

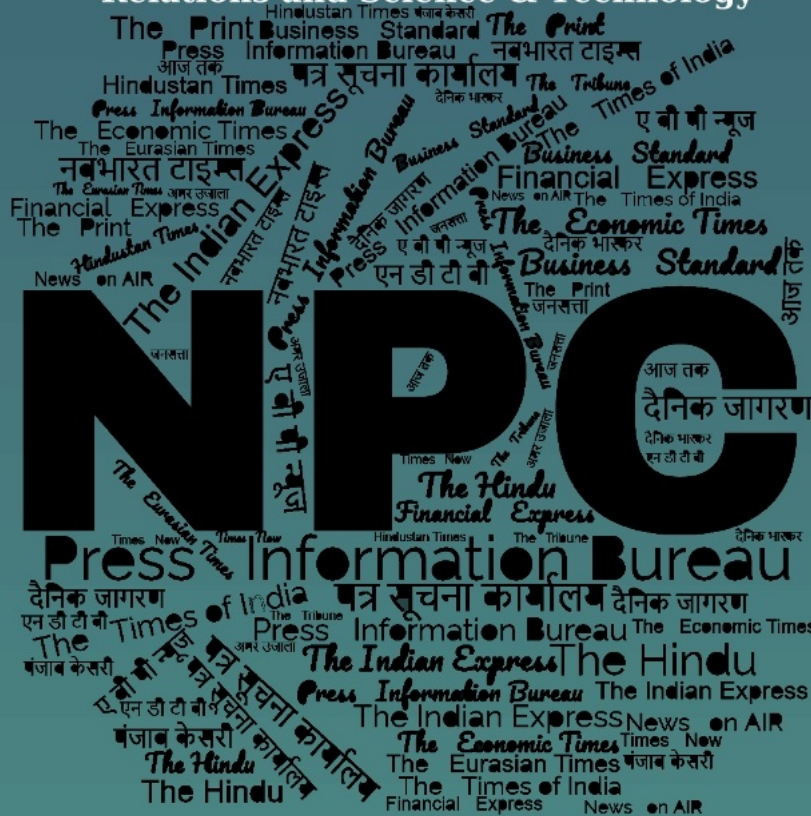
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समाचार पत्रों से चयनित अंश Newspapers Clippings

डीआरडीओ समुदाय को डीआरडीओ प्रौद्योगिकियों, रक्षा प्रौद्योगिकियों, रक्षा नीतियों, अंतर्राष्ट्रीय संबंधों और विज्ञान एवं प्रौद्योगिकी की नूतन जानकारी से अवगत कराने हेतु दैनिक सेवा

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जवानों को अब मिलेगा 'अभेद्य' रक्षा कवच, स्टील बुलेट भी इसके सामने फेल

'अभेद्य' का मतलब है जिसे भेदा न जा सके. अब भारतीय सैनिकों को दुश्मन की गोली छू भी नहीं सकेगी. ये नई बुलेटप्रूफ जैकेट भारतीय सेना के लिए तैयार की गई है. खास बात ये है कि यह पूरी तरह से स्वदेशी है और इसे भारतीय सैनिकों की जरूरतों को ध्यान में रखकर बनाया गया है. इसका नाम ABHED (एडवांस्ड बैलिस्टिक फ़ॉर हाई एनर्जी डिफीट) है.

इस बुलेटप्रूफ जैकेट को DRDO और IIT दिल्ली ने मिलकर बनाया है. इसे लाइट वेट और सैनिकों के लिए उपयोगी बनाने पर जोर दिया गया है. भारतीय सैनिक इसे पहनकर किसी भी ऑपरेशन को आसानी से अंजाम दे सकते हैं.

ये जैकेट 8.2 से 9.5 किलोग्राम वजन के बीच होती है और अलग-अलग बैलिस्टिक जरूरतों के लिए अलग-अलग ऑप्शन देती है. ये स्टील की बुलेट को रोकने में सक्षम है और 360 डिग्री सुरक्षा प्रदान करती है. जैकेट को पॉलिमर और स्वदेशी बोरॉन कार्बाइड सिरेमिक सामानों से बनाया गया है, जिससे इसकी मजबूती और विश्वसनीयता सुनिश्चित होती है.



यह जैकेट सभी जरूरी टेस्टों पर खड़ा उतरने के बाद सेनाओं की ओर से चुनी गई है. इसे बनाने के लिए DRDO के DIA-COE ने तीन निजी कंपनियों के साथ करार किया है. जल्द ही यह हल्की बुलेटप्रूफ जैकेट भारतीय सैनिकों को दी जाएगी.

सैनिक अक्सर दुश्मन की लाइन ऑफ फायर में रहते हैं. ऐसे में ये जैकेट नजदीकी लड़ाई (क्लोज क्वार्टर बैटल) में उपयोगी है. आतंकियों के साथ मुठभेड़, पेट्रोलिंग और कैंट की सुरक्षा में तैनात सैनिकों के लिए ये रक्षक का काम करेगी.



पुरानी जैकेटें भारी होने के साथ-साथ साइड प्रोटेक्शन नहीं दे पाती थीं जिससे सुरक्षा में कमी होती थी. नई जैकेट न केवल हल्की है बल्कि गर्दन और साइड की सुरक्षा भी सुनिश्चित करती है. इसका बॉडी-फिट डिजाइन ऑपरेशन और मूवमेंट को आसान बनाता है जिससे ये ज्यादा इफेक्टिव और उपयोगकर्ता के लिए सुविधाजनक साबित होती है.

पहाड़ों पर पूरे बैटल लोड के साथ चढ़ने में भारी जैकेट मुश्किल करती थी. अभेद्य हल्की होने के कारण ऑपरेशन में आसानी और सुरक्षा दोनों सुनिश्चित करेगी.

अभेद्य भारतीय सैनिकों के लिए एक वरदान साबित होगी. ये न केवल सुरक्षा में सुधार करेगी बल्कि सैनिकों की जरूरतों को ध्यान में रखते हुए तैयार की गई एक बेहतरीन तकनीक का उदाहरण है.

<https://www.abplive.com/photo-gallery/news/india-army-bulletproof-jacket-drdo-iit-delhi-indian-army-abhedya-jacket-soldier-safety-2845931>

IIT and DRDO partner with industry to produce lightweight bullet-proof jackets

The Defence Research and Development Organisation (DRDO) and IIT Delhi, on Thursday, came together with industry partners at the DIA-GARIMA event to strengthen the defence capabilities through collaborative research and technology transfer.

The event, titled 'DRDO-Industry-Academia - Global Approach to Readiness of Indigenous Military Applications', marked a significant step toward self-reliance in defence technologies, with the signing of 10 tripartite agreements.



The agreements signed during the event are focused on technology transfer, material development, and production for critical defence gear. One of the key highlights in the agreements include transfer of technology for Advanced Bullet Resistant Jacket (ABHED).

The ABHED was developed a few months ago in collaboration with IIT Delhi researchers, led by Prof. Naresh Bhatnagar. These innovative jackets have been created at the DRDO Industry Academia Centre of Excellence (DIA-CoE) at IIT Delhi, utilizing polymers and indigenous boron carbide ceramic material.

The design of these jackets is based on the characterisation of various materials at high strain rates which is followed by appropriate modeling and simulation in collaboration with DRDO.

The armour plates for these jackets have successfully passed all necessary R&D trials, meeting the highest threat levels. Notably, these jackets are lighter than the maximum weight limits stipulated in the General Staff Qualitative Requirement of the Indian Army.

With minimum possible weights of 8.2 kg and 9.5 kg for different BIS Levels, these modular-design jackets offer 360 degree protection with front and rear armours. Based on a selection-criteria matrix, several Indian industries have been shortlisted for the transfer of this technology. The Centre is ready to transfer the technology to three industry partners.

360 degree protection

Armour plates for these jackets have successfully passed all necessary R&D trials, meeting the highest threat levels. Notably, these jackets are lighter than the Indian Army standards. With minimum possible weights of 8.2 kg and 9.5 kg for different BIS Levels, these modular-design jackets offer 360 degree protection with front and rear armours.

<https://www.newindianexpress.com/cities/delhi/2024/Dec/20/iit-and-drdo-partner-with-industry-to-produce-lightweight-bullet-proof-jackets>



Press Information Bureau
Government of India

Ministry of Defence

Thu, 19 Dec 2024

DRDO, IIT Delhi & the industry sign 10 tripartite agreements during an event organised by DRDO-Industry-Academia Centre of Excellence

Transfer of Technology of Light Weight Bullet Resistant Jacket ABHED done with three industry partners

Memoranda of Agreement inked for development of Indigenous Ballistic Material and limited series production of Extreme Cold Weather & Extreme Heat Protective Clothing

DRDO-Industry-Academia Centre of Excellence (DIA-CoE) organised an event titled '*DRDO-Industry-Academia - Global Approach to Readiness of Indigenous Military Applications*' (DIA-GARIMA) at IIT Delhi on December 19, 2024. During the event, 10 tripartite agreements were signed among DRDO, IIT Delhi and industry partners, in the presence of Secretary, Department of Defence R&D and Chairman DRDO Dr Samir V Kamat; Director, IIT Delhi Prof Rangan Banerjee and industry representatives. The details of the agreements are as follows:

- Transfer of Technology of Light Weight Bullet Resistant Jacket (ABHED- Advanced Ballistic High Energy Defeat) to:
 1. MIDHANI (Mishra Dhatu Nigam), Rohtak
 2. SMPP Pvt Ltd, Delhi
 3. AR Polymers (MKU)- Kanpur
- Memorandum of Agreement (MoA) for development of Indigenous Ballistic Material with Reliance Industries Ltd.
- MoA for limited series production of Extreme Cold Weather Clothing with:
 1. Aeronav Industrial Safety Appliance, Delhi
 2. Arnaf Industries Ltd
 3. Arrow Garments, Tirupur

- MoA for limited series production of Extreme Heat Protective Clothing with:

1. Arrow Garments, Tirupur
2. Aeronav Industrial Safety Appliance, Delhi
3. Katalyst TECHTEX Ltd, Delhi

To integrate academia and industry into defence R&D, DRDO promulgated the Long Term Directed Research Policy of Ministry of Defence. Under this policy, DIA-CoEs pursue focused directed research for developing futuristic defence technologies. Aligned with the 'Aatmanirbhar Bharat' initiative, these centres leverage the expertise of faculty and researchers of the institute in collaboration with DRDO laboratories and Indian industries to meet national security needs. DIA-CoEs are being facilitated by the Directorate of Futuristic Technology Management (DFTM) under the Technology Management cluster of DRDO.

Joint Advanced Technology Centre of DRDO, established in 2017 at IIT Delhi, was converted to DIA-CoE, envisaging association of Indian industry for translation of knowledge to high technology readiness. Over the past seven years, around 50 research projects have been initiated under five technology verticals, with a total funding of Rs 375 crore from DRDO. The focus has been on soldier-centric innovations, including high-performance lightweight body armour, advanced aerostat materials, smart soldier jackets, terahertz technology for spectroscopy, firefighter heat protection gear, and extreme cold-weather jackets.

