It will carry two payloads — POLIX (Polarimeter Instrument in X-rays) and XSPECT (X-ray Spectroscopy and Timing). According to ISRO, POLIX is expected to observe about 40 bright astronomical sources of different categories; XSPECT will study the electromagnetic spectrum generated by different matter.

X-ray polarisation serves as a crucial diagnostic tool for examining the radiation mechanism and geometry of celestial sources. The insights derived from X-ray polarisation measurements on celestial objects like black holes, neutron stars and active galactic nuclei, hold the potential to significantly improve the understanding of their physics.

Built entirely by two Bengaluru-based institutes — ISRO's UR Rao Satellite Centre and Raman Research Institute — XPoSat was conceptualised in 2008 and the formal agreement with the space agency was inked in 2015.

XPoSat will become the country's third space-based observatory after the recently launched solar mission Aditya-L1, and AstroSat launched in 2015.

Across the world, there have been only a handful of experiments on X-ray polarisation measurements. Some of these have been balloon-based and short-duration experiments by NASA and collaborators. Indian astronomers, using AstroSat, have undertaken timing and broadband spectroscopy of X-ray sources but no polarisation studies were performed.

XPoSat is, therefore, expected to be a gamechanger in the field, as there have been only timing, spectroscopy and imaging-based studies done in this X-ray frequency band, globally.

This is primarily due to the difficulty in developing sensitive instrumentation.

Centre appoints Arvind Panagariya as Chairman of 16th Finance Commission

[#16thFinanceCommission](#) [#FinanceCommission](#) [#TaxDevolution](#) [#Taxation](#) [#Economy](#) [#GS3](#)

The Central government on Sunday appointed **former NITI Aayog Vice Chairman Arvind Panagariya as the Chairman of the 16th Finance Commission**. As per a notification issued by the Ministry of Finance's Department of Economic Affairs, **Indian Administrative Service (IAS) officer Ritvik Ranjanam Pandey will be the secretary to the Commission**.

According to the notification, "The **Commission shall make recommendations** as to the following matters, namely: —

- (i) The distribution between the Union and the States of the net proceeds of taxes which are to be, or may be, divided between them under Chapter I, Part XII of the Constitution and the allocation between the States of the respective shares of such proceeds;
- (ii) The principles which should govern the grants-in-aid of the revenues of the States out of the Consolidated Fund of India and the sums to be paid to the States by way of grants-in-aid of their revenues under article 275 of the Constitution for the purposes other than those specified in the provisos to clause (1) of that article; and
- (iii) The measures needed to augment the Consolidated Fund of a State to supplement the resources of the Panchayats and Municipalities in the State on the basis of the recommendations made by the Finance Commission of the State."

"The Commission may review the present arrangements on financing Disaster Management initiatives, with reference to the funds constituted under the Disaster Management Act, 2005 (53 of 2005), and make appropriate recommendations thereon," the notification said.

"The **Commission shall make its report available by 31st day of October, 2025 covering a period of five years commencing on the 1st day of April, 2026**," it said.

The **Finance Commission is constituted under article 280** of the Constitution of India.

He was first vice-chairman of NITI Aayog from January 2015 to August 2017 and served as India's G20 Sherpa in 2017. In April 2023, he was appointed chancellor of Nalanda University.

Pandey, a 1998-batch Karnataka Cadre IAS officer, is currently posted as Officer on Special Duty (O.S.D), an additional secretary equivalent post, in the Department of Economic Affairs.

In 2023, Indian science went for the Moon and reached for the Sun. What's planned for 2024?

[#ScienceAchievementsIn2023](#) [#Chandrayaan3](#) [#AdityaL1](#) [#NationalResearchFoundation](#) [#ArtemisAccord](#) [#NationalQuantumMission](#) [#ResearchStations](#) [#LIGO](#) [#ScienceandTechnology](#) [#GS3](#)

While the Moon landing was quite clearly the crowning glory for Indian science in 2023, the year also marked a definite shift in gears for India's space programme. From an agency with advanced capabilities in launching and placing satellites in orbits, the Indian Space Research Organisation (ISRO) took important steps towards becoming a full-fledged planetary exploration body.

This was one of the most productive years for ISRO, which carried out seven successful missions, including the two high-profile ones — Chandrayaan-3 and Aditya-L1, India's first mission to the Sun. The year ended the relatively lean streak for the space agency in the aftermath of the Covid

pandemic, which seemed to have badly disrupted its schedule, affecting even the human spaceflight mission, Gaganyaan, originally planned for 2022. With several preparatory tests still remaining, **Gaganyaan is now scheduled for 2025.**

In the meanwhile, ISRO unveiled an impressive list of milestones it aims to achieve in the next few years — **sending an astronaut to the International Space Station in a joint effort with NASA in 2024; Chandrayaan-4, a sample return mission from the Moon, in the next four years; space station Bhartiya Antariksh Station by 2028; and landing a human being on the Moon by 2040.**

This is in addition to routine launches, astronomy missions, and exploratory missions to Sun, Mars and Venus.