Each project is enabled to ensure high technology readiness levels for DRDO's advanced systems, with potential civil applications as well. The DIA-CoE, IIT Delhi has engaged nearly 100 faculty members and 200 research scholars in its research areas to achieve self-reliance in defence technology improving the capability and capacity of defence R&D in the country. Standard Operating Procedures for Engaging Industry through academia was brought out by DFTM, DRDO to engage the industry actively through DIA-CoEs. This SOP has paved the path for activating the 'I' part of DIA-CoE.

Raksha Mantri Shri Rajnath Singh, during an exhibition on the sidelines of the inauguration of Indian National Academy of Engineering's annual convention showed keen interest in the products made by the joint collaborations under DIA-CoE. He interacted with the scientists, professors, researchers and industry partners, congratulating them for their collective achievements.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2086250>

Defence News

Defence Strategic: National/International



Press Information Bureau
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Ministry of Defence

Thu, 19 Dec 2024

Raksha Mantri exhorts scientists & engineers to specialise in high-end tech for strengthening India's position in cutting-edge innovation

Calls to stay connected with the country's heritage while forging ahead

“Need to establish better organic relationship among industry, R&D organisations and academia to achieve progress in disruptive tech”

India is passing through a defining moment; It will soon achieve a formidable technical edge in international arena: Shri Rajnath Singh

Raksha Mantri Shri Rajnath Singh has called upon the scientists and engineers to gain command over high-end technologies, such as Artificial Intelligence & Quantum Computing, in tune with the changing times, with the aim to further strengthen India's position in the field of advance, frontier & cutting-edge innovation. He was addressing the inaugural session of Indian National Academy of Engineering's Annual Convention at IIT Delhi on December 19, 2024.

Raksha Mantri emphasised that these niche technologies are going to impact almost every sector in a big way in the coming times. “Right now, we are in the initial phase. Our aim should be to first gain command over these technologies, so that in the future, they can be used for the welfare of the people to fulfil their immediate basic needs,” he added.

Shri Rajnath Singh pointed out that the world is continuously evolving, and the defence sector cannot remain untouched by this change. He stated that earlier, due to some reasons, India was left behind in terms of modern weapons and technology, but ever since the Government, under the leadership of Prime Minister Shri Narendra Modi, has come to power, the country has moved towards self-reliance in defence at an unprecedented pace.

“Modern warfare is changing rapidly, therefore there is a need to adopt high-end technology. Towards this, we have brought out schemes like Innovations for Defence Excellence (iDEX) and Technology Development Fund (TDF) to bring out the talent of the youth, through which their as well as the nation's dreams can come true,” said Raksha Mantri.



Shri Rajnath Singh asserted that India is passing through a defining moment as it is exporting even those weapons which it once imported. He credited this revolutionary transformation to the collective efforts of the public & private sectors, academia, and engineers & innovators, exuding confidence that the country will soon achieve a formidable technical edge in the global arena.

While Raksha Mantri lauded the role of IITs in the scientific development of the country in collaboration with DRDO, he called for establishing an even better organic relationship among the industry, research & development organisations and academia. “In developed countries, academic campuses play an important role in progressing frontier technologies. There is a need to explore ways on how to co-opt IIT Delhi and similar institutions of higher scientific learning & excellence with the government’s development campaign,” he added.

“India is the youngest country at present. Our youth have the passion and the ability to innovate. Our government stands with them at every step. We encourage their innovation and provide them funds as per their needs. Today, India has become a hub of innovation and start-ups, due to which we are continuously gaining technological prowess. We will always stand with our engineers and innovators. With our combined efforts, we will realise our dream of ‘Aatmanirbhar Bharat’,” said Shri Rajnath Singh.

Raksha Mantri commended Indian National Academy of Engineering (INAE) for playing a crucial role in making India self-reliant. By focusing on innovation, collaboration and modernisation, this institute has started a technological revolution in India, he said.

Shri Rajnath Singh also urged the engineers and innovators to never forget the country’s heritage as they make headway in new & disruptive technologies. He stated that there is no harm in adopting the western model as per the needs, but staying connected with the heritage would help in paving the way ahead. “Illuminate the path of your future with the light of your history. Build the tallest building of your future by making your past as a base,” he said.

On the occasion, Raksha Mantri also visited the exhibition put up by defence industries, wherein technologies and products developed by Defence-Industry-Academia co-operation were showcased. He also appreciated the poster session, presented by the Masters students and PhD Research Scholars of IIT Delhi.

Secretary, Department of Defence R&D and Chairman DRDO Dr Samir V Kamat; INAE President Prof Indranil Manna; Director, IIT Delhi Prof Rangan Banerjee; Chairman & MD, Larsen & Toubro Ltd Shri SN Subrahmanyam; Delegates from Department of Science and Technology, Anusandhan National Research Foundation; DRDO and industry representatives were present on the occasion.

The three-day convention is being attended by about 400 engineers and technologists, comprising of INAE Fellows from the academia, industry, R&D organisations and Strategic Sectors; INAE Young Associates; Faculty, Post Graduate Students and Research Scholars of IIT Delhi and other professional associated with the engineering domain. It provides a golden opportunity for networking amongst Fellows and Young Associates. Panel Discussions and Plenary Talk by eminent personalities are conducted on topics of interest for all delegates and participants.

INAE is an autonomous professional body partly supported by grant-in-aid from the Department of Science & Technology, Government of India. The Academy undertakes meaningful technical activities each year, which have enhanced its visibility in the national engineering domain. INAE is enriched in its functioning through the leadership provided by iconic personalities in engineering and technology as its Presidents including Dr APJ Abdul Kalam. It, presently, has 1,004 Indian Fellows and 107 Foreign Fellows on its rolls identified in 10 Engineering Sections covering the entire gamut of engineering disciplines.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2085947>



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Thu, 19 Dec 2024

INS Tushil Commenced Her Passage To India

INS Tushil, the latest multi-role stealth guided missile frigate of the Indian Navy, set sail from Kaliningrad, Russia for India on 17 Dec 24, marking the beginning of her maiden operational deployment.

The ship was built in Russia and commissioned on 09 Dec 24, in the presence of Hon'ble Raksha Mantri, Shri Rajnath Singh.

The ship will traverse the Baltic Sea, the North Sea, the Atlantic Ocean, and finally, the Indian Ocean, making port calls at several friendly foreign countries along the way.

The maiden deployment of INS Tushil would involve key charter of Indian Navy, namely, Diplomatic, military, and constabulary activities.

The ship will carry out joint patrolling and maritime partnership exercises with a number of navies en route, including piracy hotspots in the region.

During her port calls, the ship will undertake capability-building activities with host Navies and hold interactions with senior military and government leadership. The port calls will also serve to engage with the Indian diaspora spread across the region.

The port calls and exercises are aimed at consolidating India's maritime cooperation with littoral countries of the region and reinforcing Indian Navy's commitment to protecting and safeguarding the seafaring community.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2086133>



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Ministry of Defence

Thu, 19 Dec 2024

Plate Cutting Ceremony for the first of 14 FPV and first of six NGOPV being constructed by MDL for ICG held in Mumbai

Plate Cutting Ceremony for the first of the 14 Fast Patrol Vessels (FPV) and first of the six Next-Gen Offshore Patrol Vessels (NGOPV) being constructed by Mazagon Dock Shipbuilders Ltd. (MDL) for the Indian Coast Guard (ICG) took place in Mumbai on December 19, 2024. MDL was awarded a Rs 2,684 crore contract under the 'Buy (Indian-IDD)' category to build these vessels which will feature advanced technologies like drones for surveillance, AI for decision-making, an Integrated Bridge System for maneuverability, and an Integrated Machinery Control System for efficient operations.

These state-of-the-art vessels are being indigenously designed, developed & constructed and will be delivered over the next few years, reinforcing the Government's vision of 'Aatmanirbhar Bharat' & enhancing the nation's defence production capabilities. With the commissioning of these vessels, the ICG will be better equipped to meet the increasing demands of coastal security, secure India's maritime borders, conduct search & rescue operations, respond rapidly to any emerging security threats in the region and enforce maritime law across country's vast maritime domain.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2086046>



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Thu, 19 Dec 2024

CAC Commanders' Conference

Air Chief Marshal AP Singh, Chief of the Air Staff, Indian Air Force visited Headquarters Central Air Command (CAC) from 18 to 19 Dec 24 for the CAC Commanders' Conference 2024. He was

received by Air Marshal Ashutosh Dixit, Air Officer Commanding-in-Chief, Central Air Command. A ceremonial Guard of Honour was presented to the CAS on arrival.

During the conference, the CAS interacted with the Commanders of the CAC AoR and highlighted the importance of being conversant with one's role in enhancing the operational capability of the Indian Air Force. He apprised them about prevailing security scenario, significant role of the Indian Air Force and stressed on the need for maintaining a high state of readiness and alertness to take on emerging contingencies.

He emphasised the need for critical analysis to enhance operational preparedness, focus on maintenance practices and ensure robust physical and cyber security. He urged the Commanders to continue their efforts in ensuring a safe operational flying environment and stressed on the need to augment the combat capability of the IAF through innovation and self-reliance. The CAS, in his address, appreciated the role of CAC in conduct of IAF level exercises, HADR operations and aid to the civil administration and for keeping IAF core values of Mission, Integrity and Excellence uppermost.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2085983>

THE ECONOMIC TIMES

Thu, 19 Dec 2024

US imposes sanctions on 4 Pak entities for role in ballistic missile programme

The outgoing Biden administration in the US has slapped sanctions on four Pakistani entities, including state-owned flagship aerospace and defence agency National Development Complex (NDC), on charges of contributing to Pakistan's ballistic missile programme.

In light of the continuing proliferation threat of Pakistan's long-range missile development, the US is designating four entities for sanctions which targets proliferators of weapons of mass destruction and their means of delivery, the State Department said on Wednesday. The entities other than NDC are Akhtar & Sons Pvt Ltd, Affiliates International and Rockside Enterprise. All three are based in Karachi, while the NDC is in Islamabad.

The NDC has worked to acquire items in furtherance of Pakistan's long-range ballistic missile programme - including special vehicle chassis intended to be used as launch support equipment for ballistic missiles and missile-testing equipment.

The US assesses the NDC is responsible for Pakistan's development of ballistic missiles, including the SHAHEEN-series ballistic missiles, the State Department said.

Akhtar & Sons Pvt Ltd has worked for NDC to supply a range of equipment to Pakistan's ballistic missile programme. Affiliates International has facilitated procurement of missile-applicable items for NDC and others in support of that country's ballistic-missile programme, while Rockside Enterprise has supplied a range of equipment to the ballistic missile programme, the State Department said.

US imposes sanctions on 4 Pak entities for role in ballistic missile programme All these entities "having engaged, or attempted to engage, in activities or transactions that have materially contributed to, or pose a risk of materially contributing to, the proliferation of weapons of mass

destruction or their means of delivery (including missiles capable of delivering such weapons), including any efforts to manufacture, acquire, possess, develop, transport, transfer or use such items, by Pakistan," State Department spokesperson Matthew Miller said.

<https://economictimes.indiatimes.com/news/defence/us-imposes-sanctions-on-4-pak-entities-for-role-in-ballistic-missile-programme/articleshow/116480760.cms>

THE ECONOMIC TIMES

Thu, 19 Dec 2024

Indian Navy Chief fosters camaraderie between India-Indonesia during reception onboard INS Mysore

Chief of Naval Staff (CNS) Admiral Dinesh K Tripathi hosted a deck reception onboard Indian Navy's indigenous guided missile destroyer, INS Mysore in Jakarta during his four-day official visit to Indonesia.

The details of the event were shared on X by the Spokesperson of the Indian Navy."Adm Dinesh K Tripathi, #CNS, hosted a deck reception onboard #IndianNavy's indigenous guided missile destroyer #INSMysore at Jakarta, fostering cultural exchange, friendship & camaraderie between #India & #Indonesia."

The post added, "Adm Muhammad Ali, Chief of Staff, #IndonesianNavy, Senior Military Leadership of Indonesia, Ambassador of India in Indonesia, and members of the diplomatic community in #Indonesia attended the event. #BridgesofFriendship"

"Strengthening ties across the seas" Adm Dinesh K Tripathi, #CNS, hosted a deck reception onboard #IndianNavy's indigenous guided missile destroyer #INSMysore at Jakarta, fostering cultural exchange, friendship & camaraderie between #India & #Indonesia. Adm Muhammad Ali, Chief... <https://t.co/v0bAuq8T59> pic.twitter.com/IzoSYWygrN

- SpokespersonNavy (@indiannavy)

The Indian Embassy in Indonesia also shared the details of the Indian Navy Chief's visit.

It stated on X, "Very eventful & successful goodwill visit of INS Mysore to Jakarta. The 4-day visit saw several high level bilateral engagements between Indian and Indonesian Navy".

"It was an honour for the ship to receive and host Laksmana Muhammad Ali, KASAL during deck reception onboard, jointly hosted by Chief of the Indian Navy Admiral Dinesh Kumar Tripathi and Ambassador Sandeep Chakravorty, which was also graced by several senior officials of Indonesian Navy, Military and MoD", it said in another post.

"Professional discussions held onboard, deepening military and defence Industry collaboration & partnerships, is another major highlight of the ship visit, underscoring the robust & active bilateral cooperation between the maritime neighbours", the post concluded.

Earlier, Admiral Dinesh K Tripathi met General Agus Subiyanto, Commander of the Indonesian Armed Forces, to discuss strengthening bilateral defence ties, with a particular focus on enhancing naval cooperation.

According to the Indian Navy spokesperson, the discussions also aimed to strengthen information sharing, capacity building, and collaboration in the defence industry between India and Indonesia.

The visit, which took place from December 15 to December 18, was part of ongoing efforts to further consolidate bilateral defence relations between the two countries, in line with the deepening Comprehensive Strategic Partnership, with a focus on enhancing Naval Cooperation.

<https://economictimes.indiatimes.com/news/defence/indian-navy-chief-fosters-camaraderie-between-india-indonesia-during-reception-onboard-ins-mysore/articleshow/116461428.cms>

THE ECONOMIC TIMES

Thu, 19 Dec 2024

Pentagon exposes China, says it still has 1.2 lakh troops, Howitzers, missiles and even tanks near Indian border

China has maintained its substantial military presence along the Line of Actual Control (LAC) with India since the Galwan Valley clash in June 2020, according to the latest Pentagon report released on Wednesday. Despite some troop disengagements in certain areas, the People's Liberation Army (PLA) has not scaled back its positions or numbers.

"PLA has not drawn down its positions or troop numbers since the 2020 clash and has built infrastructure and support facilities to maintain multiple brigade deployments along the LAC," the report states.

The Pentagon's annual assessment indicates that China has kept approximately 120,000 troops stationed along the 3,488-km-long LAC, which stretches from Ladakh to Arunachal Pradesh. In addition to the soldiers, the PLA has stationed heavy weapon systems, including tanks, howitzers, surface-to-air missiles, and other advanced military equipment.

The report further highlights that over 20 combined arms brigades (CABs) remain in forward locations across the western, middle, and eastern sectors of the LAC.

Strategic Focus on the Western Theatre Command

The Pentagon report further elaborates that China's Western Theatre Command, which oversees the border with India, has been prioritising the security of its frontier with India.

"In recent years, differing perceptions between India and China regarding border demarcations have facilitated multiple clashes, force build-ups, and military infrastructure construction," the report noted. Despite some CABs having returned to base, the "overwhelming bulk remain there," the source added, indicating that China remains firmly entrenched in the region.

China's Nuclear Expansion and Modernisation

The Pentagon report underscores China's accelerating efforts to modernise its nuclear forces. As of mid-2024, China has over 600 operational nuclear warheads, with the number expected to surpass 1,000 by 2030. The report highlights China's diversification of its nuclear arsenal, with a range of weapons from low-yield precision strike missiles to multi-megaton intercontinental ballistic missiles (ICBMs).

“The PLA seeks a larger and more diverse nuclear force of systems ranging from low-yield precision strike missiles to ICBMs (intercontinental ballistic missiles) with multi-megaton yields to provide it multiple options on the escalation ladder,” the Pentagon report states.

In addition to its nuclear capabilities, China has been advancing its counter-space technologies, including direct ascent anti-satellite missiles, co-orbital satellites, electronic warfare, and directed energy systems like lasers, which allow it to contest or deny other nations' access to space. The report notes that China is modernising its military across all domains—land, air, maritime, nuclear, space, electronic warfare, and cyberspace.

Increasing Tensions with Taiwan

China's military assertiveness extends to Taiwan, with the Pentagon report emphasising the PLA's growing presence in the Taiwan Strait. The U.S. Defence Department has noted that Chinese naval forces have been more active in the region, conducting frequent military exercises and increasing crossings into Taiwan's air defence identification zone.

Taiwan remains a critical flashpoint, with Beijing continuing to assert its claim over the island and threatening forceful reunification. The Pentagon warned that Taiwan continues to be the primary source of tension between the U.S. and China.

“The island democracy has been the chief source of tension between Washington and Beijing for decades and is widely seen as the most likely trigger for a potentially catastrophic U.S.-China war,” the report added. The Biden administration has continued to bolster U.S. military presence in the Asia-Pacific region, aiming to counter Beijing's growing military assertiveness while promoting diplomatic engagement.

China-Russia Ties and Support for Moscow's War

The Pentagon report also addresses China's growing relationship with Russia. It notes that China has provided support to Russia's military efforts in Ukraine, including the sale of dual-use items—materials that can be used for both civilian and military purposes. This strengthening of Sino-Russian ties comes as both nations seek to challenge U.S. global influence.

"China continues to demonstrate an increasing willingness to use military coercion and inducements to achieve its aims, while emphasising a greater global role for itself," the Pentagon report states.

The military collaboration between China and Russia underscores their shared interests in countering U.S. influence and shaping a more multipolar global order.

Internal Corruption and Its Impact on Military Modernisation

China's military growth faces internal challenges, notably corruption within the People's Liberation Army (PLA). The Pentagon report highlights that the Central Military Commission, which oversees the PLA, has been rocked by corruption scandals. In June, China expelled former Defence Minister Li Shangfu and his predecessor Wei Fenghe from the ruling Communist Party.

"This wave of corruption touches every service in the PLA, and it may have shaken Beijing's confidence," the report noted. In addition, the suspension and investigation of senior officials, including Miao Hua, continue to raise concerns about the internal stability of China's military leadership.

Despite these challenges, China has made significant strides in modernising its military capabilities, with unmanned aerial systems now approaching U.S. standards. However, the

Pentagon's report underscores that China's military progress remains uneven, with certain areas of development lagging behind others.

The Pentagon's report highlights China's continued military expansion, with a particular focus on its growing nuclear capabilities, naval power, and increased presence around Taiwan. Despite internal corruption scandals, China's commitment to modernising its military and projecting power in the Indo-Pacific region remains unwavering. The increasing military collaboration between China and Russia, along with growing tensions with Taiwan, suggests that China will continue to shape the region's security dynamics in the coming years.

<https://economictimes.indiatimes.com/news/defence/pentagon-exposes-china-says-it-still-has-1-2-lakh-troops-howitzers-missiles-and-even-tanks-near-indian-border/articleshow/116465629.cms>

THE ECONOMIC TIMES

Thu, 19 Dec 2024

A day after Doval-Wang talks, China highlights broader consensus to improve relations

As National Security Advisor Ajit Doval left Beijing after his crucial talks with Chinese Foreign Minister Wang Yi to normalise ties, China on Thursday said that the readouts issued by both countries after the talks shared "very much similar gist and elements" highlighting broader consensus.

Special Representatives for the border question, Wang and Doval, held "substantive talks" and reached a six-point "consensus" on the China-India boundary question in a "positive and constructive attitude," Foreign Ministry spokesperson Lin Jian told a media briefing here while replying to a question on the outcome of talks. "The two sides' readouts share very much similar gist and elements," he said.

After the talks, China said a six-point consensus was reached between the two sides.

Lin said that it is important to channel the two countries' respective valuable resources into development and revitalisation, make sure that the boundary question is appropriately placed in bilateral relations, jointly maintain peace and tranquillity in border areas, and strive to bring China-India relations back to a healthy and steady track at an early date.

Doval left Beijing on Thursday. The Special Representatives dialogue was regarded as significant as it was the first structured engagement between the two countries after relations were frozen for over four years due to the military standoff in eastern Ladakh.

Constituted in 2003 to comprehensively address the vexed dispute of the India-China border spanning 3,488 km, Wednesday's meeting, which was held after a gap of five years, was the 23rd conference between the two countries.

Commenting on the talks, Long Xingchun, a professor from the School of International Relations at Sichuan International Studies University, said the resumption of the Special Representatives' meeting sends a signal that both sides are willing and confident to resolve border disputes through peaceful negotiations.

The meeting is beneficial for fostering mutual trust between the two countries and contributes to the maintenance of peace and tranquillity in the border regions, Long told Global Times. Qian Feng, director of the research department at the National Strategy Institute at Tsinghua University, said that after the Kazan meeting between PM Narendra Modi and President Xi Jinping, a Special Representatives' meeting was held soon after, indicating that both sides are actively working to resolve the border issue and taking actions to further restore mutual trust.

"This is a positive sign of facilitating the early return of China-India relations to a healthy development track," Qian told the daily. He noted that the Special Representatives' meeting is not only an important platform agreed upon by both sides to discuss solutions to the boundary issue but also a platform for the heads of diplomatic and security affairs from both sides to engage in direct communication.

"Therefore, this meeting is also expected to lay the foundation for further deepening of common interests between the two countries and continuing to advance cooperation in multiple areas," Qian said.

Wang Shida, a researcher at the Institute for South Asian Studies at the China Institutes of Contemporary International Relations, said the detente between China and India serves the interests of both nations.

"With each nation home to over 1.4 billion people, development should be the greatest common denominator between the two neighbours," Wang told the state-run China Daily.

He added that the resumption of talks is crucial for unlocking the potential for cooperation across a wide range of fields.

The six-point consensus, highlighted by Lin, included a positive evaluation of the Oct 21 resolution to end the over four-year-long military standoff in eastern Ladakh and reaffirming the need to continue implementing the agreement.

Other points were consensus about handling the boundary question appropriately in the context of the overall bilateral relationship without affecting the development of bilateral ties, continuing to take measures to maintain peace and tranquillity in the border areas for promotion of the healthy and stable development of bilateral relations.

The reaffirmation of their commitment to continuing to seek a fair, reasonable, and mutually acceptable package settlement to the boundary question in accordance with the political parameters and guiding principles agreed upon by the two countries' special representatives in 2005, and to taking active measures to advance this process.