Chandrayaan-3

Several of these plans were firmed up only after the successful moon landing of Chandrayaan-3 in August. The fact that the **United States and the then Soviet Union had made Moon landings a fairly routine event in the 1960s and 1970s does in no way diminish the enormity of India's feat. Five decades later, there are still only two more countries to have gone to the Moon — China and India.**

Chandrayaan-3 was sweeter because India's first attempt, Chandrayaan-2 in 2019, had met with heartbreak in the last few seconds of its descent on the Moon's surface. This time, ISRO managed a perfect landing.

Once on the Moon, **Chandrayaan-3 performed previously unannounced manoeuvres that demonstrated ISRO's capabilities, and intention, to undertake more advanced missions. The biggest surprise was the 'hop' experiment.** Towards the end of the lunar day, the entire Chandrayaan-3 lander, along with the instruments it contained, made a jump on the Moon's surface, lifting itself about 40 cm above the ground and landing 30-40 cm away.

This demonstrated ISRO's capability to get the lander to lift off the Moon's surface — a key test for sample return missions or manned missions, when the spacecraft has to return to Earth. Not unexpectedly, ISRO, a few weeks later, said Chandrayaan-4 would indeed be a sample return mission.

New partnerships

The growing capabilities of ISRO also resulted in more international partnerships. **During Prime Minister Narendra Modi's visit to the United States in June this year, India joined the US-led Artemis Accords for planetary exploration.** The Artemis Accords are a set of principles that countries agree to adhere to in their quest for peaceful and cooperative exploration of the Moon and other planets. India's decision to join the Artemis Accords brings the space programmes of the two countries closer than ever.

Another demonstration of the **new close partnership was the agreement between ISRO and NASA to send a joint mission to the International Space Station, the permanent laboratory in space about 400 km above the earth's surface, in 2024.** This would mean that India's astronauts would get into space much earlier than the Gaganyaan mission of 2025.

Later in the year, **India and the US also set up a working group for commercial space collaboration, which is expected to boost the private space industry in the country. The two countries announced their intention to work together on planetary defence too.**

National Research Foundation

While ISRO was breaking new grounds in space exploration, the government made an important intervention to expand the scale and quality of scientific research in the country. **Delivering on a**

promise it made five years ago, the government approved the National Research Foundation (NRF), to fund, promote and mentor research activities.

Modelled on the National Science Foundation in the United States, the NRF would ensure research funding of Rs 50,000 crore over the next five years. However, the biggest promise of NRF is in its mandate to develop research capacities in universities and colleges.

The NRF would promote research not just in the natural sciences and engineering, but also in social sciences, arts and humanities, with one of the primary aims being finding solutions to the big problems facing Indian society.

New initiatives

The year saw India taking important decisions towards developing indigenous capabilities in frontier areas of scientific research. **In April, it launched a Rs 6,000-crore National Quantum Mission, aimed at building a 1,000-qubit quantum computer over the next eight years.** Quantum computers are not just superfast, they utilise the quantum mechanical properties of matter at a tiny scale, allowing them to perform tasks that would be impossible, or impractical, for conventional computers.

The launch of the National Quantum Mission allows India to join a global technology development race when it is still in its nascent stages. India has often been a late entrant in such matters, like in the development of supercomputers, and then has a lot of catching up to do. It also misses out on the spin-off benefits of technology development.

Another similar decision was the approval of the LIGO-India project to build a gravitational wave observatory in Maharashtra. The project had received an in-principle approval seven years earlier, but it was only in April that the final nod came. **LIGO-India would be the third arm of two similar observatories in the United States which made the first discovery of gravitational waves in 2015, a feat that won the Nobel Prize in Physics two years later.** Gravitational wave research is another field where there are very few players and facilities right now, and India has the opportunity to take the lead.

Towards the end of the year, **India announced its decision to set up a new research station in Antarctica, to replace the ageing Maitri station. The new station, Maitri-II, located just a few kilometers away from the existing one, which has been operational since 1989. India has another operational station in Antarctica, called Bharati.** These stations are centres of India's growing research footprint in Antarctica, which offers pristine environments for carrying out studies in a variety of scientific fields.

The **Maitri-II announcement came close on the heels of the decision to send the first winter expedition to the Arctic region.** Like in Antarctica, India has a science base in the Arctic as well, but it was not operational in winter. From this year, the Arctic base would be manned throughout the year.