The two sides assessed the border situation and agreed to further refine the management rules for the border areas, strengthen confidence-building measures, and achieve sustainable peace and tranquillity along the border.

They agreed to continue enhancing cross-border communication and cooperation, further strengthen the Special Representatives' meeting mechanism, and hold a new round of Special Representatives talks in India next year.

<https://economictimes.indiatimes.com/news/defence/a-day-after-doval-wang-talks-china-highlights-broader-consensus-to-improve-relations/articleshow/116479072.cms>

India-US defence relationship advancing in terrific, exciting ways: Pentagon

The defence relationship between India and the US is accelerating and advancing in terrific and exciting ways, the Pentagon has said amidst the transition from the Joe Biden administration to that of President-elect Donald Trump.

"The US-India defence relationship stands on its own. It is accelerating and advancing in terrific and exciting ways, both as it relates to defence industrial base cooperation as well as operational cooperation across the services," Ely Ratner, Assistant Secretary of Defence for Indo-Pacific Security Affairs, told reporters at a news conference here.

"It (the India-US defence ties) is a continuing growth area, even as the India-China relationship waxes and wanes," Ratner said in response to a question.

India has been accorded the status of the Major Defence Partnership by the United States. Biden administration officials have described the defence ties as one of the key pillars of this relationship.

In October, India concluded an agreement with the US for the procurement of 31 General Atomics MQ-9B (16 Sky Guardian and 15 Sea Guardian) remotely-piloted aircraft and their associated equipment, which will enhance the intelligence, surveillance and reconnaissance (ISR) capabilities of India's armed forces across all domains.

India and the US concluded the Security of Supply Arrangement (SOSA) this year, enhancing the mutual supply of defence goods and services.

During their meeting in September, Prime Minister Narendra Modi and President Biden committed to advancing ongoing discussions on aligning their respective defence procurement systems to further enable the reciprocal supply of defence goods and services.

<https://economictimes.indiatimes.com/news/defence/india-us-defence-relationship-advancing-in-terrific-exciting-ways-pentagon/articleshow/116488889.cms>

Pakistan's new ballistic missile programme an 'emerging threat' to US: White House official

A senior White House official on Thursday said that Pakistan's new ballistic missile programme, that could allow it to strike targets beyond South Asia, is an "emerging threat" to the United States, Reuters reported. US Deputy National Security Advisor Jon Finer's statement pointed out the deteriorated ties between Washington and Islamabad since the withdrawal of the US troops from Afghanistan in 2021.

Eyebrows are also being raised at whether Pakistan has shifted the focus of its nuclear weaponry and ballistic missile programmes which, for the longest of time, have been intended towards countering those of India. Pakistan has pursued "increasingly sophisticated missile technology, from long-range ballistic missile systems to equipment, that would enable the testing of significantly larger rocket motors", said Finer while speaking to the Carnegie Endowment for International Peace.

And if these trends continue, then Islamabad will have the capacity to strike targets "well beyond South Asia, including in the US", Finer added.

Naming Russia, North Korea, and China, the White House official said that the number of nuclear-powered states with missiles that can hit the US "is very small and they tend to be adversarial". Therefore, he said, it is difficult for Washington see Pakistan's action as anything but an "emerging threat to the United States".

Finer's remarks come a day after America announced a new round of sanctions in relation to Pakistan's ballistic missile development programme. In this, for the first time, the US also announced sanctions against the state-run defense agency that oversees the program. Pakistan had inked its nuclear weapons and ballistic missile programmes against India's aggression, intended at maintaining stability in the region.

Reuters cited two senior US administration officials, who spoke on anonymity conditions, saying that Washington's concerns with Pakistan's missile programmes have been there for a long time, and they have stemmed from the sizes of the rocket engines they have developed.

However, one of the official said, the threat to the United States is almost a decade away. The officials said that Finer's statements were intended to prompt Pakistani officials to address why they are developing such powerful rocket engines, something they have denied doing.

"They don't acknowledge our concerns. They tell us we are biased," said the second U.S. official, dismissing Pakistan's wrong implication of Washington's sanctions being intended "to handicap their ability to defend against India".

Meanwhile, Finer had noted how Washington and Islamabad had been "long-time partners" on development, counter-terrorism, and security. He said that he, along with several other senior US officials, couldn't get any response for the repeated concerns they raised about the missile programmes with top Pakistan officials.

Their long-time partnership, Finer said, "makes us question even more why Pakistan will be motivated to develop a capability that could be used against us".

Notably, Pakistan hasn't hidden its critical view of the ties US President Joe Biden has formed with Islamabad's rival India. With Pakistan's close relations with China, US has also slapped some sanctions on Chinese organisations for supplying Islamabad's ballistic missile programmes.

Pakistan, which was a key partner in the US' fight against al-Qaeda following the 9/11 attack on America, had also been a major non-NATO ally since 2004. However, US-Pakistan ties took a hit after Pakistani military's coup, its backing for Taliban's 1996-2001 rule and its nuclear weapons programmes.

Meanwhile, Finer's move to publicly voice US' concerns over a development in Pakistan was termed as a "mighty dramatic development" by experts like Michael Kugelman, from the Wilson Center think tank.

<https://www.hindustantimes.com/world-news/pakistans-new-ballistic-missile-programme-an-emerging-threat-to-us-white-house-official-101734657204628.html>

Navy chief to review vessel safety norms in Mumbai today

Navy chief Admiral Dinesh K Tripathi will be in Mumbai on Friday for a first-hand assessment of the collision between a naval speedboat and a passenger ferry in Mumbai harbour — the accident on Wednesday left 14 people dead — for a visit aimed at re-emphasising issues related to safety, security and standard operating procedures, officials aware of the matter said on Thursday.

There will also be a special session dedicated to safety and security, with focus on the actions taken, based on a recent special task force (STF) report during the next Naval Commanders' Conference, to be chaired by Tripathi in March 2025, the officials added.

Tripathi returned to Delhi on Thursday after a four-day visit to Indonesia to boost bilateral ties.

The Mumbai-based Western Naval Command has ordered a board of inquiry, headed by a commodore, to investigate what caused the accident. On Wednesday, the navy said the speedboat was undergoing engine trials when it lost control and collided with the passenger ferry, Neel Kamal, which was carrying more than 100 passengers from Gateway of India to Elephanta Island.

The accident came weeks after a fishing boat collided with an Indian Navy submarine off the Goa coast, with the freak accident sinking the boat and leaving two fishermen dead. The fishing boat, Marthoma, with 13 men on board, crashed into the submarine-class Scorpene when it was at periscope depth (15-20 feet underwater) around 70 nautical miles north-west of Goa.

Tripathi formed the STF, under a rear admiral, in July after INS Brahmaputra, a multi-role frigate, tipped over at the Naval Dockyard in Mumbai after a fire broke out on board the vessel, and firefighting units pumped huge quantities of water to douse the flames. A sailor was killed in that accident. The STF looked into the wider safety and security issues, said one of the officials cited above, asking not to be named.

“The STF has submitted its report, and its comprehensive recommendations have been promulgated to all naval commands, establishments and units. The naval headquarters have issued directions for the recommendations to be implemented, and the required action has been taken,” he said.

Safety and security is a top priority for the navy, and the singular focus is on how to minimise or eliminate accidents, a second official said. Several measures have already been put in place based on the findings of a special task force set up by the navy chief in July to review safety, security and standard operating procedures of the Indian Navy. Each accident is a matter of concern,” this official added.

“Adm Dinesh K Tripathi, #CNS, and all personnel of the #IndianNavy offer heartfelt condolences to the grieving families of those who tragically lost their lives in the unfortunate accident in Mumbai Harbour and wish for a speedy and full recovery of those who were injured,” the navy wrote on X on Thursday.

On Wednesday, 110 people were rescued from the site. The dead included four of the six people on board the naval speedboat. The fatalities included three representatives of the yard that made the naval boat and a sailor. Another sailor is battling for his life in a Mumbai hospital, while the fourth representative of the yard is out of danger (he was the one who made the first distress call, paving the way for authorities to mount a search and rescue operation).

Two people on board the ferry, Neel Kamal, are still missing, the navy said on Thursday. “Search and rescue operations are in progress by eight navy craft and a naval helicopter, augmented by an Indian Coast Guard vessel. Search and rescue efforts have continued throughout the night of 18-19 Dec 2024 in vicinity of the accident [site].”

<https://www.hindustantimes.com/india-news/navy-chief-to-review-vessel-safety-norms-in-mumbai-today-101734634272412.html>

THEWEEK

Thu, 19 Dec 2024

600 operational warheads and growing: China's nuclear arsenal soars despite corruption in PLA

China has over 600 operational nuclear warheads, and by 2030, this number will touch 1,000. There is also an increase in diversity and capabilities of China's arsenal, such as precision strike capable missiles with lower yield nuclear warheads, a report released by the US defence department—'Military and Security Developments Involving the People's Republic of China'—revealed.

The congressionally mandated annual report offers insight into the capabilities, strategies, and goals of China and its military.

The report reveals that China's public defense budget increased in inflation-adjusted prices to \$220 billion for 2023, allowing Beijing to focus on modernisation of weapons, recruitment, and boosting the strategic capabilities of its armed forces. The country is also making investments in nuclear expansion and space and counter-space capabilities.

According to Michael Chase, deputy assistant secretary of defense for China, Taiwan and Mongolia, the report talks not just about expansion in numbers, but also increase in quality, growing technological sophistication, and the increasing diversity of China's nuclear arsenal.

"(What) we have seen over time is that they have expanded to a nuclear triad, with the PLA Navy having ballistic missile submarines, conducting deterrence patrols, as we cover in the report, and that the PLA Air Force has also regained a nuclear deterrence and strike mission with the addition of nuclear-capable bombers," Chase has been quoted as saying.

The increase in diversity and capabilities such as precision strike capable missiles with lower yield nuclear warheads give China a wider range of options in terms of the kinds of nuclear deterrence operations.

Growing Russia-China ties

The report also focuses on increased military cooperation between China and its allies, especially Russia. Beijing has been supporting Russia for its ongoing war in Ukraine and the two countries have been holding joint military exercises, including joint bomber patrols.

"The PRC (People's Republic of China) is probably going to want to exert more leverage, to kind of extract greater cooperation from Russia in areas where Russia historically has been more reluctant...In the Arctic, for example, would be one example where that might take place," Chase said.

Corruption in PLA

The report also highlights the growing corruption in the People's Liberation Army and China's efforts to put an end to it. Corruption touches every service in the PLA, the report noted.

Last year, corruption-related investigations led to the ouster of at least 15 high-ranking military officers and defense industry executives, including defence minister Li Shangfu.

The report suggest that the corruption could relate to such things as major military construction projects as well as research development and acquisition programmes.

<https://www.theweek.in/news/defence/2024/12/19/600-operational-warheads-and-growing-chinas-nuclear-arsenal-soars-despite-corruption-in-pla.html>

Science & Technology News



Press Information Bureau
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Ministry of Science & Technology

Thu, 19 Dec 2024

Nano-plastics identified as emerging agents in spread of antibiotic resistance

Nanoplastics derived from single-use plastic bottles (SUPBs) contribute to the spread of antibiotic resistance (AR), shows a new study, underscoring an unrecognized public health risk.

The joint threats of plastic pollution and antibiotic resistance are growing concerns. Nanoplastics and microorganisms coexist in diverse environments, including the human gut.

This problem led scientists from Institute of Nano Science and Technology (INST) Mohali, an autonomous institution of the Department of Science and Technology (DST), to trace how plastic nanoparticles could impact bacteria. Recognizing the central role of *Lactobacillus acidophilus* in the gut microbiota, Dr. Manish Singh and his team investigated whether nano-plastics could transform beneficial bacteria into carriers of AR genes and pose a risk to human gut microbiome health.

They utilized the used plastic water bottles to synthesise environmentally relevant nanoplastics particles as these polyethylene terephthalate bottle-derived nanoplastics (PBNPs) better represent the actual pollutant nanoplastics generated due to dumping of single use plastic bottles and containers. The scientists demonstrated that PBNPs can facilitate the cross-species gene transfer from *E. coli* to *Lactobacillus acidophilus*, a significant bacteria found in human gut microbiota, through a process called horizontal gene transfer (HGT), particularly through outer membrane vesicle (OMV) secretion in bacteria.

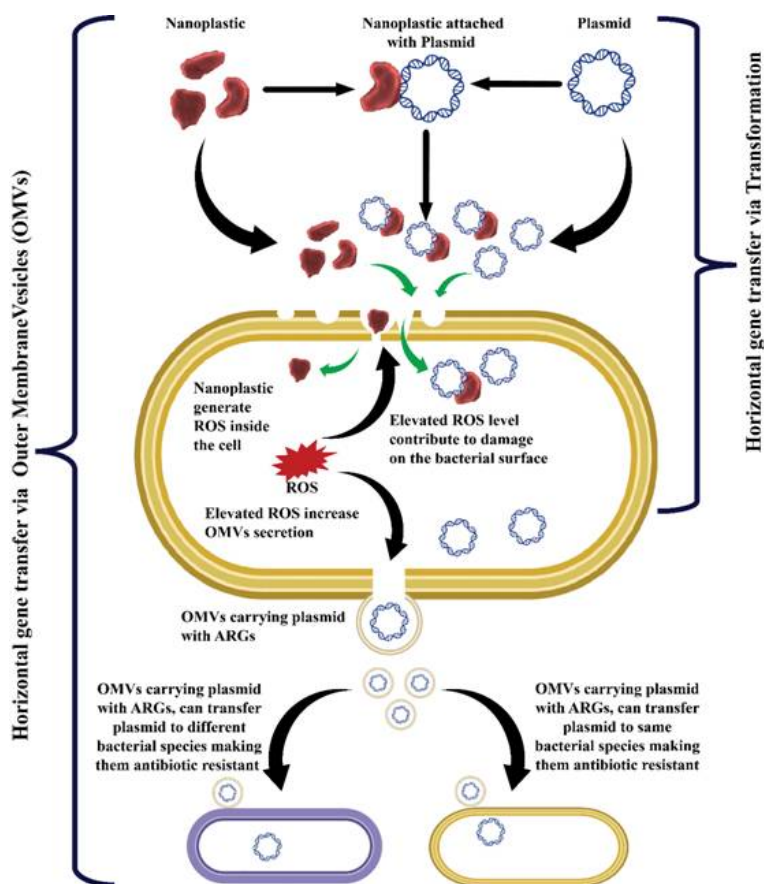
According to the researchers there are two novel mechanisms through which PBNPs facilitate AR gene transfer. One of them is through direct transformation pathway in which PBNPs act as physical carriers, transporting AR plasmids across bacterial membranes and promoting direct gene

transfer between bacteria. The other one is through OMV-Induced Transfer Pathway in which PBNPs induce oxidative stress and damage to bacterial surfaces, which makes stress response genes pro-active and triggers an increase in outer membrane vesicle (OMV) secretion. These OMVs, loaded with AR genes, become potent vectors for gene transfer across bacterial species, thus facilitating the spread of AR genes even among unrelated bacteria. This reveals an important and previously overlooked dimension of nanoplastics' effects on microbial communities.

The study published in the journal 'Nanoscale' highlights how nanoplastics might unexpectedly contribute to the AR crisis by introducing AR genes to beneficial gut bacteria like *Lactobacillus acidophilus*, which may subsequently pass these genes to pathogens. It indicates that beneficial bacteria like *Lactobacillus acidophilus* could act as reservoirs for AR genes, potentially transferring these genes to pathogenic bacteria during the course of infections.

Protecting beneficial gut bacteria is crucial for immune support, digestion, and disease prevention. Limiting nanoplastic contamination could help preserve gut microbiota integrity, minimizing the chances of AR gene transfer from beneficial to pathogenic bacteria and supporting microbiome resilience.

With increasing plastic pollution, this finding highlights the need for strict safety guidelines, awareness programs as well as the necessity of policies that prioritize responsible usage of plastics and its adequate waste management to safeguard the human health and microbiome stability.



<https://pib.gov.in/PressReleasePage.aspx?PRID=2086071>



**Press Information Bureau
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Ministry of Science & Technology

Thu, 19 Dec 2024

Parliament Question: Nanocoating Material In Chemical And Fertilizers

Nanocoating materials can enhance the nutrient use efficiency of chemicals and fertilizers in farming. Nanocoating of fertilizers involves applying nanoscale materials or thin films over the surface of fertilizer granules. This approach improves the release performance of fertilizers, addressing issues such as nutrient loss and uncontrolled release, which are common in conventional fertilizers. With an aim to provide farmers the means to boost productivity and help increase their income, Nano DAP is an efficient source of available nitrogen and phosphorus for all the crops and helps in correcting the Nitrogen & Phosphorus deficiencies in standing crops. It is available in the market.

The Ministry of Science and Technology supports R&D projects in the area of nano-biotechnology with an aim to enhance properties of soil and agriculture inputs including fertilizers for improving overall crop performance.

This information was given by Union Minister of State (Independent Charge) for Science & Technology and Earth Sciences, Dr. Jitendra Singh in a written reply in the Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2085955>



**Press Information Bureau
Government of India**

Ministry of Science & Technology

Thu, 19 Dec 2024

Parliament Question: Efforts To Make 'Viksit Bharat' By 2047

Towards achieving 'Viksit Bharat' 2047 goal, the Government has been making several efforts through key interventions in the field of Science and Technology. Some of the notable efforts include instituting high-stakes mission-driven initiatives, namely National Quantum Mission; National Mission on Interdisciplinary Cyber-Physical Systems among others. These missions focus on the development of key technologies to reduce dependency on imports, promote domestic innovation, and position India as a global leader in the identified sectors.

Government has launched several programmes to catalyze startup culture and build a strong and inclusive ecosystem for innovation and entrepreneurship in the country.

Several strategic policy measures have been introduced by the Government including the Geospatial Policy 2022, the Space Policy 2023 and BioE3 (Biotechnology for Economy, Environment and Employment) Policy 2024.

The Government has established the Anusandhan National Research Foundation (ANRF) through the ANRF Act 2023 towards strengthening our technological leadership, marking a paradigm shift in our R&D ecosystem. The ANRF aims to drive a multi-phased roadmap for scientific breakthroughs and cross-sectoral collaboration, providing competitive, peer-reviewed grants to optimize resource allocation for high-impact research. ANRF aims to position India as a global leader in innovative, sustainable technological progress. The Foundation has outlined multifaceted strategic interventions to enhance India's research ecosystem, aligning with national scientific and geopolitical priorities.

In order to make India Viksit Bharat by 2047, Sectoral Group of Secretaries (SGoS) on Technology has held detailed discussions and many of the interventions are a result of these discussions. Some other actions emphasize strengthening research and innovation in the areas of Quantum Technologies, Cyber Physical Systems, Bio Manufacturing etc. These efforts focus on technological self-reliance, sustainability, and economic growth, with a strong emphasis on R&D, skilled workforce development, and global leadership in emerging technologies. Through coordinated efforts across various sectors, the endeavour is to transform India into a scientifically advanced and innovation-driven economy, laying the foundation for Viksit Bharat by 2047.

The efforts made by the Government through various programmes and policy measures have helped the nation in improving its position in the Science and Technology at global level which is visible through its global position in scientific publications, number of Ph.Ds, number of start-ups, resident patent filing, Global Innovation Index, number of start-ups, etc. Some of the key highlights include:

- India ranks 3rd in terms of number of research publications (2,07,390) as per Science & Engineering Indicators 2024 published by National Science Foundation (NSF), USA.
- India ranked 3rd in terms of the total number of startups (more than 1,40,000) in 2024 as per DPIIT.
- India ranks 4th in number of PhD degrees awarded (16,968) in Science and Engineering as per Science & Engineering Indicators 2024 published by National Science Foundation (NSF), USA.
- India is ranked at 6th position both in terms of resident (38551) and non-resident (38517) patent filing activity from respective country as per WIPO Report, 2023.
- India has witnessed a significant jump in its Global Innovation Index (GII) ranking from 81st in the year 2015 to 39th in 2024 among 133 economies of the world.
- The Gross expenditure on R&D (GERD) in the country has been consistently increasing over the years and has more than doubled from Rs. 53041.30 crore in 2009-10 to Rs. 127380.96 crore in 2020-21. As per DST R&D Statistics 2022-23, India occupies 7th position in terms of GERD (in billion current PPP\$) ahead of United Kingdom, Russia, Brazil, Italy, Canada, Spain, Australia, etc
- Gender participation in R&D has increased to 18.6% (2021) from 14.3 % (2009) as per DST R&D Statistics, 2022-23.

- Number of researchers per million population has increased to 262 in 2020 as compared to 164 in 2009 as per DST R&D Statistics, 2022-23.

This information was given by Union Minister of State (Independent Charge) for Science & Technology and Earth Sciences, Dr. Jitendra Singh in a written reply in the Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2085956>



Press Information Bureau
Government of India

Ministry of Science & Technology

Thu, 19 Dec 2024

Parliament Question: Collaboration For Research Cooperation

Ministry of Science and Technology is facilitating international cooperation in all major areas of Science, Technology and Innovation with 40 countries through instruments such as Memorandum of Understanding (MoU), Letter of Intent (LoI), Programme of Cooperation (PoC) or other Agreements. Every year, the Department of Science and Technology (DST) launches about 15-18 joint calls for Research and Development (R&D) proposals to enhance international bilateral collaboration as well as multilateral collaboration. India is also participating in the state-of-the-art research facilities like Facility for Antiproton and Ion Research (FAIR) in Germany, Thirty Meter Telescope (TMT) in USA, Square Kilometer Array (SKA) in Australia and South Africa wherein India works closely with many leading countries across the globe. India is also a part of European Organization for Nuclear Research (CERN, Geneva); ELLETRA Synchrotron (Italy); Sp-Ring-8 (Japan); KEK Accelerator (Japan); Fermi-Lab (US); Synchrotron light source (Brazil and Singapore); Synchrotron Radiation Sources Beam-line (Russia) etc. Global Centre for Nuclear Energy Partnership (GCNEP), a constituent unit of the Department of Atomic Energy (DAE) is having MoUs with 16 international partners including USA, Russia, IAEA, France, etc. to strengthen global partnerships to promote safe, secure and sustainable nuclear energy for the service of mankind.