Meanwhile, the **government instituted new national awards for scientists, called Rashtriya Vigyan Puraskar. The new awards followed last year's decision to scrap all awards, including the Shanti Swarup Bhatnagar Prizes, India's top science prize.** The Bhatnagar Prizes have been restored in the new system of awards. The Rashtriya Vigyan Puraskar would have three other awards — one for lifetime achievement, another for scientists of any age (Bhatnagar is meant only for scientists below 45 years), and the third to recognise team or collaborative effort.

In the new year

There are a series of high-profile launches scheduled in 2024, starting with the New Year's day itself. The **XPoSat, or the X-Ray Polarimeter Satellite, slated for launch on January 1, is the world's**

second-of-its-kind mission, meant for studying the universe using X-ray polarimetry measurements. NASA had sent a similar satellite, Imaging X-ray Polarimetry Explorer, or IXPE, in 2021.

This would be India's second consecutive astronomy mission after Aditya-L1. These two satellites will observe the universe instead of the Earth, which most satellites do.

The much-awaited **NASA-ISRO Satellite Aperture Radar (NISAR) is scheduled for the first quarter of next year.** Later, a test flight of Gaganyaan, without the astronauts, is scheduled.

Elsewhere, the impacts of NRF would begin to be apparent. Despite having a large pool of science and engineering graduates, a fairly large network of laboratories and research institutions, and active involvement in premium scientific research, India lags behind several countries on a variety of research indicators.

India spends just 0.65% of its GDP on scientific research, far below the global average of 1.79% . Women comprise only 18% of total scientific researchers in India, while globally this number is 33%. The number of researchers per million population in India, 262, is significantly lower than even developing countries like Brazil (888), South Africa (484) or Mexico (349). The performance of the NRF would be judged on its ability to improve these indicators.

Places In News

#Bolgrod #Kharkiv #PlacesInNews

Russia pounds east Ukraine city in bid for revenge after 24 killed in Belgorod

ASSOCIATED PRESS
KYIV, DECEMBER 31

RUSSIA LAUNCHED a fresh drone assault on Ukraine on Saturday night, after promising that strikes on the Russian border city of Belgorod earlier in the day "would not go unpunished".

The Ukrainian Air Force said Sunday that it had shot down 21 of 49 drones launched by Russian forces overnight.

Twenty-eight people were wounded in an attack on the eastern city of Kharkiv, regional Gov. Oleh Syniehubov said Sunday. A central hotel, apartment buildings, kindergarten, shops and administrative buildings sustained damage, according to the regional prosecutor's office.

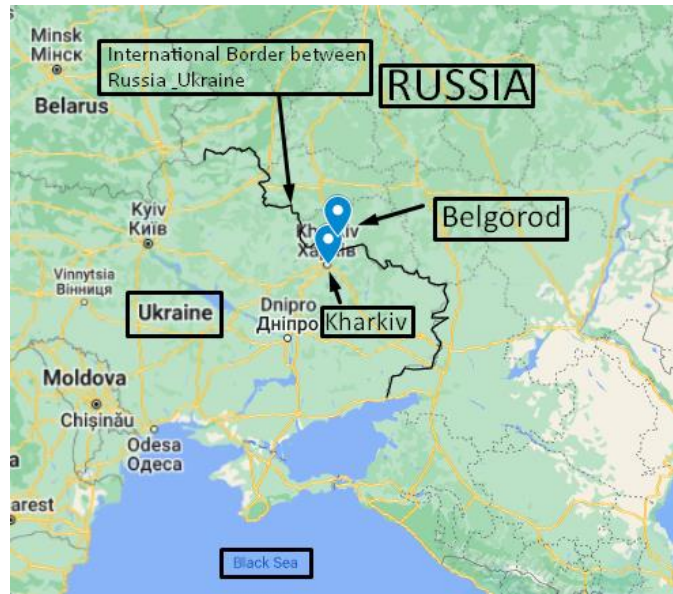
In the Kyiv region that surrounds the capital, a Russian drone attack caused a fire to break out at a critical infrastructure facility, officials said. The Russian attacks came after

shelling in the center of the Russian border city of Belgorod Saturday killed 24 people, including three children.

A further 108 people were wounded in the strike, regional governor Vyacheslav Gladkov said Sunday, making it one of the deadliest attacks on Russian soil since the start of Moscow's invasion of Ukraine 22 months ago.

Russian authorities accused Kyiv of carrying out the attack, which took place the day after an 18-hour Russian aerial bombardment across Ukraine killed at least 41 civilians. Russia's Defense Ministry said it identified the ammunition used in the strike as Czech-made Vampire rockets and Olkha missiles. "This crime will not go unpunished," the ministry said in a statement on social media.

In an emergency meeting at the UN Security Council demanded by Russia Saturday night, envoy Vasily Nebenzya accused Kyiv of a "terrorist attack."



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