Significant progress has been made in fostering and expanding international partnerships with many countries. Joint S&T calls for proposals have been implemented in different areas of S&T. These projects are progressing well in terms of their objectives and outcome. Details of projects progressing in this respect, country-wise, field-wise are given in the Annexure.

The main aim of these collaborations is to connect Indian research with global efforts particularly in the frontier areas of S&T and in areas addressing global challenges. The collaboration has helped in facilitating joint R&D projects, seminars, fellowships, training programmes, increased research capacity building and infrastructure development, exchange and exposure visits, access to advanced facilities, technology transfer, joint publications etc. Partnership in global mega research infrastructure facilities enable access to our researchers to advanced facilities & participation in mega-science/ consortia projects. These collaborations have helped projecting India's S&T prowess globally thereby supporting brand-building for the organization and the nation at large.

The proposed measures include periodic reviews of these collaborative MoUs through Joint Working Group mechanism to monitor implementation of each of the activities undertaken to

identify mutually rewarding collaborations and build new modes of synergistic linkages in different areas of S&T research. In addition, GCNEP is constantly working to build expertise in nuclear technologies by facilitating collaborations with national & international organizations, fostering knowledge exchange, skilled human resource development, joint research, and technological advancements.

This information was given by Union Minister of State (Independent Charge) for Science & Technology and Earth Sciences, Dr. Jitendra Singh in a written reply in the Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2085957>



Press Information Bureau
Government of India

Ministry of Science & Technology

Thu, 19 Dec 2024

Parliament Question: Anusandhan National Research Foundation

The Anusandhan National Research Foundation (ANRF) has launched the 'Partnership for Accelerated Innovation and Research (PAIR)' an initiative to enhance research capabilities of universities particularly Central and State public institutions in the country. PAIR is a multi-institutional programme to boost research capability of institutions, where research is relatively at nascent stage, through a mentorship-driven hub and spoke framework by pairing them with well-established top tier institutions. Hubs will guide emerging institutions (spokes) in research activities, provide access to harness their resources and expertise, thus bridging the gap between institutions and nurturing a robust research ecosystem in the country.

The PAIR programme was launched on November 14, 2024 and no universities and institutions have been selected so far under the programme. Also, No fund release has been made so far under the programme.

The programme will be fully funded by the Central Government through Anusandhan National Research Foundation (ANRF).

Institutions/universities will be identified from among the ones with the following eligibility criteria. Hub Institutions should be those institutions within 25 National Institutional Ranking Framework (NIRF) overall rankings in the preceding two years or institutions of national importance within 26 to 50 NIRF overall ranking in the preceding two years. Spoke Institutions should be Central Universities and State Public Universities within 200 NIRF overall ranking or within 200 NIRF University ranking or within 100 NIRF State Public University ranking, excluding those eligible as Hubs. Additionally, other Central and State Public Universities which are not NIRF ranked but have potential in specific research areas, are also eligible as spoke institutions, subject to a maximum of one such institution in each PAIR Network. Select emerging National Institute of Technology and Indian Institute of Information Technology with promising research competence are also eligible as spoke institutions. Each PAIR network will consist of a Hub and 3 to 7 spoke institutions and to ensure regional diversity, at least one spoke institution must be located outside the State of the Hub institution. Based on the merit of the proposal, ANRF, on recommendation of an Apex Committee of ANRF, will select the PAIR network.

This information was given by Union Minister of State (Independent Charge) for Science & Technology and Earth Sciences, Dr. Jitendra Singh in a written reply in the Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2085958>

THE ECONOMIC TIMES

Thu, 19 Dec 2024

Scientists discover mysterious 'alien' life forms in human body

In a groundbreaking discovery, scientists have identified organisms inside the human body that defy everything we thought we knew about life. A Stanford University research team, led by Dr. Ivan Zheludev, has found evidence of peculiar RNA-based life forms in the human microbiome. Published in 2024, the study introduces these organisms as “Obelisks,” which are unlike any known life forms on Earth.

What Are Obelisks?

The researchers analysed RNA sequences from human gut samples using metatranscriptomic analysis. They discovered over 1,000 unusual base pairs that don't match any known genetic patterns.

These Obelisks, present in 10% of microbiome samples, have circular genomes with rod-like structures and produce a novel protein called Oblins. However, the exact role of these proteins remains unknown.

Where Are They Found?

Obelisks appear in multiple parts of the human microbiome, including the gut and oral microbiomes. Surprisingly, while only 7% of stool samples contained Obelisks, they were present in up to 50% of oral samples, suggesting they are more widespread than initially thought.

Additionally, some Obelisks were found inside *Streptococcus sanguinis*, a typically harmless bacterial species. These organisms persist in the body for over 300 days, leaving researchers to question whether they are permanent residents or transient visitors.

Are They Truly Alien?

Though the term "alien" might evoke images of extraterrestrial beings, these organisms are not from another planet. Instead, they are "alien" to life as we know it due to their unique RNA-based structure and self-replicating abilities. This discovery could provide profound insights into the origins of life and evolution.

The question remains: Have these organisms been coexisting with us unnoticed, or do they represent an entirely new chapter in the story of life?

<https://economictimes.indiatimes.com/news/science/scientists-discover-mysterious-alien-life-forms-in-human-body/articleshow/116468336.cms>

Indian, US officials meet to chart next steps in space collaboration

Officials from India and the United States have charted next steps in space collaboration, including human spaceflight, joint space exploration and a commitment to facilitating commercial partnerships between space companies to advance the shared interests in the growing space economy, the White House said on Wednesday. A meeting in this regard was held in Houston on December 17.

The participants in the meeting were US Principal Deputy National Security Advisor Jon Finer, Deputy Secretary of State Kurt Campbell and Indian Ambassador to the United States Vinay Kwatra.

"Following President (Joe) Biden and Prime Minister (Narendra) Modi's June 2023 commitment to work together to 'reach new frontiers across all sectors of space cooperation' and India's signing of the Artemis Accords, our two nations reached an inflection point on collaboration across civil, security and commercial space sectors," the White House said in a fact-sheet.

"This includes human spaceflight, joint space exploration and a commitment to facilitating commercial partnerships between US and Indian space companies to advance our shared interests in the growing space economy," it said.

As part of their visit to Houston, Finer and Campbell met with representatives from the National Aeronautics and Space Administration (NASA), Indian Space Research Organisation (ISRO) and space industry leaders to identify new opportunities to further strengthen the two countries' burgeoning space partnership.

They also reflected on the accomplishments of the past few months and charted next steps to take the India-US partnership to the next level, including selecting two ISRO astronauts to train at the NASA's Johnson Space Centre for the first-ever joint effort between American and Indian astronauts at the International Space Station, with Axiom Space serving as the provider of the mission.

The launch of the Axiom-4 mission as soon as spring 2025 will mark a significant milestone in the US-India space partnership and space exploration.

They agreed to exploring the creation of a new space innovation bridge to promote partnerships between US and Indian startups focused on advancing space situational awareness, satellite technology and space launch and exploration.

The two sides agreed to promote defence space cooperation through the US-India Advanced Domains Defence Dialogue, India's participation in US Space Command's annual Global Sentinel exercise and a recently-launched space situational awareness joint challenge under the India-US Defence Acceleration Ecosystem (INDUS-X).

The officials agreed to advance reviews of missile technology exports to generate new opportunities for bilateral industry partnerships on space-launch technology, including for commercial satellite launches. They also celebrated the completion of a Strategic Framework for Human Spaceflight Cooperation to deepen interoperability in space and working toward the

conclusion of a new arrangement on advanced astronaut training. The officials also met with two ISRO astronauts who are training at the NASA's Johnson Space Centre in preparation to join a proposed mission -- the International Space Station -- in 2025.

They also discussed plans to launch a jointly developed NASA-ISRO Synthetic Aperture Radar Earth Science (NISAR) satellite in 2025. The officials met with representatives from the space industry private sector to explore innovative ways for the US and Indian commercial space sectors to strengthen collaboration, a key priority under the initiative on Critical and Emerging Technologies (iCET), the State Department said in a separate media release.

<https://economictimes.indiatimes.com/news/science/indian-us-officials-meet-to-chart-next-steps-in-space-collaboration/articleshow/116454601.cms>

THE ECONOMIC TIMES

Wed, 18 Dec 2024

China to unveil giant underground machine to capture 'ghost particles' that travel through Universe, including our bodies

A massive underground detector in southern China is close to completion, marking a significant step in the global effort to study neutrinos—tiny, elusive particles that have puzzled scientists for nearly a century. The Jiangmen Underground Neutrino Observatory (JUNO), located 2,297 feet underground, is set to begin operations next year. This \$300 million project aims to capture these "ghost particles" and provide new insights into the universe's origins.

The Challenge of Detecting Neutrinos

Neutrinos are nearly impossible to detect on their own due to their minuscule mass and weak interaction with matter. They travel through the universe, including our bodies, without leaving any trace. To study them, scientists measure the flashes of light or charged particles produced when neutrinos collide with other matter. As these interactions are rare, large detectors are needed to increase the chances of capturing a collision.

"The solution for how we measure these neutrinos is to build very, very big detectors," Andre de Gouvea, a theoretical physicist at Northwestern University told AP. The JUNO detector is one of three being built worldwide to study neutrinos in greater detail.

Building the Giant Detector

The JUNO detector, under construction for over nine years, is designed to detect antineutrinos—particles produced by nuclear reactors. These antineutrinos, generated by two power plants 31 miles away, will interact with particles inside the detector, creating detectable flashes of light. The detector's design aims to unravel a long-standing mystery in neutrino science: the different "flavours" of neutrinos and their mass hierarchy.

"It's the least understood particle in our world," said Cao Jun, a manager of the JUNO project told AP. The detector's success could provide groundbreaking answers to these questions, but catching these particles is no easy task.

Global Collaboration in Neutrino Research

JUNO is not alone in this quest. Two other neutrino detectors, Japan's Hyper-Kamiokande and the Deep Underground Neutrino Experiment in the United States, are under construction and expected to begin operations in the coming years. These detectors will work together to cross-check results and deepen scientists' understanding of neutrinos.

The data gathered will help researchers unlock the secrets of neutrinos and, potentially, answer big questions about the universe's formation.

Neutrinos and the Origin of the Universe

Neutrinos are believed to have existed since the Big Bang, making them key to understanding the early universe. Their study could help scientists uncover why there is more matter than antimatter in the universe, a mystery that has long baffled researchers.

As the JUNO detector begins its work next year, it will contribute to a growing body of knowledge about these elusive particles and the fundamental forces that shaped the universe.

<https://economictimes.indiatimes.com/news/science/china-to-unveil-giant-underground-machine-to-capture-ghost-particles-that-travel-through-universe-including-our-bodies/articleshow/116443221.cms>



Fri, 20 Dec 2024

How scientists used Scotch tape to create ultra-thin films of diamond

When Richard Drew invented Scotch tape in 1930, he was looking for a simple solution to wrap presents. And this remains the invention's primary use case, with sales spiking during the holiday season.

But Scotch tape might have another, potentially revolutionary use case. A team of scientists have managed to create films of diamond, upto five centimetres wide and less than a micrometre (one millionth of a metre) thick, using some sticky tape, an article published in the journal *Nature* on Thursday (December 18) reported.

A welcome accident

The "simple, scalable and reliable method" was discovered by accident when electrical engineer Jing Jixiang of the University of Hong Kong accidentally peeled away a bit of diamond with a misplaced piece of Scotch tape.

Intrigued, Jing and his colleagues decided to experiment further. They first implanted some nano-sized diamonds in a small silicon wafer, and then blew methane gas over it at high temperatures to form a continuous, thin diamond sheet. This is a technique known as chemical vapour deposition, a method very commonly used for creating thin films used in semiconductors.

The challenge was to extract the thin diamond layer from the silicon without damaging it. For this, they cut the wafer to expose the diamond's edge, and fixed some tape to the diamond. When they peeled the tape back, a thin layer of diamond came with it. Subsequently, they dissolved the tape in a chemical solution to produce a free-standing ultra-thin diamond film.

Scientists have previously used a similar technique (which also utilised Scotch tape) to create thin materials such as graphene, a sheet of graphite made of a single layer of carbon atoms.

Desirable qualities

What excited the scientists were the qualities of the diamond sheet they produced. They were extremely thin while at the same time being smooth enough to allow for the kind of etching techniques used to produce silicon chips, and extremely flexible.

The films' "flat workable surface, support standard micromanufacturing techniques, and their ultra flexible nature allows for direct elastic strain engineering and deformation sensing applications, which is not possible with their bulky counterpart," the *Nature* article said. ("Scalable production of ultraflat and ultraflexible diamond membrane").

Diamond is known to possess unique electronic properties. On one hand, it is a good insulator. At the same time, it also allows electrons of certain energies to move without resistance. In theory, this can translate to diamond chips being able to be far more efficient (although likely more expensive) than conventional silicon chip designs.

But so far, creating high-quality, freestanding films of diamond, which can then be fashioned into chips, has been a challenge. This is why the latest development is extremely promising.

"This new edge-exposed exfoliation method will be an enabler for a multitude of device designs and experimental approaches," physicist Mete Atatüre of the University of Cambridge told *NewScientist*. One area it could be particularly useful for is offering greater control in quantum devices that use diamonds as sensors, he said.

<https://indianexpress.com/article/explained/explained-sci-tech/scotch-tape-create-ultra-thin-films-diamond-electronics-9734509/>

THE TIMES OF INDIA

Fri, 20 Dec 2024

ISRO Starts Assembly Of HLVM3 For Gaganyaan Mission At SDSC Or First Uncrewed Flight

Indian Space Research Organisation continues to make significant milestones in space exploration with its continuous efforts to launch India's first crewed spaceflight under the Gaganyaan mission. The Indian astronaut called Gagannauts into space aboard Human - Rated Launch Vehicle Mark-3 (HLVM3). On Wednesday, ISRO initiated the assembly of Human - Rated Vehicle Mark-3 (HLVM3) as a critical component of India's Gaganyaan mission which aims to achieve the country's first crewed spaceflight. This coincides with the 10th anniversary of the Launch Vehicle Mark-3 (LVM3-X/CARE) mission as a foundational role in the Gaganyaan program mission.

ISRO HLVM3 successfully launched on December 18

On December 18 2024 at 8:45am, ISRO began the launch campaign for the HLVM3-G1/0M-1 featuring the full-flex seal nozzle of the S200 motor at the Satish Dhawan Space Center (SDSC) in Sriharikota. This step acts as a major step towards the launch vehicle for the future space missions. Some of the additional components following the launch vehicle include S200 motors, control systems, and avionics to be integrated.

LVM3's human-rating enhances safety for future missions

HLVM3 assembly as the crucial development is the successful human rating of the LVM3 launch vehicle. The human-rating involves the rigorous testing to ensure the vehicle's systems meet the safety standards being required for the human spaceflight. All the systems have undergone extensive ground and flight tests even in off-nominal conditions to verify their performance and reliability under the human safety requirement, confirmed ISRO.

LVM3, a human rating process, ensures to handle the human-space travel complexities. The inclusion of the Crew Escape System (CES), a safety feature designed to protect astronauts during every phase of ascent, adds a layer of redundancy to the vehicle's safety mechanisms. The CES system, which is operational from the launch pad until its separation after the atmospheric flight regime, significantly boosts the confidence in the upcoming manned missions.

Specifications of HLVM3

HLVM3 is a massive, three stage vehicle standing 53m tall and 640 tonnes in weight.

- **Capable of carrying payloads up to 10 tonnes into Low Earth Orbit**

This crew module will be a part of the Gaganyaan mission designed with multiple redundancies and enhanced safety features to protect the astronauts. It can operate under the most extreme conditions of human spaceflight.

The Gaganyaan program is not only an important aspect of India's space exploration goals, but it is also a necessary precursor to the Bharatiya Antariksh Station (BAS). The Gaganyaan mission's experience will be valuable in the construction and operation of India's prospective space station. ISRO's long-term strategy includes applying Gaganyaan's lessons to the development of more advanced space technology and a sustainable space infrastructure.

- **Development in India's Gaganyaan human spaceflight program**

The LVM3-X mission, which launched on December 18, 2014, was critical in the development of India's human spaceflight program. The mission successfully transported a 3,775 kg crew module to a suborbital altitude of 126 km, where it was manoeuvred with thrusters to guarantee a successful reentry.

The module was designed as part of Gaganyaan's pre-project operations and data from this flight will have a direct impact on the design and the testing of the crew module for the subsequent mission.

- **Crew module to ensure safe human spaceflight for Gaganyaan**

The crew module from the Bay of Bengal on December 18 2024 was a watershed moment that confirmed the ability of the vehicle to safely return from space highlighting the importance of the mission. Information collected during the mission has been an integral part in refining the crew module and its associated systems to ensure that they are capable of supporting human spaceflight in future.

- **Leveraging LVM3 data to enhance the Gaganyaan mission and future of manned missions**

After the successful completion of the LVM3-X mission, ISRO has built upon the foundational data gathered during that mission. The improvement in the design of the crew module has been made and the other subsequent tests such as pad abort tests, air-drop tests, and test vehicle flights. This has provided with the valuable insights that informed the ongoing development of the crew module and other systems of the Gaganyaan mission. The data will be essential to ensure the

success of the manned future missions which will ultimately allow ISRO to make necessary adjustments and improvements to the module the launch vehicle before launching astronauts into space.

Paving the path for India's first human spaceflight

As ISRO prepares for the uncrewed Gaganyaan mission, the insights gained will be pivotal for the future of human spaceflight in India. With the human-rating of the LVM3 vehicle and the successful integration of key systems, the nation is now closer than ever to achieving its goal of sending astronauts to space. The upcoming uncrewed flight will serve as a critical testing ground for the various systems and technologies involved, paving the way for a successful manned mission.

ISRO's successful assembly of the HLVM3 vehicle and the completion of key tests mark significant progress in India's space exploration journey. The Gaganyaan mission not only aims to send humans to space but also plays a key role in laying the foundation for more ambitious future projects, including the Bharatiya Antariksh Station. The lessons learned from this program will help shape India's space exploration goals for the coming decades.

<https://timesofindia.indiatimes.com/science/isro-starts-assembly-of-hlvm3-for-gaganyaan-mission-at-sdsc-for-first-uncrewed-flight/articleshow/116480273.cms>

THE TIMES OF INDIA

Fri, 20 Dec 2024

Next gen storage solutions are being developed in india

For decades, NetApp has served as the backbone of enterprise data storage. Its solutions power a significant share of the world's unstructured data, guiding organisations through the tumultuous shift from on-premises hardware to flexible hybrid cloud environments.

“If you look at large enterprises—the Fortune 500 and beyond—our systems are often at the centre of their critical data operations,” Harv Bhela, executive VP and chief product officer at NetApp, who is based out of the US, told us during a recent visit to India, “We’ve always managed data storage well, but now we’re transforming what storage itself can do.”

This shift is largely fueled by NetApp's largest development centre, located in Bengaluru. “This is not a small remote site,” Bhela says. “The Bengaluru office is our single biggest engineering hub, working on everything from enterprise storage and cloud integration to AI-driven data services and advanced cybersecurity capabilities.”

The India teams aren't just executing a roadmap— they're shaping it. The result is a new generation of NetApp products that don't just store data, but also accelerate AI adoption and defend customers from ransomware attacks, says Bhela.

The Bengaluru engineering organisation is embedding intelligence directly into the storage layer, making data readily accessible and actionable rather than hidden in vast, unstructured reservoirs.

“We’ve got customers telling us they spend 80% of their time just preparing data— copying it, cleaning it, searching for it—before they can even start meaningful AI analysis,” says Bhela. “Our India teams have flipped that ratio by integrating a realtime data catalog right into storage. Instead

of dark pools of unstructured files, enterprises immediately know what data they have, where it resides, and whether it's suitable for their AI workloads."

One of the most complex aspects of operationalising AI involves converting raw data into vector embeddings— mathematical representations that AI models use to find patterns and meaning in text, images, and other unstructured content. Ordinarily, this is another complicated pipeline that must be built and maintained separately.

But NetApp's India engineers are working to handle vector embeddings natively in storage. Customers define what embeddings they need, and the platform automates the process, eliminating a significant layer of complexity. "There's no reason customers should build their own vector embeddings pipeline from scratch," says Bhela. "Our India teams have shown a path to making that a built-in feature."

Anonymising on the fly

Governance and compliance also improve when policies are baked into storage. With regulations tightening and privacy concerns growing, organisations fear accidentally training AI models on sensitive data. "In Bengaluru, we've engineered the capability to identify personal or proprietary information at the source," notes Bhela.

"We can anonymise it on the fly, apply policies automatically, and ensure every dataset meets internal and external rules. That gives enterprises the confidence to scale AI responsibly."

As AI expands, enterprises increasingly embrace hybrid environments, using public cloud tools for training but keeping core datasets onpremises. Here, too, the India teams have excelled, ensuring that NetApp's software runs seamlessly across both private data centres and public clouds. "AI is the first true hybrid workload," Bhela explains.

"With the Bengaluru team's work, a data scientist in the cloud sees all their relevant data— wherever it physically resides—as if it's local. We handle the orchestration, caching, and transfers behind the scenes, so our customers don't have to."

All these advances would be less meaningful if businesses couldn't protect their data against escalating cyber threats. To that end, India's engineers have integrated anomaly detection directly into storage operations. By monitoring baseline behaviors, they can spot suspicious patterns and raise alerts the moment something goes wrong.

"If attackers try encrypting files or suddenly access vast swaths of data, we know it immediately," Bhela says. "And because we're right at the storage layer, we can trigger automated policies— like creating immutable snapshots—to freeze a clean copy of the data before the attacker can do more damage."

This security model is continuously updated, thanks to the Bengaluru teams' ongoing improvements. As attackers evolve tactics, NetApp refreshes its detection models to stay a step ahead. "We're treating cybersecurity like a living system, one that learns and adapts, just like AI," says Bhela.

<https://timesofindia.indiatimes.com/technology/times-techies/next-gen-storage-solutions-are-being-developed-in-india/articleshow/116485977.cms>

What is the quantum satellite for India's National Quantum Mission? | Explained

Many of us want to know how the SARS-CoV-2 virus originated. To do that, right now we need to unravel its evolution from its bat coronavirus ancestor by sequencing the genomes of animals and viruses near the outbreak site and we need to effect China's cooperation to check whether SARS-CoV-2 could have 'leaked' from a lab. Where the virus came from was once singularly important because the answer could have pointed the way to avoiding similar outbreaks in future. But today, there is good reason for this question to take the back seat.

We don't know where or how the virus originated. If it did in a lab, we would have to re-examine how we regulate research facilities and their safeguards and the manner of political oversight that won't curtail research freedom. If the virus is au naturel, we would have to institute and/or expand pathogen surveillance, eliminate wildlife trafficking, and improve social security measures to ensure populations can withstand outbreaks without becoming distressed. But even as these possibilities aren't equally likely (according to scientists I trust), the origin of SARS-CoV-2 is less important than it once was because the COVID-19 pandemic caused us to implement all these outcomes to varying degrees.

SARS-CoV-2 isn't special of course: it's still difficult to conclusively say what really happened with many things, scientifically. In 1977, a telescope in the U.S. recorded a signal from outer space that remains strange to this day. We don't have a physical explanation for the "spooky" result of an experiment Anton Zeilinger and co. conducted in 1998. We lack a complete understanding of how general anaesthesia works its magic on the brain. Not even their makers fully know how powerful AI models work the way they do. No existing theory of nature can say what happens in intervals shorter than $10^{(-43)}$ seconds.

In fact, not knowing is ubiquitous. To quote philosopher Nicholas Rescher, "no one can say in advance what questions natural science can and cannot answer." But science communication has taught me not all of us can know everything unless we invest considerable, perhaps even impossible, resources. Years ago, the philosopher Daniel Sarewitz wrote an article that changed my relationship with science. He argued that while we may know about the Higgs boson particle and that it gives other elementary particles their masses, we can't truly know any of this until we learn the complicated mathematics required to make sense of it. Until then, we just have faith in the physicists who know. This relationship goes for most technical information in our lives.

Science journalists like me communicate science by providing for scientists' claims, to quote Rescher, "the backing of a rationale that renders [their] correctness evident", but I still demand a considerable amount of faith from readers. At some point faith also becomes trust but trust still isn't understanding. (This said, the system of sanctions should they err provides a reasonable backstop for trust in scientists' and journalists' work.) The general idea here is that you pick someone you trust and you believe what they say to be true. Let's call this the social character of scientific knowledge.

When people encounter a weighty concept scientists aren't able to explain fully, the social character becomes more apparent than it normally is. Some people trust impassioned scientists unwilling to consider extra-scientific possibilities. Some lean towards authority figures who don't trust science to provide the answer. Historically, people have turned to faith in the face of the

unknown. The problems arise when we don't know, or choose to overlook, where science ends and faith/trust begins. Then we fixate on answers that may never matter at the expense of answers that are already useful.

<https://www.thehindu.com/opinion/op-ed/notebook-the-social-character-of-scientific-knowledge/article69005116.ece>



Thu, 19 Dec 2024

What is an AI agent? The computer science of the next wave of AI tools

Interacting with AI chatbots like ChatGPT can be fun and sometimes useful, but the next level of everyday AI goes beyond answering questions: AI agents carry out tasks for you.

Major technology companies, including OpenAI, Microsoft, Google and Salesforce, have recently released or announced plans to develop and release AI agents. They claim these innovations will bring newfound efficiency to technical and administrative processes underlying systems used in health care, robotics, gaming and other businesses.

Simple AI agents can be taught to reply to standard questions sent over email. More advanced ones can book airline and hotel tickets for transcontinental business trips. Google recently demonstrated Project Mariner to reporters, a browser extension for Chrome that can reason about the text and images on your screen.

In the demonstration, the agent helped plan a meal by adding items to a shopping cart on a grocery chain's website, even finding substitutes when certain ingredients were not available. A person still needs to be involved to finalize the purchase, but the agent can be instructed to take all of the necessary steps up to that point.

In a sense, you are an agent. You take actions in your world every day in response to things that you see, hear and feel. But what exactly is an AI agent? As a computer scientist, I offer this definition: AI agents are technological tools that can learn a lot about a given environment, and then – with a few simple prompts from a human – work to solve problems or perform specific tasks in that environment.

Rules and goals

A smart thermostat is an example of a very simple agent. Its ability to perceive its environment is limited to a thermometer that tells it the temperature. When the temperature in a room dips below a certain level, the smart thermostat responds by turning up the heat.

A familiar predecessor to today's AI agents is the Roomba. The robot vacuum cleaner learns the shape of a carpeted living room, for instance, and how much dirt is on the carpet. Then it takes action based on that information. After a few minutes, the carpet is clean.

The smart thermostat is an example of what AI researchers call a simple reflex agent. It makes decisions, but those decisions are simple and based only on what the agent perceives in that moment. The robot vacuum is a goal-based agent with a singular goal: clean all of the floor that it can access. The decisions it makes – when to turn, when to raise or lower brushes, when to return to its charging base – are all in service of that goal.

A goal-based agent is successful merely by achieving its goal through whatever means are required. Goals can be achieved in a variety of ways, however, some of which could be more or less desirable than others.

Many of today's AI agents are utility based, meaning they give more consideration to how to achieve their goals. They weigh the risks and benefits of each possible approach before deciding how to proceed. They are also capable of considering goals that conflict with each other and deciding which one is more important to achieve. They go beyond goal-based agents by selecting actions that consider their users' unique preferences.

Making decisions, taking actionWhen technology companies refer to AI agents, they aren't talking about chatbots or large language models like ChatGPT. Though chatbots that provide basic customer service on a website technically are AI agents, their perceptions and actions are limited. Chatbot agents can perceive the words that a user types, but the only action they can take is to reply with text that hopefully offers the user a correct or informative response.

The AI agents that AI companies refer to are significant advances over large language models like ChatGPT because they possess the ability to take actions on behalf of the people and companies who use them.

OpenAI says agents will soon become tools that people or businesses will leave running independently for days or weeks at a time, with no need to check on their progress or results. Researchers at OpenAI and Google DeepMind say agents are another step on the path to artificial general intelligence or "strong" AI – that is, AI that exceeds human capabilities in a wide variety of domains and tasks.

The AI systems that people use today are considered narrow AI or "weak" AI. A system might be skilled in one domain – chess, perhaps – but if thrown into a game of checkers, the same AI would have no idea how to function because its skills wouldn't translate. An artificial general intelligence system would be better able to transfer its skills from one domain to another, even if it had never seen the new domain before.

Worth the risks?

Are AI agents poised to revolutionize the way humans work? This will depend on whether technology companies can prove that agents are equipped not only to perform the tasks assigned to them, but also to work through new challenges and unexpected obstacles when they arise.

Uptake of AI agents will also depend on people's willingness to give them access to potentially sensitive data: Depending on what your agent is meant to do, it might need access to your internet browser, your email, your calendar and other apps or systems that are relevant for a given assignment. As these tools become more common, people will need to consider how much of their data they want to share with them.

A breach of an AI agent's system could cause private information about your life and finances to fall into the wrong hands.

Are you OK taking these risks if it means that agents can save you some work?

What happens when AI agents make a poor choice, or a choice that its user would disagree with? Currently, developers of AI agents are keeping humans in the loop, making sure people have an opportunity to check an agent's work before any final decisions are made.

In the Project Mariner example, Google won't let the agent carry out the final purchase or accept the site's terms of service agreement. By keeping you in the loop, the systems give you the opportunity to back out of any choices made by the agent that you don't approve. Like any other AI

system, an AI agent is subject to biases. These biases can come from the data that the agent is initially trained on, the algorithm itself, or in how the output of the agent is used.

Keeping humans in the loop is one method to reduce bias by ensuring that decisions are reviewed by people before being carried out. The answers to these questions will likely determine how popular AI agents become, and depend on how much AI companies can improve their agents once people begin to use them.

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<https://www.thehindu.com/sci-tech/science/what-is-an-ai-agent-the-computer-science-of-the-next-wave-of-ai-tools/article69003878.ece>



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Data on animal movements help Hungarian researchers create a swarm of autonomous drones

Moving in a dense cloud, like throngs of people walking across a crowded public square, 100 drones maneuver through the night sky in Hungary's capital, the result of over a decade of research and experimentation that scientists believe could change the future of unmanned flight.

The behaviour of the swarm, made up of autonomous drones that make their own real-time decisions on collision avoidance and trajectory planning without pre-programming or centralised control, is guided by research the Hungarian scientists performed on the collective movements of creatures from the natural world.

“It’s very rare that you see some technology and you say it’s beautiful,” said Boldizsár Balázs, one of the researchers working on the project.

“In its theoretical core it resembles nature. That’s why the drones themselves don’t need to be pretty, but what they do is pretty because it resembles natural swarming behavior.”

In this handout photo Gabor Vasarhelyi, physicist and researcher of the Department of Biological Physics at Eötvös Loránd University, is using his computer to set a swarm of 100 quadcopters to fly autonomously during an experiment near Budapest, Hungary, Thursday, Oct. 21, 2021.

Drones have in recent years become a common sight in our skies: Companies like Amazon and FedEx have launched drone delivery services, hobbyists use them for aerial photography and groups of over 1,000 drones have been pre-programmed to deliver large-scale light shows.

But the scientists at the Eötvös Loránd University in Budapest have developed new models based on animal behavior that allow a large number of drones to travel autonomously, reacting in real time to their environment and each other as they coordinate individual routes and tasks in dense aerial traffic.

“This is the level we call decentralisation ... After the drones are told what to do, we can switch off the ground control station, we can burn it or whatever, throw it away,” said Gábor Vászárhelyi, a senior researcher at the university's Department of Biological Physics.

“The drones will be able to do what they have to do just by communicating to each other.”

Using data they gathered by monitoring the behavior of pigeons in flight, the patterns of wild horses in the Great Hungarian Plain and other animal movements, they developed an algorithm that allows the drones to make on-board, autonomous decisions, safely mitigating conflicts and avoiding collisions.

While such technology has the potential to increase efficiency across many fields, some researchers have voiced concerns that certain applications of autonomous drones could pose significant dangers. Anna Konert and Tomasz Balcerzak with the Faculty of Law and Administration at Lazarski University in Warsaw, Poland, have researched such risks, and warn that military applications could escalate arms races or be misused or hacked by malign actors such as terrorist groups.

“When drones take over lethal actions, responsibility may shift from human operators to machines, leading to uncertainty about who should be held accountable if errors occur,” they wrote in an email.

“This detachment could lower the psychological barriers to initiating force, potentially making war more frequent and brutal.”

They also write that autonomous drones reducing the human cost of military engagements could “encourage more frequent military actions, leading to faster conflict escalation since fewer immediate human consequences would weigh against the decision to engage militarily.”

But beyond military uses, the researchers in Hungary say their technology has the potential to improve people's lives through numerous other applications.

Their digital simulations in three dimensions have them convinced that their algorithm can be scaled up to support 5,000 drones flying together autonomously, which they say could have applications in meteorology, land surveying, goods deliveries and beyond.

The researchers are also working on rolling out an agricultural application that can be used for the precision spraying of crops, and believe the technology could also play a role in decentralising air traffic control systems as more and more unmanned aircraft take to the skies.

<https://www.thehindu.com/sci-tech/energy-and-environment/data-on-animal-movements-help-hungarian-researchers-create-a-swarm-of-autonomous-drones/article69003567.ece>

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